GuardShield Type 4 and GuardShield Remote Teach User Manual

Allen-Bradley









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Important User Information

Because of the variety of uses for the products described in this publication, those responsible for the application and use of this control equipment must satisfy themselves that all necessary steps have been taken to assure that each application and use meets all performance and safety requirements, including any applicable laws, regulations, codes and standards.

The illustrations, charts, sample programs and layout examples shown in the guide are intended solely for purposes of example. Since there are many variables and requirements associated with any particular installation, Rockwell Automation does not assume responsibility or liability (to include intellectual property liability) for actual use based upon the examples shown in this publication.

Rockwell Automation publication SGI-1.1, Safety Guidelines for the Application, Installation and Maintenance of Solid-State Control (available from your local Rockwell Automation sales office), describes some important differences between solid-state equipment and electromechanical devices that should be taken into consideration when applying products such as those described in this publication.

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Throughout this manual 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.
IMPORTANT	Identifies information that is critical for successful application and understanding of the product.
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 consequences.
SHOCK HAZARD 	Labels may be on or inside the equipment (for example, drive or motor) to alert people that dangerous voltage may be present.
BURN HAZARD 	Labels may be on or inside the equipment (for example, drive or motor) to alert people that surfaces may reach dangerous temperatures.

It is recommended that you save this user manual for future use.

Conditions required for proper use of the GuardShield Safety Light Curtain

Please make sure you read and understand these requirements before you select and install the GuardShield safety light curtain. GuardShield safety light curtains are point of operation safeguarding devices. These safety light curtains are intended to be used to provide point of operation safeguarding of personnel on a variety of machinery.

The GuardShield family of safety light curtains are general purpose presence sensing devices which are designed to protect personnel working on or near machinery.

The installation of GuardShield safety light curtains must comply with all applicable federal, state, and local rules, regulations, and codes.

It is the responsibility of the employer to properly install, operate and maintain the product as well as the machinery on which the GuardShield presence sensing device is installed.

GuardShield safety light curtains must be properly installed by qualified personnel.

GuardShield safety light curtains are presence sensing devices and will not protect personnel from heat, chemicals, or flying parts. They are intended to signal a stop of hazardous machine motion when the sensing field is broken.

GuardShield safety light curtains can only be used on machinery which can be stopped anywhere in its stroke or cycle.

GuardShield safety light curtains should never be used on full revolution clutched machinery.

The effectiveness of the GuardShield safety light curtains depends upon the integrity of the machine control circuit. The machinery on which the GuardShield presence sensing device is installed should have control circuitry that is fail safe in design.

All stopping mechanisms for the machinery should be inspected regularly to ensure proper operation. The protected machinery must have a consistent reliable and repeatable stopping time.

ATTENTION 	Failure to read and follow these instructions can lead to misapplication or misuse of the GuardShield safety light curtains, resulting in personal injury and damage to equipment.

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IMPORTANT	Save these instructions for use at a future time.

Generally recognized technical regulations and quality assurance system ISO 9000 are carefully applied during the development and production of Allen-Bradley/Guardmaster products.

This technical description must be followed when installing and commissioning the GuardShield. Inspection and commissioning must be carried out by a qualified person.

Rockwell Automation reserves the right to make changes or revisions to the material contained in this publication and cannot be held liable for incidental or consequential damages resulting from the furnishing, performance or use of this material.

This manual covers the operation and installation of the:

- Standard and cascading GuardShield light curtain
- Remote Teach GuardShield
- GuardShield with Integrated Laser Alignment
- GuardShield with Integrated Laser Alignment and ArmorBlock Guard I/O

GuardShield Safety Light Curtain

Introduction

The GuardShield family of safety light curtains are general purpose presence sensing devices, designed for use on hazardous machinery providing point of operation, as well as, perimeter and access detection.

It is a self-contained, two box, Type 4 ESPE (Electro Sensitive Protective Equipment) with DIP-switch selectable operating modes.

The GuardShield is offered in a number of configurations based on a standard Type 4 safety light curtain platform.

In addition to the standard GuardShield, the GuardShield is offered with a Remote Teach box used to externally teach fixed blanking, in a cascading configuration which allows the interconnection of up to three pair of Guard Shields, with an integrated laser alignment system in standard and cascadable configurations and with connectivity to ArmorBlock Guard I/O for network connectivity providing OSSDs over a DeviceNet safety network. The ArmorBlock Guard I/O option is available in standard and cascadable versions with the integrated laser system.

Features of the GuardShield, which are integrated into the system's receiver;

- Fixed blanking
- Floating blanking
- External device monitoring (EDM)
- Internal or external restart
- Beam coding
- Laser alignment (option)

IMPORTANT	These installation instructions are designed to address the technical personnel of the machine manufacturer and or the installer of the safety system regarding the proper mounting, configuration, electrical installation, commissioning, operation and maintenance of the GuardShield safety light curtain. These installation instructions do not provide instruction for the operation of machinery to which the GuardShield safety light curtain is, or will be, integrated. Only qualified personnel should install this equipment.

Safety Precautions

Principles for Safe Use and Symbols Used

The following instructions are preventive warnings to ensure the safe and proper operation of the GuardShield. These instructions are an essential part of the safety precautions and therefore have to be observed at any time.

Throughout this manual we use the labels ATTENTION and IMPORTANT to alert you to the following:

ATTENTION Failure to observe may result in dangerous operation

ATTENTION: Identifies information about practices of circumstances that can lead to personal injury or death, property damage, or economic loss.

ATTENTION helps you

- Identify a hazard
- Avoid a hazard
- Recognize the consequences

IMPORTANT: Identifies information that is especially important for successful application and understanding of the product.

ATTENTION	Potentially hazardous situation, which, if not prevented, might lead to serious or deadly injury. Failure to observe may result in dangerous operation.

ATTENTION	The GuardShield must not be used with machines that cannot be stopped electrically in an emergency. The safety distance between the GuardShield and a dangerous machine movement has to be maintained at all times. Additional mechanical protective devices have to be installed in a way that hazardous machine elements cannot be reached without passing through the protective field. The GuardShield has to be installed in a way that operators can only operate within the sensing area. Improper installation can result in serious injury. Never connect the outputs to +24V DC. If the outputs are connected to +24V DC, they are in ON-state and cannot stop hazardous spots at the machine/application. Never expose the GuardShield to flammable or explosive gases. Regular safety inspections are imperative (see maintenance). Do not repair or modify the GuardShield. The GuardShield safety light curtain is not field repairable and can only be repaired at the factory. Removal of either of the GuardShield endcaps will void the warranty terms of this product.

Specialist Personnel

The GuardShield safety light curtain must be installed, commissioned and serviced only by a qualified person. A qualified person is defined as a person who:

- Has undergone the appropriate technical training

and

- Who has been instructed by the responsible machine operator in the operation of the machine and the currently valid safety guidelines

and

- Who has read and has ongoing access to these installation instructions

Range of Uses of the Device

The GuardShield safety light curtain is classified as electro-sensitive protective equipment (ESPE). The physical resolution is 14 mm (0.55 in.) or 30 mm (1.18 in.). The maximum protective field width is 7 m (22.9 ft) for the 14 mm (0.55 in.) resolution and 18 m (59 ft) for the 30 mm (1.18 in.) resolution GuardShield. The protective field height is between 160 mm (6.3 in.) and 1760 mm (69.2 in.).

The GuardShield with an Integrated Laser Alignment system is offered in protected heights from 320 to 1600 mm in increments of 160 mm. All GuardShield light curtains with ArmorBlock Guard I/O have Integrated Laser Alignment.

The device is a *Type 4 ESPE* as defined by IEC 61496-1 and CLC/TS 61496-2 and is therefore allowed for use with controls in safety category Type 4 in compliance with EN ISO 13849, SIL CL3 in accordance with EN62061 or up to PLe in accordance with EN ISO 13849. The device is suitable for:

- Point of operation protection (finger and hand protection)
- Hazardous area protection
- Access protection

Access to the hazardous point must be allowed only through the protective field. The machine/system is not allowed to start as long as personnel are within the hazardous area. Refer to the "Examples of Range of Use" on page 6 for an illustration of the protection modes.

Depending on the application, mechanical protection devices may be required in addition to the safety light curtain.

Proper Use

The GuardShield safety light curtain must be used only as defined in the "Range of Uses of the Device." It must be used only by qualified personnel and only on the machine where it has been installed and initialized by qualified personnel.

If the device is used for any other purposes or modified in any way, warranty claims against Allen-Bradley/Guardmaster shall become null and void.

General Protective Notes and Protective Measures

IMPORTANT	**Safety Notes** Please observe the following items in order to ensure the proper and safe use of the GuardShield safety light curtain.

- The national/international rules and regulations apply to the installation, use and periodic technical inspections of the safety light curtain, in particular:

  - Machine Directive 2006/42/EC
  - Low Voltage Directive 2006/95/EC
  - Equipment Usage Directive 89/655/EEC
  - The work safety regulations/safety rules
  - Other relevant health and safety regulations

  Manufacturers and users of the machine with which the safety light curtain is used are responsible for obtaining and observing all applicable safety regulations and rules.

- The notices, in particular the test regulations of these installation instructions (e.g. on use, mounting, installation or integration into the existing machine controller) must be observed.
- The tests must be carried out by specialist personnel or specially qualified and authorized personnel and must be recorded and documented to ensure that the tests can be reconstructed and retraced at any time.
- The installation instructions must be made available to the user of the machine where the GuardShield safety light curtain is installed. The machine operator is to be instructed in the use of the device by specialist personnel and must be instructed to read the installation instructions.

Product Description

This section provides information on the special features and properties of the safety light curtain. It describes the structure and functions of the unit, in particular the different operating modes.

➢ **Please read this section before mounting, installing and commissioning the unit.**

Special Features

- Start interlock
- Restart interlock
- Teachable fixed blanking
- One or two beam floating blanking
- External Device Monitoring (EDM)
- Machine test signal
- Beam coding

GuardShield Light Curtain Principle of Operation

The GuardShield safety light curtain consists of a non-matched pair of optic units, i.e., transmitter and receiver with the same protected height and resolution. The transmitter and receiver operate on +24V DC. The maximum distance between transmitter and receiver is referred to as the protective field width or range. The protective field height is the distance between the first and last beam in the device.

The transmitter emits sequential pulses of infrared light which are received and processed by the GuardShield receiver. The synchronization of the timing of the emission and reception of infrared light pulses is accomplished optically by the first beam adjacent to the GuardShield status LEDs. This beam is referred to as the synchronization beam. Because the GuardShield transmitter and receiver are optically synchronized, no electrical connection is required between the transmitter and receiver.

The GuardShield receiver has two safety outputs, Output Signal Switching Devices (OSSDs) and one nonsafety auxiliary output. When the GuardShield transmitter and receiver are properly powered and aligned, all OSSDs are current sourcing +24V DC with a switching capacity of 500 mA. The two safety OSSDs are cross monitored and short-circuit protected. Interruption of the sensing field causes the receiver to switch the sourced current OFF (0V DC).

Restoring the GuardShield sensing field, (in Guard only configuration) causes all outputs (OSSDs) to switch to the active high state (resume current sourcing +24V DC with a switching capacity of 500 mA).

The GuardShield Light Curtain

The GuardShield safety light curtain consists of a transmitter and a receiver.

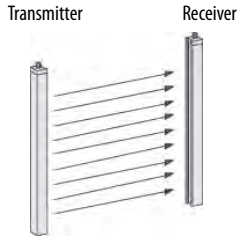


Figure 1: Components of the GuardShield



Up to three GuardShield POC segments can be interconnected.

The upper and lower limit of the protective field is shown by markings on the housings.

The GuardShield with an Integrated Laser Alignment system has the limits of the protected height indicated by the yellow border on the laser label and target label.

The ***width of the protective field*** is derived from the length of the light path between sender and receiver and must not exceed the maximum rated width of the protective field (7 m…14 mm (22.9 ft…0.55 in.), 18 m…30 mm (59.0 ft…1.18 in.)).

Cascading

The GuardShield, Type 4 POC is also available in cascading segments which allow a number of GuardShield transmitters and receivers to be interconnected. This product configurability allows the GuardShield to protect multiple sides of a machine or simply adds flexibility when positioning the GuardShield in various applications.

Standard GuardShield cascading segments are offered in protective heights from 320 to 1760 mm in both 14 mm and 30 mm resolutions. Cascading segments of 160 mm are not offered, however a 160 mm GuardShield can be used as the last segment in a cascading system.

Cascading GuardShields with an integrated laser alignment system are offered in protected heights from 320 mm to 1600 mm. It is possible to mix standard GuardShield light curtains with integrated laser alignment systems.

A maximum of three GuardShield light curtains can be interconnected with a common pair of OSSDs. There are no limitations for the total number of beams in a cascading system and the maximum number of beams possible is in three 1760 mm, 14 mm resolution GuardShield interconnected segments. The individual segments can have mixed resolutions, i.e., 14 mm and 30 mm as long as the pairs have the same protective heights and resolutions.

Cascading segments can be used as standalone light curtain pairs or can have up to three segments interconnected. These cascading segments all function as independent light curtains.

When cascading segments are used as standalone pairs or as the last segment in a cascading system, it is necessary to use a termination plug on the top connector of the GuardShield cascading receiver. It is also

possible to use a standard GuardShield Type 4 POC pair as the last segment in a cascading system.

Examples of Range of Use

The GuardShield safety light curtain operates as a proper protective device only if the following conditions are met:

- The control of the machine must be electrical.
- The controlled machine must be able to be stopped any where in the machines stroke or cycle.
- The transmitter and receiver must be mounted such that access to the hazard is only through the light curtain's protective field.
- The restart button must be located outside the hazardous area such that it cannot be operated by a person working inside the hazardous area.
- The statutory and local rules and regulations must be observed when installing and using the device.

Restart interlock is not available in GuardShield light curtains with ArmorBlock Guard I/O connectivity.

IMPORTANT	Additional measures may be necessary to ensure that the ESPE does not fail to danger when other forms of light radiation are present in a particular application (i.e., use of cableless control devices on cranes, radiation from weld spatter or effects from strobe lights).

GuardShield Laser Alignment

The laser light source in the Integrated Laser Alignment system of the GuardShield light curtains is a Class 1, eye safe laser diode with a wavelength of 670 nm.

This Class 1, eye safe laser is switched from a low output power state to a high output power state (and back again) by means of control circuitry which detects reflected laser light from a temporary blockage of the emitted laser light. This is most commonly accomplished by a person's finger placed over the laser overlay window. There is also an automatic shutdown feature that switches the laser diode from the high power state to the low power state if there is no finger or other interruption detected for a period of five minutes.

During the high output mode of operation, the laser is pulsed at a rate of approximately 2 Hz in order to facilitate finger detection in high ambient light conditions.

ATTENTION 	Use of controls or adjustments or performance of procedures other than those specified herein, may result in hazardous radiation exposure.

Safety Functions

The GuardShield safety light curtain offers a variety of functions, which are integral to the system.

Operating modes, functions and features of the GuardShield system are activated through DIP switch settings.

IMPORTANT	The protective system must be tested for proper operation after each and every change to the configuration.

Guard Only

When in the guard only mode of operation, the light curtain operates as an on/off device, meaning the OSSD outputs switch off/on according to an obstruction or clearing of the detection field. The GuardShield is shipped from the factory configured in Guard only mode.

Start Interlock

The start interlock prevents the OSSD outputs from switching to ON state after power up of the system with the protective field unobstructed. A manual reset of the system is required for the GuardShield to enter the ON state.

This can be accomplished by one of two methods.

- Actuation of a momentary N.O. push button
- Interruption and restoration of the protective field within one second.

Activation of this mode of operation and selection of the resetting method is through DIP-switch settings. Indication of this mode of operation is through illumination of a yellow LED on the GuardShield receiver.

Start interlock is not available on middle and end segments of a cascading GuardShield system, however, it is possible to configure this operating mode in the host segment allowing the whole cascading system to operate in this mode. Start interlock is not available in GuardShield light curtains with ArmorBlock Guard I/O connectivity.

Restart Interlock

The restart interlock mode of operation prevents the OSSD outputs from switching to ON after interruption and clearance of the protective field. A manual reset of the GuardShield system is required. Resetting of the system is accomplished through a momentary N.O. push button or key switch. Configuration and activation of this mode of operation is through DIP-switch settings. The restart interlock mode is indicated by the illumination of a yellow LED on the GuardShield receiver.

Restart interlock is not available on middle and end segments of a cascading GuardShield system, however, it is possible to configure this operating mode in the host segment allowing the whole cascading system to operate in this mode.

Restart interlock is not available in GuardShield light curtains with ArmorBlock Guard I/O connectivity.

Relay Monitoring (MPCE/EDM)

The relay monitoring function is an input signal to the GuardShield receiver and is used to monitor the state of the protected machinery's primary control contactors or other final switching device. Detection of unsafe conditions such as welded contacts, cause the GuardShield to enter a lockout condition (OSSDs OFF). Activation of this mode of operation is through DIP-switch setting in the GuardShield receiver.

EDM is not available in the middle and end segments of a cascading GuardShield system, however, it is possible to configure this operating mode in the host segment allowing the whole cascading system to operate in this mode.

External Device Monitoring (EDM) is not available in GuardShield light curtains with ArmorBlock Guard I/O connectivity.

System Testing

The GuardShield performs a complete system self-test at power up and switches to the ON state if the system is properly aligned and the protective field is unobstructed and the start/restart interlock modes of operation are deactivated.

External Test (Machine Test Signal)

A test cycle of the system can be triggered by an external test signal to the GuardShield transmitter. Supplying or removing a signal (+24V DC) via a N.C. or N.O. switch at the test input deactivates the transmitter for the duration of the test signal, simulating an interruption of the protective sensing field. The test input must be configured via a DIP-switch located in the GuardShield transmitter.

External test signal is not available in the middle and end segments of a cascading GuardShield system, however, it is possible to configure this feature in the host segment allowing the whole cascading system to operate in this mode.

IMPORTANT	If a test cycle of a cascading system is required, it is necessary to have all transmitters in a cascading system configured in the same condition, i.e. all "active high" or all "active low."

Beam Coding

If several safety light curtains are operating in close proximity to one another, it is possible that the transmitter's infrared light from one GuardShield system is "seen" by another GuardShield system's receiver. This would cause a "nuisance" stop. To prevent this optical interference, the GuardShield has the ability to have the transmitter generate different beam patterns, which is referred to as "Beam coding." Selection and activation of beam coding is accomplished through DIP-switch settings in both the transmitter and receiver.

The following settings are available in the GuardShield safety light curtain; noncoded and coded.

IMPORTANT	Beam coding improves resistance to optical interference. Beam coding increases the system's response time, which may also increase the required safety distance. Refer to Safety Distance calculations on page 9 of this manual.

Blanking

The GuardShield safety light curtain is capable of fixed blanking of one or more adjacent beams, exclusive of the synchronization beam. Floating blanking of one or two beams is also capable of being configured. It is possible to activate both fixed and floating blanking simultaneously.

Each cascading GuardShield segment pair functions as a standalone safety light curtain with its OSSDs connected in series to the host segment's OSSDs, therefore, it is necessary to configure fixed and/or floating blanking in each individual pair segment. This is accomplished by first aligning all segment pairs and securing the brackets. It is then possible to open a segment pair's receiver door using the security tool provided, set the appropriate DIP switches and perform the teach function. The successful completion of the teach function changes the operating mode of that segment pair only.

Fixed Blanking

The fixed blanking mode of operation is activated through DIP-switch settings located in the GuardShield receiver. The beams to be blanked are "taught" by depressing the teach button located in the GuardShield receiver endcap while the object is in the GuardShield sensing field.

The fixed blanking mode of operation is monitored. If any part or all of the object is removed from the sensing field, the GuardShield OSSD outputs go to the OFF state.

The GuardShield fixed blanking mode of operation will not be activated until the teach function is complete and the access door is closed.

IMPORTANT	Balanced areas may require an additional risk analysis. If no mechanical or other guarding is used to restrict access to the hazard, the blanked area must be taken into consideration in the calculation of the safety distance.

IMPORTANT	The configuration and activation of fixed blanking creates a "hole" in the GuardShield protective field. If the fixed object that is located in the protective field does not completely fill the area between the GuardShield transmitter and receiver it is necessary to obstruct access to the hazard by additional means. This is usually accomplished by "hard guarding" the open area.

Note: "Hard guards" refer to mechanical barriers.

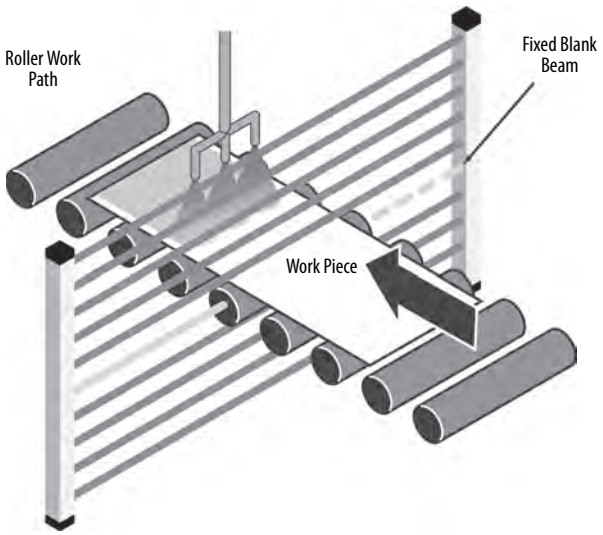


Figure 2: Monitored fixed blanking of in-feed rollers

- Beams are "taught" to ignore the fixed object in the sensing field
- The fixture or object must remain in the sensing field or GuardShield enters a Fault state

Fixed Blanking enables the blanking out of fixed objects in the sensing area of the light curtain. The following table shows the reaction of the monitored machine with Fixed Blanking de-activated and activated.

Symbol	Description
○	Beam not interrupted
⊠	Beam interrupted
□	Beam is activated for Fixed Blanking and not interrupted
⊠	Beam is activated for Fixed Blanking and interrupted

IMPORTANT	IEC 62046 provides information on additional means that may be required to prevent an operator from reaching into the hazard through the blanked areas of the detection zone.

Floating Blanking

The floating blanking mode of operation is activated through DIP-switch settings located in the GuardShield receiver. Floating blanking allows one or two beams located anywhere in the protective field to be "blanked out" i.e. blocked beam(s) ignored and GuardShield remains with outputs active.

The following chart depicts the Machine state for one and two beam floating blanking.

With Floating Blanking up to two light channels can be interrupted.

Note: It is not possible to activate more than one beam floating blanking on a 30 mm resolution GuardShield system.

IMPORTANT	Actuation of the floating blanking mode of operation changes the resolution of the GuardShield.

GuardShield Resolution	Number of Beams "Floated"	Effective Resolution
14 mm (0.55 in.)	1 Beam	24 mm (0.94 in.)
	2 Beam	34 mm (1.34 in.)
30 mm (1.18 in.)	1 Beam	50 mm (1.97 in.)

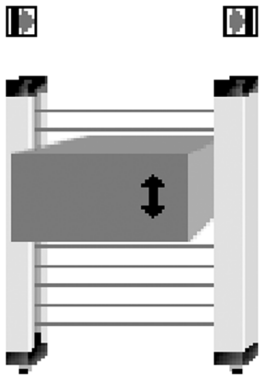


Figure 3: Floating blanking

Floating Blanking allows an object to "float" in (move within, or in and out of) the GuardShield protective field without causing the light curtain's outputs to change to the OFF state.

IMPORTANT	After each configuration or reconfiguration of a GuardShield light curtain, test the configuration of the GuardShield using the appropriate test piece.

IR Beam	Floating Blanking Deactivated	Floating Blanking 1 Channel Active				Floating Blanking 2 Channels Active						
1	○	○	○	○	○	○	○	○	○	○	○	⊠
2	○	○	○	⊠	⊠	○	○	⊠	⊠	⊠	⊠	○
3	⊠	○	⊠	⊠	○	○	⊠	⊠	○	⊠	○	⊠
4	○	○	○	○	⊠	○	○	○	⊠	⊠	⊠	○
5	○	○	○	○	○	○	○	○	○	○	⊠	⊠
Machine	**Stop**	**On**	**On**	**Stop**	**Stop**	**On**	**On**	**On**	**On**	**Stop**	**Stop**	**Stop**

Response Time

The response time of the GuardShield safety light curtain depends on the height of the protective field, the resolution and the number of light beams as well as the coding of the system.

The response time of a cascading system is the response time of the interrupted individual segment pair's response time.

Resolution [mm (in.)]	Protective Height [mm (in.)]	Number of Beams	Response Time w/o Coding	Response Time w/Coding
14 (0.55)	160 (6.3)	16	20 ms	30 ms
14 (0.55)	320 (12.5)	32	20 ms	30 ms
14 (0.55)	480 (18.8)	48	20 ms	30 ms
14 (0.55)	640 (25.1)	64	20 ms	30 ms
14 (0.55)	800 (31.4)	80	20 ms	30 ms
14 (0.55)	960 (37.7)	96	20 ms	30 ms
14 (0.55)	1120 (44.0)	112	20 ms	30 ms
14 (0.55)	1280 (50.3)	128	20 ms	30 ms
14 (0.55)	1440 (56.6)	144	20 ms	30 ms
14 (0.55)	1600 (62.9)	160	25 ms	35 ms
14 (0.55)	1760 (69.2)	176	25 ms	35 ms

Resolution [mm (in.)]	Protective Height [mm (in.)]	Number of Beams	Response Time w/o Coding	Response Time w/Coding
30 (1.18)	160 (6.3)	8	20 ms	30 ms
30 (1.18)	320 (12.5)	16	20 ms	30 ms
30 (1.18)	480 (18.8)	24	20 ms	30 ms
30 (1.18)	640 (25.1)	32	20 ms	30 ms
30 (1.18)	800 (31.4)	40	20 ms	30 ms
30 (1.18)	960 (37.7)	48	20 ms	30 ms
30 (1.18)	1120 (44.0)	56	20 ms	30 ms
30 (1.18)	1280 (50.3)	64	20 ms	30 ms
30 (1.18)	1440 (56.6)	72	20 ms	30 ms
30 (1.18)	1600 (62.9)	80	20 ms	30 ms
30 (1.18)	1760 (69.2)	88	20 ms	30 ms

IMPORTANT Determining Stop Time: The measurement of stopping time (Ts) must include the stopping times of all devices in the stop circuit. Not including all device and control system elements when calculating Ts will result in an inaccurate safety distance calculation.

Determining the Safety Distance

The light curtain must be mounted with proper safety distance

- From the point of danger
- From reflecting surfaces

US Safety Distance Formula

ATTENTION



The GuardShield safety light curtains must be mounted at a sufficient distance from the pinch point or point of operation hazard to ensure that the machine stops before a person's finger, hand, arm(s), or body reaches the hazard.

This distance, referred to as the safety distance, must be properly calculated prior to determining the safety light curtain protective height and mounting the light curtains on the machine. Failure to properly calculate this safety distance may result in operator injury.

IMPORTANT Regardless of the calculated safety distance, GuardShield safety light curtains should never be mounted closer than six inches from the point of operation or pinch point hazard.

In the United States there are two formulas that are used to properly calculate the safety distance. The first, the OSHA formula, is the minimum requirement for the calculation of the safety distance. The second formula, the one recommended by Rockwell Automation, is the ANSI formula, which incorporates additional factors to be considered when calculating the safety distance.

OSHA Safety Distance Calculation Formula

The OSHA safety distance formula as specified in CFR Subpart O 1910.217 is as follows:

$$Ds = 63 \times T_S$$

Ds — Safety Distance

63 — Is the OSHA recommended hand speed constant in inches per second

Ts — Is the total stop time of all devices in the safety circuit, measured in seconds. This value must include all components involved in stopping the hazardous motion of the machinery. For a mechanical power press it is the stopping time measured at approximately the 90º position of the crankshaft rotation.

Note: The T_S number must include the response times of ***all*** devices, including the response time of the safety light curtain, the safety light curtain controller (if used), the machine's control circuit and any other devices that react to stop the hazardous motion of the machinery. Not including the response time of a device or devices in the stop time calculation will result in insufficient safety distance for the application. This may result in operator injury.

The ANSI Safety Distance Formula

The ANSI safety distance formula, which is the Rockwell Automation recommended formula, is as follows:

$$D_S = K \times (T_S + T_C + T_r + T_{bm}) + D_{pf}$$

Ds — Minimum safety distance between the safe guarding device and the nearest point of operation hazard, in inches.

K — Hand speed constant in inches per second. The ANSI standard value is 63 inches per second when the operator begins reaching toward the point of operation hazard from rest. NOTE: ANSI B11.19 1990 E4.2.3.3.5 states "The value of the hand speed constant, K, has been determined by various studies and although these studies indicate speeds of 63 inches/second to over 100 inches/second, they are not conclusive determinations. The employer should consider all factors, including the physical ability of the operator, when determining the value of K to be used."

Ts — Stop time of the machine tool measured at the final control element.

Tc — Response time of the control system

Note: T_S and T_C are usually measured by a stop time measuring device.

Tr — Response time of the presence sensing device (safety light curtain) and its interface, if any. This value is generally stated by the device manufacturer or it can be measured by the user.

Tbm — Additional time allowed for the brake monitor to compensate for variations in normal stopping time.

Dpf — Depth penetration factor. It is an added distance to allow for how far into the protective field an object, such as a finger or hand, can travel before being detected. D_{pf} is related to the safety light curtain's object sensitivity. Object sensitivity is the smallest diameter object which will always be detected anywhere in the sensing field.

European Safety Distance Formula

A safety distance must be maintained between the light curtain and the point of danger. This safety distance ensures that the point of danger can only be reached after the dangerous state of the machine has been completely removed.

The safety distance as defined in EN ISO 13855 and EN ISO 13857 depends on:

- Stopping/run-down time of the machine or system. (The stopping/run-down time is shown in the machine documentation or must be determined by taking a measurement.)
- Response time of the protective device, e.g. GuardShield (for "Response Time" see page 9).
- Reach or approach speed.
- Resolution of the light curtain and/or beam separation.

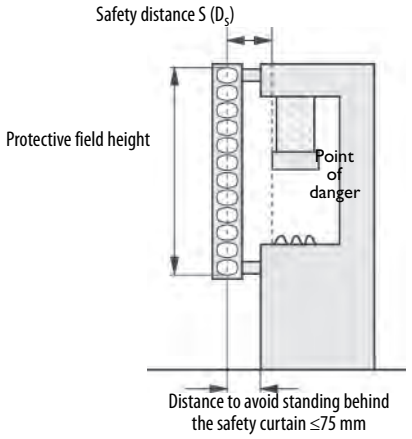


Figure 4: Safety distance from the point of danger

How to Calculate the Safety Distance S According to EN ISO 13855 and EN ISO 13857:

➢ **First, calculate S using the following formula:**
S = 2000 × T + 8 × (d – 14) [mm]

Where …

T = stopping/run-down time of the machine + response time of the protective device [s]
d = resolution of the light curtain [mm]
S = safety distance [mm]
The reach/approach speed is already included in the formula.

➢ **If the result S is ≤ 500 mm (19.6 in.), then use the determined value as the safety distance.**

- **If the result S is > 500 mm (19.6 in.), then recalculate S as follows:**
  S = 1600 × T + 8 × (d – 14) [mm]
- **If the new value S is > 500 mm (19.6 in.), then use the newly determined value as the minimum safety distance.**
- **If the new value S is ≤ 500 mm (19.6 in.), then use 500 mm (19.6 in.) as the safety distance.**

Example:

Stopping/run-down time of the machine = 290 ms
Response time = 30 ms
Resolution of the light curtain = 14 mm (0.55 in.)
T = 290 ms + 30 ms = 320 ms = 0.32 s
S = 2000 × 0.32 + 8 × (14 – 14) = 640 mm (25.1 in.)
S > 500 mm, therefore:
S = 1600 × 0.32 + 8 × (14 – 14) = 512 mm (20.1 in.)

Example:

In opto-electronic safeguarding, such as with a perpendicular safety light curtain applications with object sensitivity (effective resolution) less than 2.5 inches, the D_{pf} can be approximated based on the following formula:

D_{pf} (inches) =3.4 × (Object Sensitivity – 0.276),
but not less than 0.

Minimum Distance from Reflecting Surfaces

The infrared light from the sender may be reflected off of shiny surfaces and be received by the system's receiver. If this condition occurs, it can result in an object not being detected when it enters the GuardShield sensing field.

All reflecting surfaces and objects (e.g. material bins) must therefore be located at a minimum distance ***a*** from the protective field of the system. The minimum distance ***a*** depends on the distance ***D*** between sender and receiver.

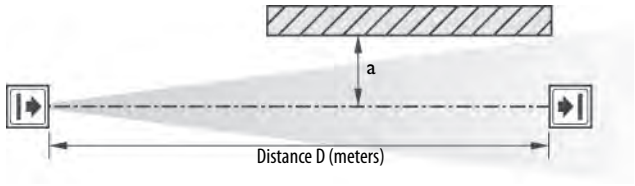


Figure 5: Minimum distance from reflecting surfaces

How to Determine the Minimum Distance from the Reflecting Surfaces:

- **Determine the distance *D* [m] sender-receiver**
- **Read the minimum distance *a* [mm] from the graph:**

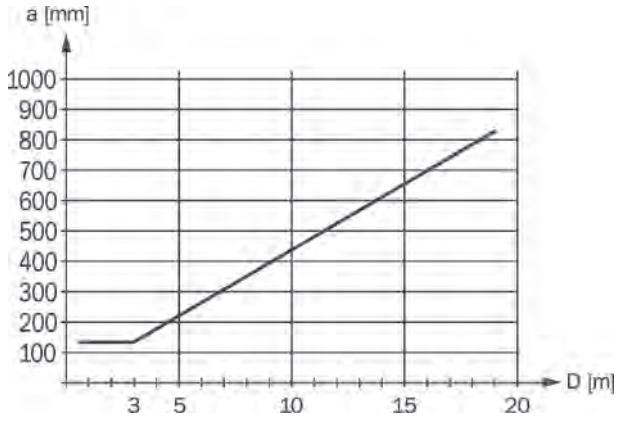


Figure 6: Graph, minimum distance from reflecting surfaces

The effective aperture angle for the GuardShield system is +/- 2.5° at a mounting distance of > 3.0 m (9.8 ft). Calculate the minimum distance to reflecting surfaces depending on the distance between the transmitter and the receiver, using an aperture angle of +/- 2.5°, or take the appropriate value from the following table:

Distance Between Transmitter and Receiver (Range L) [m (ft)]	Minimum Distance a [mm (in.)]
0.2 to 3.0 (0.65 to 9.8)	135 (5.31)
4.0 (13.1)	175 (6.88)
5.0 (16.4)	220 (8.66)
6.0 (19.6)	265 (10.43)
7.0 (22.9)	310 (12.2)
10.0 (32.8)	440 (17.32)
16.0 (52.4)	700 (27.55)

Note: Formula: a = tan 2.5° x D [mm]

a = minimum distance to reflecting surfaces
D = distance between transmitter and receiver

Installation and Mounting

This section describes the preparation, selection and installation of the GuardShield safety light curtain.

The standard GuardShield has an amber LED in the receiver which is used as an alignment aid. This LED will begin flashing when the infrared light from the transmitter is "seen" by the receiver. This LED turns off when optimal alignment is attained.

Alignment Procedure: Standard GuardShield

Mount and connect both transmitter and receiver. They must be parallel to each other and be positioned at the same height.

Turn on power to GuardShield system.

Rotate the transmitter while watching the amber LED on the receiver to find the point where the indicator for the ON state (Green LED) illuminates and the amber LED goes off.

Determine the maximum left and right turning angles and position unit in center. Tighten all hardware assuring that the alignment indicator is not illuminated.

Cycle power to assure that the system powers up and goes to the ON state (alignment indicator is OFF).

The GuardShield is also offered with an integrated laser alignment system which has a constantly powered Class 1, eye safe laser located in the top of the GuardShield transmitter and in the bottom of the GuardShield receiver. Each laser emits a low level of visible light. Simply blocking this light below the finger symbol causes the light to be reflected back to a photo sensor which changes the condition of the laser light. If this light is at a low level, interrupting it will cause the laser to emit a highly visible level of light. Interrupting the visible light in the same location will cause the laser to switch to a low level of emission. The emission of visible light will also change to a low level after five minutes of activation.

Across from each laser is a target used to help with the alignment of the GuardShield pair. Positioning the visible light in the center of the top and bottom targets will position the GuardShield pair for optimal alignment.

An external laser (440L-ALAT) and mounting bracket (440L-AF6109) is offered as an accessory for aligning the GuardShield.

Alignment Procedure for GuardShield with Integrated Laser Alignment

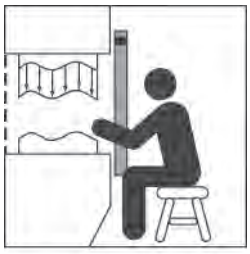
1. Properly locate the GuardShield pair from the point of operation hazard after performing the safety distance calculation.
2. Using the GuardShield mounting brackets, mount the transmitter and receiver so that they are facing one another and are positioned in the same direction. A reference would be that the indicator LEDs are opposite one another.
3. Turn on each laser by placing a finger or hand in front of each laser.
4. For optimal alignment, adjust the transmitter and receiver in such a way that both visible laser beams hit the laser targets opposite each laser. A small deviation around the target is allowable.

The GuardShield safety light curtain is suitable for most operating environments (IP65 environmental rating). Proper safety distance as well as adequate protective height must be observed.

IMPORTANT	The installation of the GuardShield safety light curtain must be such that access to the hazard is only possible through the sensing field of the GuardShield. Auxiliary safe guarding may be required in conjunction with the GuardShield to meet this requirement.

Determine if the machinery, on which the GuardShield is to be mounted, meets the requirements as specified in the beginning of this manual, i.e., machinery must be able to be stopped anywhere in its stroke or cycle, consistently and repeatedly.

Correct Installation



Operators cannot reach hazardous machine parts without passing through the protective field.



Operators must not step between protective field and hazardous machine parts (by-pass prevention).

Incorrect Installation



Operators can reach hazardous machine parts without passing through the protective field.

Operators can step between protective field and hazardous machine parts.

The GuardShield must be mounted at the proper distance from the point of operation hazard. This distance is referred to as the Safety Distance.

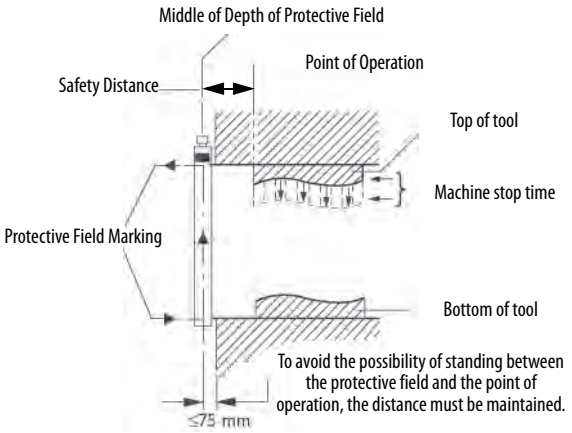


Figure 5: Determining machine stopping time and safety distance

Typical Mounting Configurations of Cascading GuardShield

Configuration of Operating Modes in Cascading Systems

All of the operating modes of a standard GuardShield can be configured in the host or first segment in a cascading GuardShield system. Middle and end segments can only have the following operating modes/features configured;

- Beam coding
- Floating blanking
- Fixed blanking

All other possible operating modes of a standard GuardShield, if configured in a middle or end segment will cause lock out or off conditions which require a cycling of power and a reconfiguration of the segment.

Two Segment Cascading GuardShield Systems;

When the safety distance calculation requires that a GuardShield pair is vertically mounted at a distance that would allow a person to stand between the vertical pair and the machine hazard, a means of detection of that person is required.

There are a few methods of detecting the presence of a person who could be standing in front of the machine hazard but inside of the light curtain; installing a safety mat or safety laser scanner are possible solutions, however they are costly solutions as these are separate safety systems that need to be integrated to the safety circuit. The most cost effective solution is to interconnect an additional light curtain in series to the vertical pair. This is accomplished by first selecting a “Host” or cascading pair of GuardShield safety light curtains with a protective height and resolution based upon the results of a risk assessment. It is then necessary to select the horizontal protected height of the pair of GuardShield light curtains. This pair should provide detection from the vertical pair to the front of the machine hazard. In most cases this pair of GuardShields can be 30 mm resolution as their purpose is to detect the presence of a person, not a person’s fingers or hands.

The next step is to select the interconnect patchcords for the transmitter and receiver. These patchcords are offered in a variety of lengths. Finally it is necessary to determine if the last segment of the cascading system is a standard or cascading GuardShield pair. Cascading segments that are not connected to another pair of GuardShield light curtains must have a termination plug attached to the receiver segment.

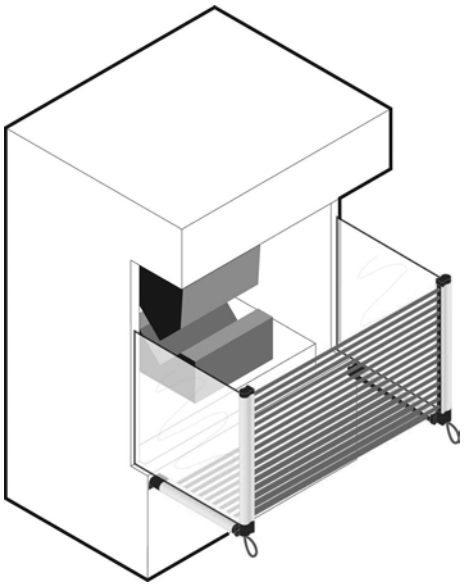


Figure 6: “L-shaped” two segment GuardShield cascading systems offer protection when it is possible to stand between the vertical light curtain and the machine hazard

Three Segment GuardShield Cascading Systems

When the use of corner mirrors is not practical or possible, three-sided guarding of a machine hazard is possible using cascading GuardShield light curtains.

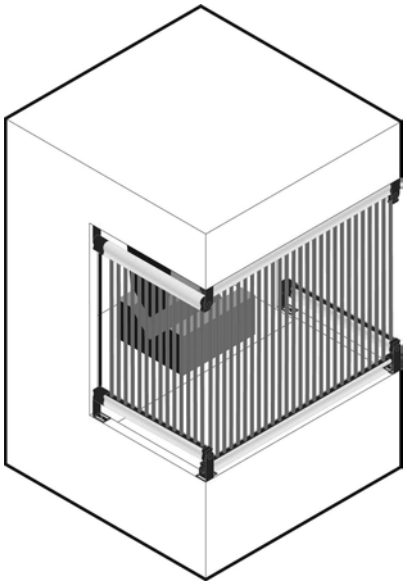


Figure 7: Top and bottom mounting of three GuardShield segments is possible, which will provide three-sided machine guarding without the use of corner mirrors

Mounting and Alignment of Cascading GuardShield

IMPORTANT	It is necessary to align cascading segments in a particular order. Begin by aligning the last segment in the system, once the last receiver LED is green; secure mounting brackets of that pair. Next align middle segment pair, when middle segment receiver LED is green secure those brackets. Finally align the host segment, when that receiver's LED is green, secure those brackets. Test system by interrupting sensing field of last segment and verify that all receiver OSSD LEDs are red. Next interrupt the sensing field of middle segment pair if any and confirm that middle segment and host segment receiver OSSD LEDs are red (the last segment pair receiver's LED should remain green). Finally, interrupt the sensing field of the host segment receiver and confirm that the receiver OSSD LEDs are red (middle and end segment pairs will indicate green).

Multiple GuardShields

When two or more GuardShields are mounted in close proximity to one another, it may be possible for the receiver of one GuardShield pair to receive infrared light from the transmitter of another GuardShield pair. This optical interference can be over come by the GuardShield feature of Beam Coding. Beam coding changes the pulse pattern of infrared light emitted by a GuardShield transmitter.

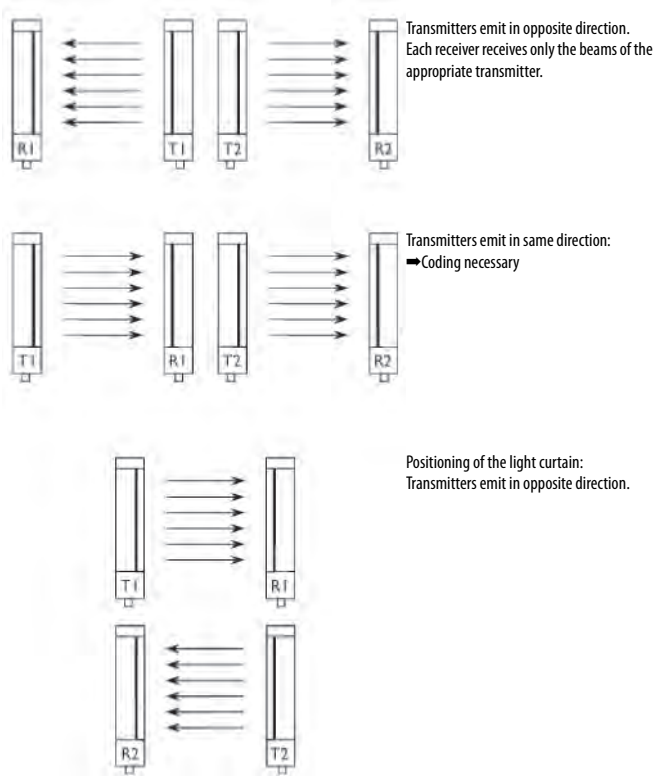


Figure 8: Multiple GuardShield alignment options

Mounting Brackets

The GuardShield is mounted using right angle brackets attached to the endcaps of both transmitter and receiver. It may be necessary to use additional brackets to mount the GuardShield at a proper safety distance from the machinery hazard.

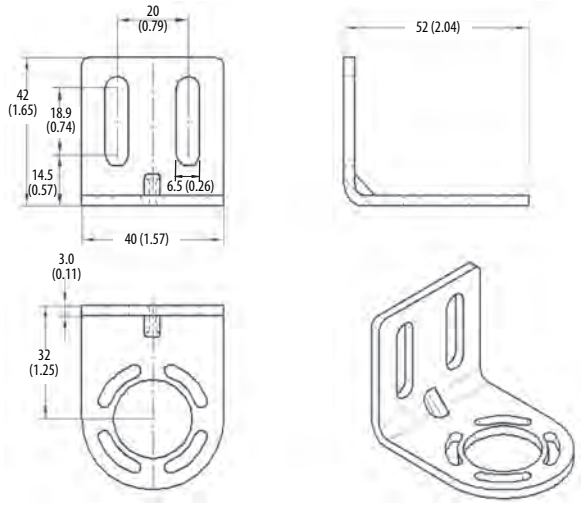


Figure 9: Mounting brackets

Optional Middle Mounting Bracket (440L-AF6108)

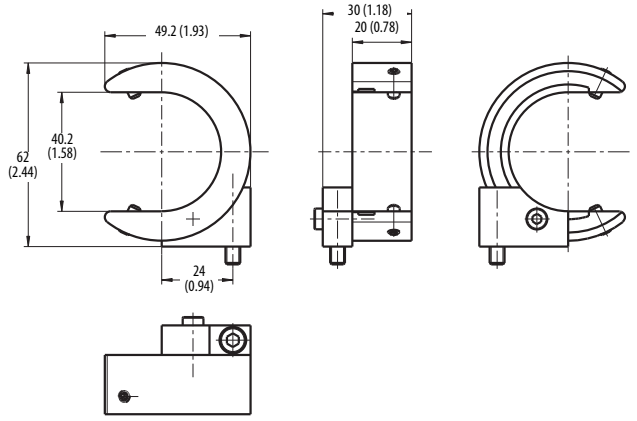


Figure 10: Middle mounting brackets

Note: Middle mounting brackets should be used in vibration applications for protective heights of 1120 mm and larger.

GuardShield Remote Teach Receiver Bracket

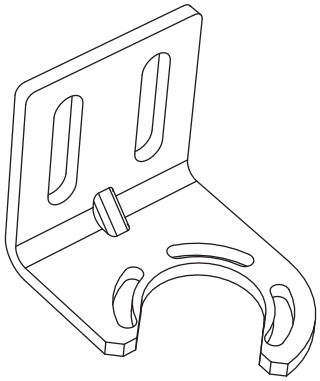


Figure 11: Remote teach receiver bracket

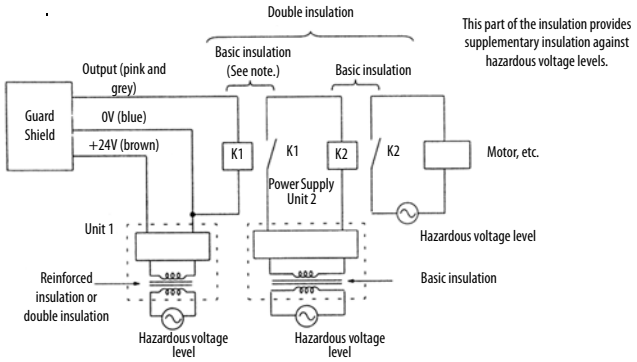
Electrical Installation

Connections

Power Supply

The external voltage supply (+24V DC) must meet the requirements of IEC 61496-1. In addition, the following requirements have to be fulfilled:

- A short-term power failure of 20 ms must be bridged by the power supply.
- The power supply has double insulation between the primary and the secondary side.
- The power supply is protected against overload.
- The power supply corresponds to the guidelines of the EWG (industrial environment).
- The power supply corresponds to the Low Voltage Directives.
- The grounded conductor of the power supply device must be connected to a grounded conductor PE.
- The maximum deviation of the voltage levels is 24V DC +/- 20%.



EDM Connection

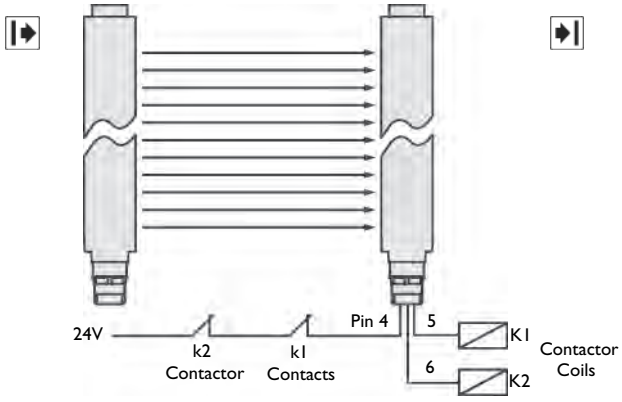


Figure 12: Connecting the contact elements to the EDM

IMPORTANT	Not available for GuardShield with ArmorBlock Guard I/O connectivity.

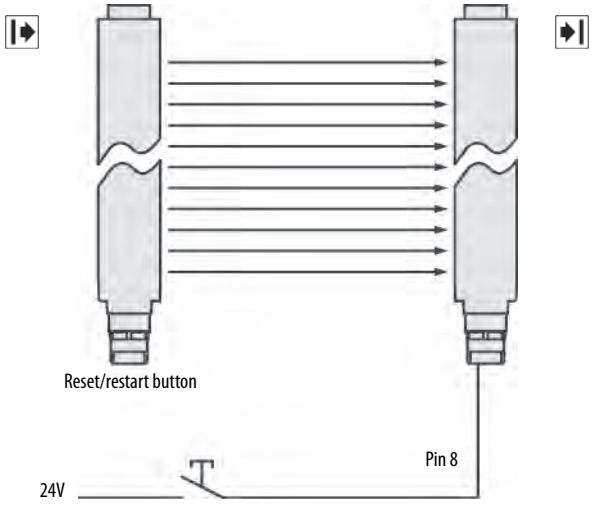
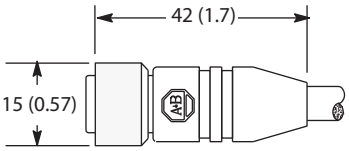


Figure 13: Connecting the reset button/restart button

IMPORTANT Not available for GuardShield with ArmorBlock Guard I/O connectivity.

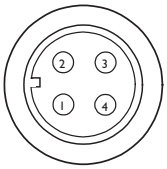
Connections [mm (in.)]



Cables/Connectors

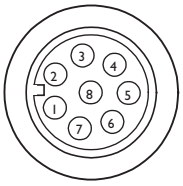
The GuardShield transmitter connector is a four-pin DC micro connector offered in cable lengths from 2 to 30 meters. The GuardShield receiver connector is an 8-pin DC micro connector offered in cable lengths of 2 to 30 meters.

GuardShield Standard and GuardShield with ArmorBlock Guard I/O Connectivity

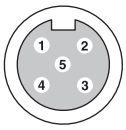
Transmitter Connection Face View of Female DC Micro	Color	Pin No.	Signal Transmitter
	Brown	1	+24V DC
	White	2	No Connection
	Blue	3	0V DC
	Black	4	Machine Test Signal

Note: The transmitter is not expected to be connected to the ArmorBlock Guard I/O module.

Standard GuardShield Receiver Connector

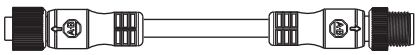
Receiver Connection Face View of Female DC Micro	Color	Pin No.	Signal Receiver
	White	1	Auxiliary Output
	Brown	2	+24V DC
	Green	3	Ground
	Yellow	4	EDM
	Grey	5	OSSD 1
	Pink	6	OSSD 2
	Blue	7	0V DC
	Red	8	Start/Restart

GuardShield Receiver Connector for ArmorBlock Guard I/O Connectivity

Top View	Color	Pin No.	Signal Receiver
	Brown	1	+24V
	White	2	OSSD 2
	Blue	3	0V
	Black	4	OSSD 1
	Grey	5	NC

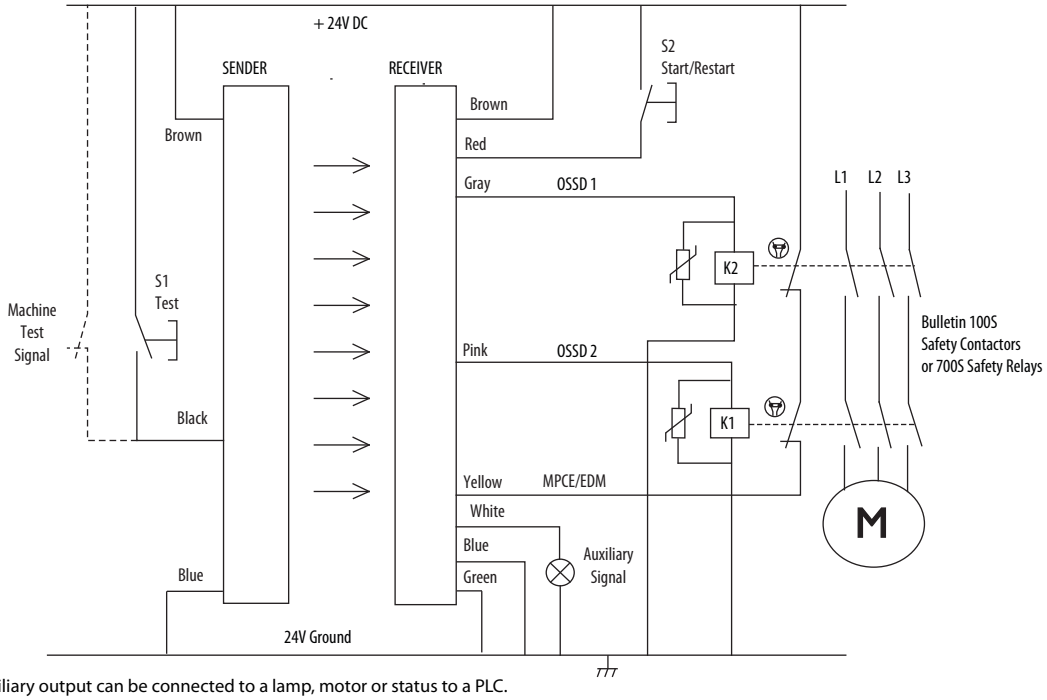
Interconnecting Patchcords for Cascading GuardShield

Cat. No.	Description
Transmitter Patchcord	
889D-F4HLDM-0M3	4-pin M12 patchcord, 12 inches
889D-F4HLDM-1	4-pin M12 patchcord, 1 meter
889D-F4HLDM-2	4-pin M12 patchcord, 2 meters
Receiver Patchcords	
889D-F8ABDM-0M3	8-pin M12 patchcord, 12 inches
889D-F8ABDM-1	8-pin M12 patchcord, 1 meter
889D-F8ABDM-2	8-pin M12 patchcord, 2 meters
Shorting Plug (Required for cascading GuardShield if last pair in cascade sytem or standalone pair.)	
Receiver	
898D-81CU-DM	Termination plug 8-pin M12 quick-disconnect



Example of Patchcord for connecting cascading GuardShield

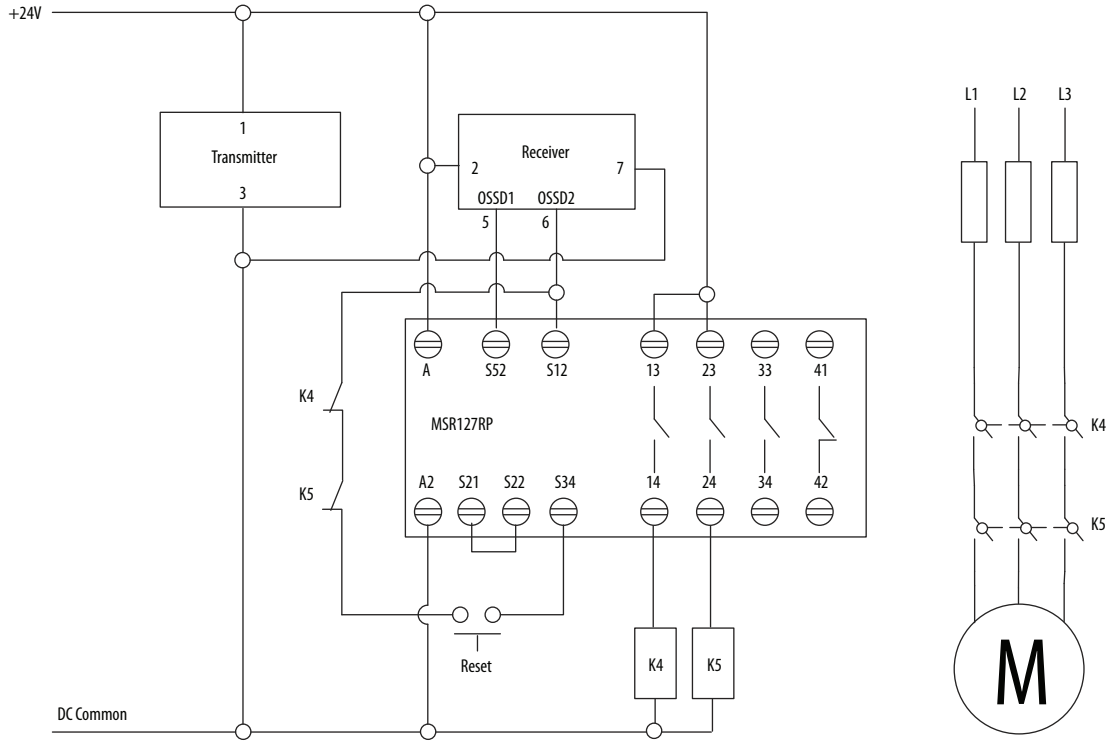
Typical Wiring Diagram—Direct to Contactors



❶ Nonsafety auxiliary output can be connected to a lamp, motor or status to a PLC.

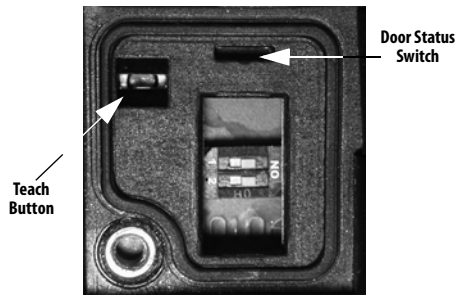
Note: If MPCE/EDM is activated in the GuardShield, the application requires a safety contactor. If MPCE/EDM is not used K1 & K2 can be standard contactors.

Typical Wiring Diagram—To MSR127 Safety Relay Module

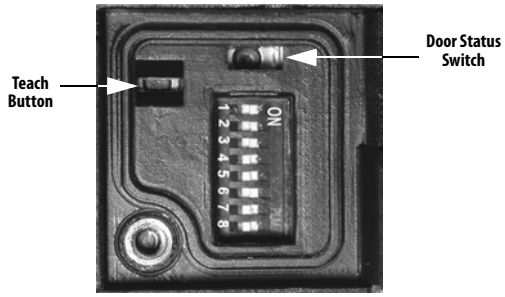


System Configuration

DIP-Switch Selection Settings—Transmitter



DIP-Switch Selection Settings—Receiver



After mounting, electrically connecting and aligning the GuardShield safety light curtain, it is now possible to configure your system.

To begin system configuration, use the security tool provided to loosen the screw in the configuration door.

Note: The configuration door screw is a captive screw.

Note: The transmitter can only be configured for beam coding and Machine Test Signal. If neither of these configurations are required, then it is only necessary to configure the GuardShield receiver.

Identify and set the appropriate DIP-switches for the configuration desired.

DIP-switch identification and function is explained in the tables below.

Follow the Teach Function Procedure to reconfigure the GuardShield.

IMPORTANT	After each reconfiguration of the GuardShield, test the system for proper configuration and operation before placing the guarded machine in operation.

When delivered from the factory, the following settings are configured.

Receiver—Factory Settings

Switch	Switch Function	Default Setting	Description
1	Mode Activation—Combination activates one of the following modes: Guard only, Start interlock, Restart Interlock	ON	Guard Only
2		ON	
3	MPCE Monitoring disable	ON	Disabled
4	Fixed Blanking Activate	OFF	Disabled
5	Floating Blanking Activate—Single Beam	OFF	Switches 5&6 cannot be activated "On" at the same time.
6	Floating Blanking Activate—Two Beams	OFF	
7	Set Beam Coding	OFF	Disabled
8	Not used	OFF	

Transmitter—Factory Settings

Switch	Switch Function	Default Setting	Description
1	Set Beam Coding	OFF	Disabled
2	Machine Test Signal	OFF	OFF: Signal High active—No connection or connect normally open ON: Signal Low active—Connect N/C

Settings for Mode of Operation—Receiver

Switch 1	Switch 2	Condition	Operation
ON	ON	Guard Only	ON/OFF Operation
OFF	ON	Start Interlock (Push Button Reset)	Interlock at start up—Reset by actuation of pushbutton switch
OFF	OFF	Restart Interlock	Interlock at interruption of sensing area—Reset by actuation of pushbutton switch
ON	OFF	Start Interlock	Interlock at start up—Reset by Interruption/ restoration of sensing area for <1 sec

ATTENTION 	Every modification at the DIP switches must be stored in the memory of the device through the Teach function.

IMPORTANT	GuardShield light curtains with ArmorBlock Guard I/O connectivity have receiver DIP switches 1, 2, and 3 disabled. The configurable features allowed for this GuardShield light curtain are fixed and floating blanking and beam coding.

Cascading segment's DIP switch settings

There are a few operating modes that can not be configured in the middle and end segments of a cascading GuardShield system. The following Operating modes if configured will cause the light curtain to fault;

- EDM (External Device Monitoring)
- Start and Restart Interlock

Power must be cycled and the segment pair must be re-taught to deactivate the mode.

IMPORTANT	Configuring EDM in a middle or end segment will cause an EDM fault in that configured segment even if EDM is also configured and functioning in the Host segment. Interruption of the middle or end segment which has EDM also configured will cause the middle or end segment to go to a lock out condition that can not be reset without cycling power and reconfiguring the middle or end segment without the non allowed configuration. Configuring Start or Restart Interlock in the middle or end segment will cause a fault in the middle or end segment which has that Operating mode configured. The LED indication will show a "Waiting for reset" fault which can not be reset even if the Host segment is also configured for Start or Restart Interlock. Due to the lack of an internal reset line in the middle or end segment it will not be possible to reset the middle or end segment before resetting the Host segment.

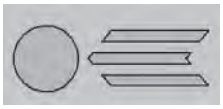
Teach Function

Procedure:

Step 1 Open cover of the end cap (LED blinks: Receiver is red LED, Transmitter is amber LED).

Step 2 Select the desired switch setting.

Step 3 Press and hold the Teach button. The yellow LED flashes at 10 Hz (10x per second).



Step 4 The yellow LED will stop blinking while the button is depressed. After the yellow stops flashing, release the teach button within 2 seconds.

- After 3 flashes of the yellow LED the function is activated.

Step 5 Close and secure the cover.

Note: The doors on the transmitter and receiver must be closed for the GuardShield to operate.

IMPORTANT	If the GuardShield teach procedure is not properly completed, the unit will remain in the previous operating mode.

IMPORTANT	Once the teach function is completed and the door secured, verify that the operating mode has changed to the intended mode.

Troubleshooting Guide

The light curtain carries out an internal self-test after startup. If an error occurs, an appropriate signal combination is sent through the LEDs to the transmitter and receiver.

Condition No.	Error Description	Action
8	Internal fault, receiver	• Check configuration of transmitter and receiver • Replace receiver
9	Internal fault, transmitter	• Check configuration of transmitter and receiver • Check protective field transmitter/receiver • Check connections transmitter/receiver • Exchange transmitter
10	External fault	• Check connections of OSSD outputs for short circuit against +24V DC and GND (cable, connected devices) • Exchange receiver
11	External fault (MPCE error) The function **Relay monitoring** is activated and after clearing the OSSD the input Relay monitoring does not recognize a change of state.	• Check connection Relay monitoring • Check connected relay for closed contact (if OSSD ON—input Relay monitoring must have GND level, if OSSD OFF—input Relay monitoring must have +24V) • Switch on only after POWER OFF/ON
12	Configuration mode (Receiver)	• Cover for DIP switch setting at the receiver is open
13	Configuration mode (Transmitter)	• Cover for DIP switch setting at transmitter is open

System Status Indicators



	Receiver LEDs					Transmitter LEDs	
Condition No.	OSSDs OFF ● Red	OSSDs ON ● Green	Blanking ● Yellow	Alignment ● Amber	Interlock ● Yellow	Power On ● Amber	Emitting ● Yellow
1	OFF	ON	OFF	OFF	OFF	ON	ON
2	ON	OFF	OFF	OFF	OFF	ON	ON
3	ON	OFF	OFF	ON	OFF	ON	ON
4	ON	OFF	OFF	OFF	ON	ON	ON
5	OFF	ON	ON	OFF	OFF	ON	ON
6	OFF	ON	FLASH	OFF	OFF	ON	ON
7	ON	OFF	OFF	OFF	OFF	ON	OFF
8	FLASH	OFF	OFF	OFF	OFF	ON	ON
9	ON	OFF	OFF	OFF	OFF	FLASH	ON
10	FLASH	OFF	OFF	ON	OFF	ON	ON
11	FLASH	OFF	OFF	OFF	ON	ON	ON
12	FLASH	OFF	DATA TRANS	OFF	OFF	ON	ON
13	ON	OFF	OFF	OFF	OFF	FLASH	DATA TRANS

8 through 13 = Fault conditions

Flash rate is approximately 2 Hz (2 times per second)

Condition No.	Description
1	Guard only mode, light curtain unobstructed (aligned, not in interlock)
2	Guard only mode, light curtain interrupted (aligned, not in interlock)
3	Guard only mode, misaligned (not in interlock)
4	Guard only mode, in start or restart interlock (aligned)
5	Fixed blanking mode (aligned, not in interlock)
6	Floating or Floating/Fixed Blanking mode (aligned, not in interlock)
7	Transmitter test input active (pin 4)
8	Internal fault, receiver
9	Internal fault, transmitter
10	External fault (OSSD short to ground, +V, or cross connection)
11	External fault (MPCE/EDM error)
12	Configuration mode (receiver access door open)
13	Configuration mode (transmitter access door open)

Note: For fault conditions 8 through 13, see Troubleshooting guide on page 19.

ATTENTION 	Assure that all power to the machine, and safety system is disconnected during electrical installation.

IMPORTANT	Prior to powering up the GuardShield system, the responsible person should review the following Checklist.

Checklist

Before the initiation of the GuardShield the responsible person should work through the following checklist.

Cable check prior to initiation:

1. o The power supply is solely connected to the GuardShield.
2. o The power supply is a 24V DC device, that must comply to all applicable standards of the Machinery Directive 2006/42/EC, and the product standard (IEC 61496).
3. o Proper polarity of the power supply at the GuardShield.
4. o The transmitter connection cable is properly connected to the transmitter, the receiver connection cable is properly connected to the receiver.
5. o The double insulation between the light curtain output and an external potential is ensured.
6. o The OSSD outputs are not connected to +24V DC.
7. o The connected switching elements (load) are not connected to 24V DC.
8. o No connection to a conventional power supply.
9. o If two or more GuardShield are to be used, make sure that each system is properly installed, in order to avoid optical interference.

Switch the GuardShield on and check its function by observing the following:

10. o Two seconds after switching on, the system starts to work properly, if the protective field is free of obstructions.

Safety Instructions—Maintenance

ATTENTION 	Never operate the GuardShield before carrying out the following inspection. Improper inspection can lead to serious or even deadly injury.

Note:

1. For safety reasons all inspection results should be recorded.
2. Only persons, who clearly understand the functioning of the GuardShield and of the machine, may carry out an inspection.
3. If installer, planning engineer and operator are different people, make sure that the user has sufficient information available to carry out the inspection.

Daily Inspection

1. o Approach to hazardous machine parts must only be possible through passage through the protective field of GuardShield.
2. o Operators cannot step through the sensing area while working on dangerous machine parts.
3. o The safety distance of the application is bigger than the calculated value.
4. o The optic front cover is neither scratched nor dirty.

Operate the machine and check, if the hazardous movement will stop under the following circumstances.

5. o The protective field is interrupted.
6. o Hazardous machine movement stops immediately, if the protective field is interrupted by the test rod directly in front of the transmitter, directly in front of the receiver and in the middle between transmitter and receiver.
7. o No hazardous machine movement while the test rod is anywhere within the protective field.
8. o The power supply of the GuardShield is turned off.
9. o If the blanking function is activated, check all sections of the protective field with the appropriate test piece.

IMPORTANT	If any of the above conditions do not result in the hazardous motion of the machine ceasing, do not allow the protected machine to be placed in operation.

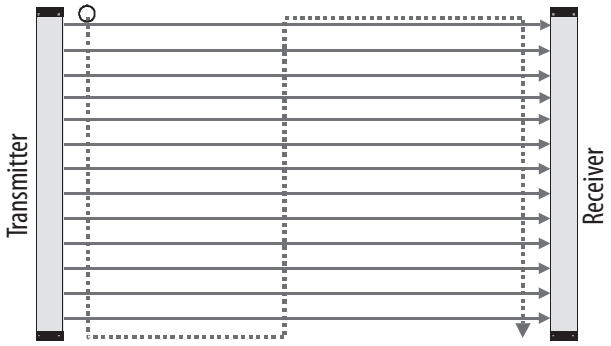


Figure 4: Proper testing of protective field using test rod

Six-Month Inspection

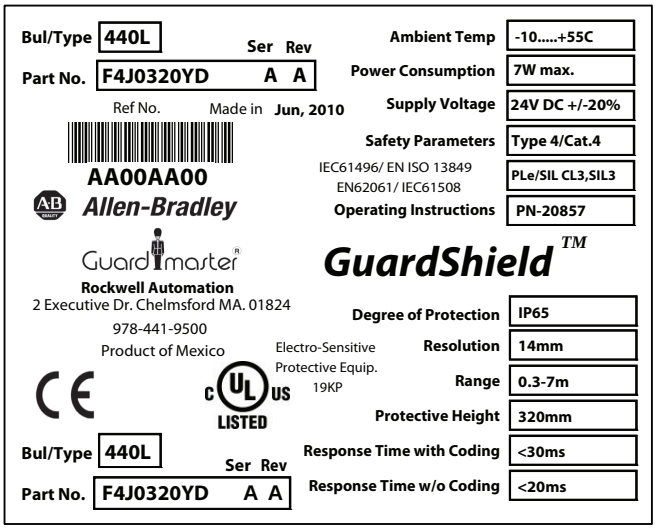
Check the following items every six months or whenever a machine setting was changed.

1. o Machine stops or does not obstruct any safety function.
2. o The latest machine or connection modifications have no effect on the control system.
3. o The outputs of the GuardShield are properly connected to the machine.
4. o The total response time of the machine is shorter than the calculated value.
5. o Cables and plugs of the GuardShield are in flawless condition.
6. o Mounting brackets, caps and cables are tightly secured.

Cleaning

If the optic front cover of the GuardShield is dirty, the outputs of the GuardShield turn off. Take a clean, soft cloth and rub without pressure. Do not apply aggressive, abrasive or scratching cleansing agents, which might attack the surface.

Date Code



Location of Manufacture	Year of Manufacturer	Week of Manufacturer
X	X*	XX
M or 4K	R	02
M represented Manchester, NH replaced by 4K for Monterrey, Mexico		
* J=2004 K=2005 L=2006 M=2007 N=2008 P=2009 R=2010		S=2011 T=2010 U=2013 V=2014 W=2015 Y=2016 Z=2017

Figure 5: Explanation of data code

Technical Specifications

Light Beams	8 – 176			
Protective Field	160…1760 mm (6.3…69.29 in.) in 160 mm (6.3 in.) increments for Standard GuardShield; 320…1600 mm for GuardShield with Integrated Laser Alignment			
Resolution	14 mm (0.55 in.), 30 mm (1.18 in.)			
Range	14 mm (0.55 in.); 0.3…7.0 m (0.98…22.9 ft), 30 mm (1.18 in.); 0.3…18.0 m (0.98…59.0 ft)			
Response Time	OSSD – ON to OFF: (Reaction times); 20…25 ms uncoded; 30…35 ms coded			
Power Supply	24V DC +/-20%; Power supply must meet the requirements of IEC 60204-1 and IEC 61496-1.			
Power Consumption	400 mA max. (unloaded)			
IR Transmitter	Infrared LED (wave length 870 nm)			
Aperture Angle	Within ± 2.5° for transmitter and receiver			
Operating Condition	IR transmitter ON			
Functions	Guard Only:	On/Off operation with clear/obstructed detection area		
	Start Interlock:	Interlock at start up—Reset by actuation of momentary N.O. pushbutton switch (or interruption/restoration of light curtain)		
	Restart Interlock:	Interlock at interruption of sensing field—Reset by actuation of momentary N.O. pushbutton switch		
	Relay Monitoring:	Monitoring a switch contact of the installation		
	Coding:	May be necessary for multiplex alignment		
	Test Function:	Triggering of system test via external switch		
Inputs Transmitter				
Machine Test Signal	Minimum duration 100 ms			
	Voltage level for Logic 0:	0…5V DC	Voltage level for Logic Hi 1:	> 16V DC
Inputs Receiver				
Start/Restart Interlock	Logic Lo			
	Minimum duration 100 ms; maximum duration 900 ms			
	Voltage level for Logic Lo 0:	0…5V DC	Voltage level for Logic Hi 1:	> 16V DC
MPCE	300 ms after activation of OSSD			
	Voltage level for Logic 0:	0…5V DC	Voltage level for Logic Hi 1:	> 16V DC
Outputs:				
Safety Outputs (OSSDs)	2 solid state outputs, max. switching capacity 500 mA, short circuit protected, max. residual voltage 2V (excl. voltage drop through cables)			
Auxiliary Output	Solid state output, max. power consumption 500 mA, max. residual voltage 2V—nonsafety output			
Status Indicators Receiver				
ON-state	Constant ON when system is in ON-state (green LED)			
OFF-state	Constant ON when system is in OFF-state (red LED) • Lights up at interruption of protective field or if fault occurs			
Blanking	Constant ON when Fixed Blanking is active • Flashes, if Floating Blanking is active alone or together with Fixed Blanking (yellow LED)			
Alignment	Lights up, if input signal is too weak (amber LED)			
Interlock	Lights up when light curtain is in start or restart interlock mode (yellow LED)			
Status Indicators Sender				
Power ON	Lights up, when voltage is on (amber LED)			
Emitting	Constant ON when transmitter is active (yellow LED)			
QD Connectors	Transmitter: M12 plug 4 pin; receiver: M12 plug 8 pin; Standard GuardShield, GuardShield with ArmorBlock I/O 5 pin M12 for transmitter and receiver			
Cable Length	Maximum 30 m (100 ft)			
Ambient Temperature	During operation: –10…55°C (14…131°F); For storage: –25…75°C (-13…167°F)			
Humidity of the Air	Up to 95% (without condensation) between 20°C and 55°C (68°F and 131°F)			
Enclosure Rating	IP65			
Vibration Resistance	Per IEC 61496-1, IEC 60068-2-6 Frequency 10…55 Hz Amplitude 0.35 mm			
Shock	Per IEC 61496-1, IEC 60068-2-29 Acceleration 10 g, Duration 16 ms			
Material	Housing: Aluminum; Cover: PMMA (acrylic)			
Dimensions (cross section)	Approx. 40 x 50mm (1.57 x 1.96 in.)			
Accessories Included	Test rod, mounting brackets, operating instructions, security tool			
Approvals	IEC 61496 Parts 1and 2, UL 61496 Parts 1 and 2, UL 1998			
Safety Classification	Type 4 per EN/IEC 61496, Category 4 EN/ISO 13849, SIL 3, IEC 61508, SIL CL3, EN 62061, PLe, EN/ISO 13849			
PFHd (mean probability of a dangerous failure/hr	Standalone sys.: 9.51 x 10^{-9}; Cascading sys. (host/guest): 1.95 x 10^{-8}; Cascading sys. (host/guest/guest): 2.75 x 10^{-8}			
T_M (mission time)	20 years (EN ISO 13849)			
Transmitter Wave Length	870 nm			

Standard GuardShield

Sensor Pair	Transmitter	Receiver	Resolution [mm (in.)]	No. of Beams	Protective Heights [mm (in.)]	Pair Weight [kg (lbs)]
440L-P4J0160YD	440L-T4J0160YD	440L-R4J0160YD	14 (0.55)	16	160 (6.3)	3.15 (1.43)
440L-P4J0320YD	440L-T4J0320YD	440L-R4J0320YD	14 (0.55)	32	320 (12.59)	5.17 (2.35)
440L-P4J0480YD	440L-T4J0480YD	440L-R4J0480YD	14 (0.55)	48	480 (18.89)	6.59 (2.99)
440L-P4J0640YD	440L-T4J0640YD	440L-R4J0640YD	14 (0.55)	64	640 (25.19)	7.99 (3.62)
440L-P4J0800YD	440L-T4J0800YD	440L-R4J0800YD	14 (0.55)	80	800 (31.49)	9.43 (4.28)
440L-P4J0960YD	440L-T4J0960YD	440L-R4J0960YD	14 (0.55)	96	960 (37.79)	12.21 (5.54)
440L-P4J1120YD	440L-T4J1120YD	440L-R4J1120YD	14 (0.55)	112	1120 (44.09)	13.44 (6.10)
440L-P4J1280YD	440L-T4J1280YD	440L-R4J1280YD	14 (0.55)	128	1280 (50.39)	14.88 (6.75)
440L-P4J1440YD	440L-T4J1440YD	440L-R4J1440YD	14 (0.55)	144	1440 (56.69)	16.32 (7.40)
440L-P4J1600YD	440L-T4J1600YD	440L-R4J1600YD	14 (0.55)	160	1600 (62.99)	17.76 (8.06)
440L-P4J1760YD	440L-T4J1760YD	440L-R4J1760YD	14 (0.55)	176	1760 (69.29)	19.20 (8.71)
440L-P4K0160YD	440L-T4K0160YD	440L-R4K0160YD	30 (1.18)	8	160 (6.3)	3.54 (1.61)
440L-P4K0320YD	440L-T4K0320YD	440L-R4K0320YD	30 (1.18)	16	320 (12.59)	5.33 (2.42)
440L-P4K0480YD	440L-T4K0480YD	440L-R4K0480YD	30 (1.18)	24	480 (18.89)	6.88 (3.12)
440L-P4K0640YD	440L-T4K0640YD	440L-R4K0640YD	30 (1.18)	32	640 (25.19)	8.25 (3.74)
440L-P4K0800YD	440L-T4K0800YD	440L-R4K0800YD	30 (1.18)	40	800 (31.49)	9.63 (4.37)
440L-P4K0960YD	440L-T4K0960YD	440L-R4K0960YD	30 (1.18)	48	960 (37.79)	12.45 (5.65)
440L-P4K1120YD	440L-T4K1120YD	440L-R4K1120YD	30 (1.18)	56	1120 (44.09)	13.73 (6.23)
440L-P4K1280YD	440L-T4K1280YD	440L-R4K1280YD	30 (1.18)	64	1280 (50.39)	16.40 (7.44)
440L-P4K1440YD	440L-T4K1440YD	440L-R4K1440YD	30 (1.18)	72	1440 (56.69)	17.84 (8.10)
440L-P4K1600YD	440L-T4K1600YD	440L-R4K1600YD	30 (1.18)	80	1600 (62.99)	19.28 (8.75)
440L-P4K1760YD	440L-T4K1760YD	440L-R4K1760YD	30 (1.18)	88	1760 (69.29)	20.72 (9.40)

Standard GuardShield with Integrated Laser Alignment System

440L-P4JL0320YD	440L-T4JL0320YD	440L-R4JL0320YD	14 (0.55)	32	320 (12.59)	5.17 (2.35)
440L-P4JL0480YD	440L-T4JL0480YD	440L-R4JL0480YD	14 (0.55)	48	480 (18.89)	6.59 (2.99)
440L-P4JL0640YD	440L-T4JL0640YD	440L-R4JL0640YD	14 (0.55)	64	640 (25.19)	7.99(3.62)
440L-P4JL0800YD	440L-T4JL0800YD	440L-R4JL0800YD	14 (0.55)	80	800 (31.49)	9.43 (4.28)
440L-P4JL0960YD	440L-T4JL0960YD	440L-R4JL0960YD	14 (0.55)	96	960 (37.79)	12.21 (5.54)
440L-P4JL1120YD	440L-T4JL1120YD	440L-R4JL1120YD	14 (0.55)	112	1120 (44.09)	13.44 (6.10)
440L-P4JL1280YD	440L-T4JL1280YD	440L-R4JL1280YD	14 (0.55)	128	1280 (50.39)	14.88 (6.75)
440L-P4JL1440YD	440L-T4JL1440YD	440L-R4JL1440YD	14 (0.55)	144	1440 (56.69)	16.32 (7.40)
440L-P4JL1600YD	440L-T4JL1600YD	440L-R4JL1600YD	14 (0.55)	160	1600 (62.99)	17.76 (8.06)
440L-P4KL0320YD	440L-T4KL0320YD	440L-R4KL0320YD	30 (1.18)	16	320 (12.59)	5.33 (2.42)
440L-P4KL0480YD	440L-T4KL0480YD	440L-R4KL0480YD	30 (1.18)	24	480 (18.89)	6.88 (3.12)
440L-P4KL0640YD	440L-T4KL0640YD	440L-R4KL0640YD	30 (1.18)	32	640 (25.19)	8.25 (3.74)
440L-P4KL0800YD	440L-T4KL0800YD	440L-R4KL0800YD	30 (1.18)	40	800 (31.49)	9.63 (4.37)
440L-P4KL0960YD	440L-T4KL0960YD	440L-R4KL0960YD	30 (1.18)	48	960 (37.79)	12.45 (5.65)
440L-P4KL1120YD	440L-T4KL1120YD	440L-R4KL1120YD	30 (1.18)	56	1120 (44.09)	13.73 (6.23)
440L-P4KL1280YD	440L-T4KL1280YD	440L-R4KL1280YD	30 (1.18)	64	1280 (50.39)	16.40 (7.44)
440L-P4KL1440YD	440L-T4KL1440YD	440L-R4KL1440YD	30 (1.18)	72	1440 (56.69)	17.84 (8.10)
440L-P4KL1600YD	440L-T4KL1600YD	440L-R4KL1600YD	30 (1.18)	80	1600 (62.99)	19.28 (8.75)

Standard GuardShield with Integrated Laser Alignment and ArmorBlock I/O Connection

Sensor Pair	Transmitter	Receiver	Resolution [mm (in.)]	No. of Beams	Protective Heights [mm (in.)]	Pair Weight [kg (lbs)]
440L-P4JL0320YA	440L-T4JL0320YA	440L-R4JL0320YA	14 (0.55)	32	320 (12.59)	5.17 (2.35)
440L-P4JL0480YA	440L-T4JL0480YA	440L-R4JL0480YA	14 (0.55)	48	480 (18.89)	6.59 (2.99)
440L-P4JL0640YA	440L-T4JL0640YA	440L-R4JL0640YA	14 (0.55)	64	640 (25.19)	7.99(3.62)
440L-P4JL0800YA	440L-T4JL0800YA	440L-R4JL0800YA	14 (0.55)	80	800 (31.49)	9.43 (4.28)
440L-P4JL0960YA	440L-T4JL0960YA	440L-R4JL0960YA	14 (0.55)	96	960 (37.79)	12.21 (5.54)
440L-P4JL1120YA	440L-T4JL1120YA	440L-R4JL1120YA	14 (0.55)	112	1120 (44.09)	13.44 (6.10)
440L-P4JL1280YA	440L-T4JL1280YA	440L-R4JL1280YA	14 (0.55)	128	1280 (50.39)	14.88 (6.75)
440L-P4JL1440YA	440L-T4JL1440YA	440L-R4JL1440YA	14 (0.55)	144	1440 (56.69)	16.32 (7.40)
440L-P4JL1600YA	440L-T4JL1600YA	440L-R4JL1600YA	14 (0.55)	160	1600 (62.99)	17.76 (8.06)
440L-P4KL0320YA	440L-T4KL0320YA	440L-R4KL0320YA	30 (1.18)	16	320 (12.59)	5.33 (2.42)
440L-P4KL0480YA	440L-T4KL0480YA	440L-R4KL0480YA	30 (1.18)	24	480 (18.89)	6.88 (3.12)
440L-P4KL0640YA	440L-T4KL0640YA	440L-R4KL0640YA	30 (1.18)	32	640 (25.19)	8.25 (3.74)
440L-P4KL0800YA	440L-T4KL0800YA	440L-R4KL0800YA	30 (1.18)	40	800 (31.49)	9.63 (4.37)
440L-P4KL0960YA	440L-T4KL0960YA	440L-R4KL0960YA	30 (1.18)	48	960 (37.79)	12.45 (5.65)
440L-P4KL1120YA	440L-T4KL1120YA	440L-R4KL1120YA	30 (1.18)	56	1120 (44.09)	13.73 (6.23)
440L-P4KL1280YA	440L-T4KL1280YA	440L-R4KL1280YA	30 (1.18)	64	1280 (50.39)	16.40 (7.44)
440L-P4KL1440YA	440L-T4KL1440YA	440L-R4KL1440YA	30 (1.18)	72	1440 (56.69)	17.84 (8.10)
440L-P4KL1600YA	440L-T4KL1600YA	440L-R4KL1600YA	30 (1.18)	80	1600 (62.99)	19.28 (8.75)

Cascading GuardShield

440L-C4J0320YD	440L-G4J0320YD	440L-F4J0320YD	14 (0.55)	32	320 (12.59)	5.17 (2.35)
440L-C4J0480YD	440L-G4J0480YD	440L-F4J0480YD	14 (0.55)	48	480 (18.89)	6.59 (2.99)
440L-C4J0640YD	440L-G4J0640YD	440L-F4J0640YD	14 (0.55)	64	640 (25.19)	7.99 (3.62)
440L-C4J0800YD	440L-G4J0800YD	440L-F4J0800YD	14 (0.55)	80	800 (31.49)	9.43 (4.28)
440L-C4J0960YD	440L-G4J0960YD	440L-F4J0960YD	14 (0.55)	96	960 (37.79)	12.21 (5.54)
440L-C4J1120YD	440L-G4J1120YD	440L-F4J1120YD	14 (0.55)	112	1120 (44.09)	13.44 (6.10)
440L-C4J1280YD	440L-G4J1280YD	440L-F4J1280YD	14 (0.55)	128	1280 (50.39)	14.88 (6.75)
440L-C4J1440YD	440L-G4J1440YD	440L-F4J1440YD	14 (0.55)	144	1440 (56.69)	16.32 (7.40)
440L-C4J1600YD	440L-G4J1600YD	440L-F4J1600YD	14 (0.55)	160	1600 (62.99)	17.76 (8.06)
440L-C4J1760YD	440L-G4J1760YD	440L-F4J1760YD	14 (0.55)	176	1760 (69.29)	19.20 (8.71)
440L-C4K0320YD	440L-G4K0320YD	440L-F4K0320YD	30 (1.18)	16	320 (12.59)	5.33 (2.42)
440L-C4K0480YD	440L-G4K0480YD	440L-F4K0480YD	30 (1.18)	24	480 (18.89)	6.88 (3.12)
440L-C4K0640YD	440L-G4K0640YD	440L-F4K0640YD	30 (1.18)	32	640 (25.19)	8.25 (3.74)
440L-C4K0800YD	440L-G4K0800YD	440L-F4K0800YD	30 (1.18)	40	800 (31.49)	9.63 (4.37)
440L-C4K0960YD	440L-G4K0960YD	440L-F4K0960YD	30 (1.18)	48	960 (37.79)	12.45 (5.65)
440L-C4K1120YD	440L-G4K1120YD	440L-F4K1120YD	30 (1.18)	56	1120 (44.09)	13.73 (6.23)
440L-C4K1280YD	440L-G4K1280YD	440L-F4K1280YD	30 (1.18)	64	1280 (50.39)	16.40 (7.44)
440L-C4K1440YD	440L-G4K1440YD	440L-F4K1440YD	30 (1.18)	72	1440 (56.69)	17.84 (8.10)
440L-C4K1600YD	440L-G4K1600YD	440L-F4K1600YD	30 (1.18)	80	1600 (62.99)	19.28 (8.75)
440L-C4K1760YD	440L-G4K1760YD	440L-F4K1760YD	30 (1.18)	88	1760 (69.29)	20.72 (9.40)

Cascading GuardShield with Integrated Laser Alignment

Sensor Pair	Transmitter	Receiver	Resolution [mm (in.)]	No. of Beams	Protective Heights [mm (in.)]	Pair Weight [kg (lbs)]
440L-C4JL0320YD	440L-G4JL0320YD	440L-F4JL0320YD	14 (0.55)	32	320 (12.59)	5.17 (2.35)
440L-C4JL0480YD	440L-G4JL0480YD	440L-F4JL0480YD	14 (0.55)	48	480 (18.89)	6.59 (2.99)
440L-C4JL0640YD	440L-G4JL0640YD	440L-F4JL0640YD	14 (0.55)	64	640 (25.19)	7.99(3.62)
440L-C4JL0800YD	440L-G4JL0800YD	440L-F4JL0800YD	14 (0.55)	80	800 (31.49)	9.43 (4.28)
440L-C4JL0960YD	440L-G4JL0960YD	440L-F4JL0960YD	14 (0.55)	96	960 (37.79)	12.21 (5.54)
440L-C4JL1120YD	440L-G4JL1120YD	440L-F4JL1120YD	14 (0.55)	112	1120 (44.09)	13.44 (6.10)
440L-C4JL1280YD	440L-G4JL1280YD	440L-F4JL1280YD	14 (0.55)	128	1280 (50.39)	14.88 (6.75)
440L-C4JL1440YD	440L-G4JL1440YD	440L-F4JL1440YD	14 (0.55)	144	1440 (56.69)	16.32 (7.40)
440L-C4JL1600YD	440L-G4JL1600YD	440L-F4JL1600YD	14 (0.55)	160	1600 (62.99)	17.76 (8.06)
440L-C4KL0320YD	440L-G4KL0320YD	440L-F4KL0320YD	30 (1.18)	16	320 (12.59)	5.33 (2.42)
440L-C4KL0480YD	440L-G4KL0480YD	440L-F4KL0480YD	30 (1.18)	24	480 (18.89)	6.88 (3.12)
440L-C4KL0640YD	440L-G4KL0640YD	440L-F4KL0640YD	30 (1.18)	32	640 (25.19)	8.25 (3.74)
440L-C4KL0800YD	440L-G4KL0800YD	440L-F4KL0800YD	30 (1.18)	40	800 (31.49)	9.63 (4.37)
440L-C4KL0960YD	440L-G4KL0960YD	440L-F4KL0960YD	30 (1.18)	48	960 (37.79)	12.45 (5.65)
440L-C4KL1120YD	440L-G4KL1120YD	440L-F4KL1120YD	30 (1.18)	56	1120 (44.09)	13.73 (6.23)
440L-C4KL1280YD	440L-G4KL1280YD	440L-F4KL1280YD	30 (1.18)	64	1280 (50.39)	16.40 (7.44)
440L-C4KL1440YD	440L-G4KL1440YD	440L-F4KL1440YD	30 (1.18)	72	1440 (56.69)	17.84 (8.10)
440L-C4KL1600YD	440L-G4KL1600YD	440L-F4KL1600YD	30 (1.18)	80	1600 (62.99)	19.28 (8.75)

Cascading GuardShield with Integrated Laser Alignment and ArmorBlock IO Connection

440L-C4JL0320YA	440L-G4JL0320YA	440L-F4JL0320YA	14 (0.55)	32	320 (12.59)	5.17 (2.35)
440L-C4JL0480YA	440L-G4JL0480YA	440L-F4JL0480YA	14 (0.55)	48	480 (18.89)	6.59 (2.99)
440L-C4JL0640YA	440L-G4JL0640YA	440L-F4JL0640YA	14 (0.55)	64	640 (25.19)	7.99(3.62)
440L-C4JL0800YA	440L-G4JL0800YA	440L-F4JL0800YA	14 (0.55)	80	800 (31.49)	9.43 (4.28)
440L-C4JL0960YA	440L-G4JL0960YA	440L-F4JL0960YA	14 (0.55)	96	960 (37.79)	12.21 (5.54)
440L-C4JL1120YA	440L-G4JL1120YA	440L-F4JL1120YA	14 (0.55)	112	1120 (44.09)	13.44 (6.10)
440L-C4JL1280YA	440L-G4JL1280YA	440L-F4JL1280YA	14 (0.55)	128	1280 (50.39)	14.88 (6.75)
440L-C4JL1440YA	440L-G4JL1440YA	440L-F4JL1440YA	14 (0.55)	144	1440 (56.69)	16.32 (7.40)
440L-C4JL1600YA	440L-G4JL1600YA	440L-F4JL1600YA	14 (0.55)	160	1600 (62.99)	17.76 (8.06)
440L-C4KL0320YA	440L-G4KL0320YA	440L-F4KL0320YA	30 (1.18)	16	320 (12.59)	5.33 (2.42)
440L-C4KL0480YA	440L-G4KL0480YA	440L-F4KL0480YA	30 (1.18)	24	480 (18.89)	6.88 (3.12)
440L-C4KL0640YA	440L-G4KL0640YA	440L-F4KL0640YA	30 (1.18)	32	640 (25.19)	8.25 (3.74)
440L-C4KL0800YA	440L-G4KL0800YA	440L-F4KL0800YA	30 (1.18)	40	800 (31.49)	9.63 (4.37)
440L-C4KL0960YA	440L-G4KL0960YA	440L-F4KL0960YA	30 (1.18)	48	960 (37.79)	12.45 (5.65)
440L-C4KL1120YA	440L-G4KL1120YA	440L-F4KL1120YA	30 (1.18)	56	1120 (44.09)	13.73 (6.23)
440L-C4KL1280YA	440L-G4KL1280YA	440L-F4KL1280YA	30 (1.18)	64	1280 (50.39)	16.40 (7.44)
440L-C4KL1440YA	440L-G4KL1440YA	440L-F4KL1440YA	30 (1.18)	72	1440 (56.69)	17.84 (8.10)
440L-C4KL1600YA	440L-G4KL1600YA	440L-F4KL1600YA	30 (1.18)	80	1600 (62.99)	19.28 (8.75)

Cat. No. Explanation—Standard and Cascading GuardShield without Laser Alignment System

440L - P 4 J 03 20 Y D

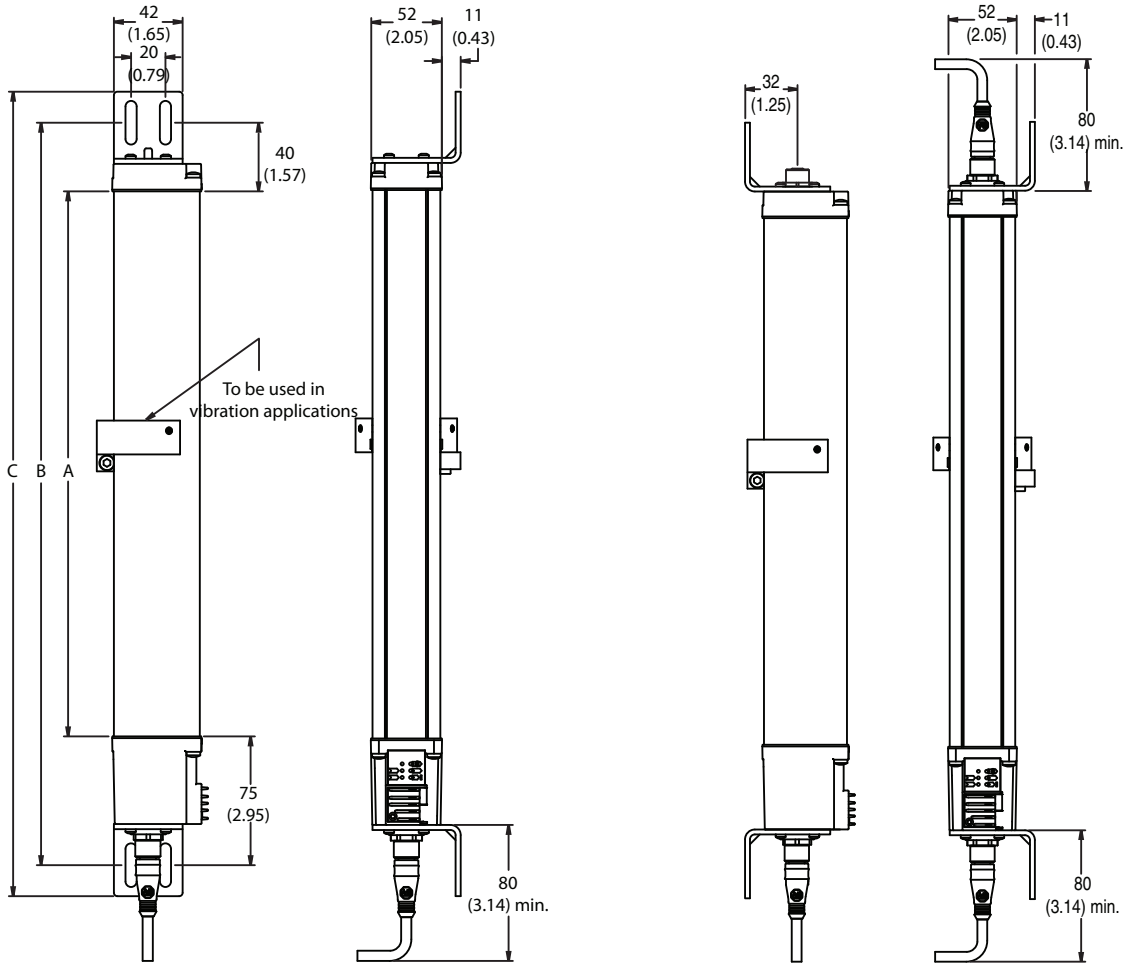
- D
  - Connector Option Micro QD
  - R-Remote Teach Pigtail Connector
  - A-ArmorBlock Safety I/O Connector (M12, 5 pin
- Y — Environmental Rating IP65
- 20 — Protective Height
  - 0160
  - 0320
  - 0480 0960 1440
  - 0640 1120 1600
  - 0800 1280 1760
- J — 14 mm (0.55 in.) GuardShield K - 30 mm (1.18 in.) GuardShield
- 4 — Category Type 4
- P — P - Pair, T - Transmitter, R - Receiver, (Standard)
  C - Host, Pair, G - Host Transmitter, F - Host Receiver (cascading)
- 440L - Bulletin Number

Cat. No. Explanation—GuardShield with Integrated Laser Alignment System

440L - P 4 K L 0320 Y D

- D
  - Connector Option
  - D-Standard 5 pin M12 XMTR 18 pin M12 receiver
  - A-5 pin M12 for ArmorBlock Safety I/O connector
- Y — Environmental Rating IP65
- 0320 — Protective Height
  - 0320
  - 0480 0960 1440
  - 0640 1120 1600
  - 0800 1280
- L — L = Integrated Laser Alignment System
- K — K=30 mm resolution; J=14 mm resolution
- 4 — Category Type 4
- P — P = Pair, T = Transmitter, R = Receiver
  C = Cascade pair, G = Cascade transmitter, F = Cascade receiver
- 440L - Bulletin Number

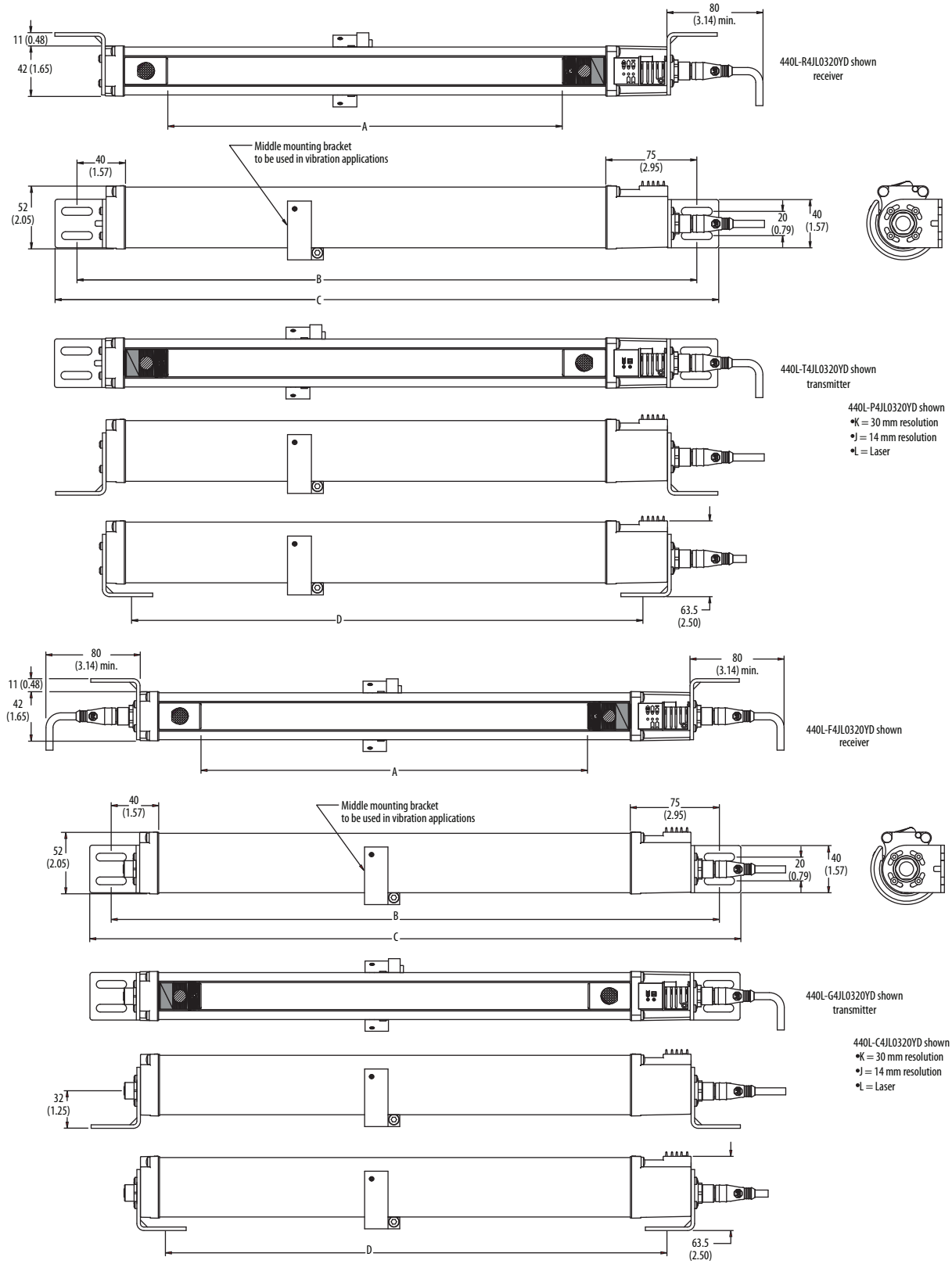
Dimensions [mm (in.)]



Standard **Cascading**

Type	A Protective Height	B Mounting Value	C Total Length
440L-❶4❷0160Y❸	160 ±0.5 (6.3) ±0.02	276 (10.9)	312 ±1.5 (12.3) ±0.06
440L-❶4❷0320Y❸	320 ±0.5 (12.6) ±0.02	436 (17.2)	472 ±1.5 (18.6) ±0.06
440L-❶4❷0480Y❸	480 ±0.5 (18.9) ±0.02	596 (28.5)	632 ±1.5 (24.9) ±0.06
440L-❶4❷0640Y❸	640 ±0.5 (25.2) ±0.02	756 (29.8)	792 ±1.5 (31.2) ±0.06
440L-❶4❷0800Y❸	800 ±0.6 (31.5) ±0.02	916 (36.1)	952 ±1.5 (37.5) ±0.06
440L-❶4❷0960Y❸	960 ±0.6 (37.8) ±0.02	1076 (42.4)	1112 ±1.5 (43.8) ±0.06
440L-❶4❷1120Y❸	1120 ±0.6 (44.1) ±0.02	1236 (48.7)	1272 ±1.8 (50.1) ±0.07
440L-❶4❷1280Y❸	1280 ±0.7 (50.4) ±0.02	1396 (55.0)	1432 ±1.8 (56.4) ±0.07
440L-❶4❷1440Y❸	1440 ±0.7 (56.7) ±0.03	1556 (61.3)	1592 ±1.8 (62.7) ±0.07
440L-❶4❷1600Y❸	1600 ±0.8 (63.0) ±0.03	1716 (67.6)	1752 ±2.0 (69.0) ±0.08
440L-❶4❷1760Y❸	1760 ±0.8 (69.3) ±0.03	1876 (73.9)	1912 ±2.0 (75.3) ±0.08

❶ J or K
❷ P, T, R, C, G, F
❸ D or R


80
(3.14) min.
11 (0.48)
42 (1.65)
A
440L-R4JL0320YD shown
receiver
Middle mounting bracket
to be used in vibration applications
40
(1.57)
75
(2.95)
52
(2.05)
20
(0.79)
40
(1.57)
B
C
440L-T4JL0320YD shown
transmitter
440L-P4JL0320YD shown
•K = 30 mm resolution
•J = 14 mm resolution
•L = Laser
D
63.5
(2.50)
80
(3.14) min.
80
(3.14) min.
11 (0.48)
42
(1.65)
A
440L-F4JL0320YD shown
receiver
40
(1.57)
Middle mounting bracket
to be used in vibration applications
75
(2.95)
52
(2.05)
20
(0.79)
40
(1.57)
B
C
440L-G4JL0320YD shown
transmitter
440L-C4JL0320YD shown
•K = 30 mm resolution
•J = 14 mm resolution
•L = Laser
32
(1.25)
D
63.5
(2.50)

GuardShield Remote Teach

Introduction

The GuardShield Remote Teach system provides a remote means of changing a fixed blanking configuration within the GuardShield safety light curtain. This keyswitch box eliminates the need to open the GuardShield receiver door and perform the Teach function.

When a machine setup has been changed, which requires a new fixed blanking field to be configured, the GuardShield Remote Teach box is the ideal solution.

An IP65 metal keyswitch box is designed to be located in the vicinity of the GuardShield light curtain receiver. The Remote Teach box should be mounted in such a way as to allow the operator performing the Teach function a clear view of the area being blanked out

The GuardShield receiver requires a modified right angle mounting bracket to fit around the cable gland hardware on the receiver endcap. This bracket is supplied with each GuardShield remote teach receiver.

The GuardShield Remote Teach Box system consists of the following;

- Remote teach keyswitch box with mounting plate and two keys
- GuardShield transmitter
- Two meter patchcord for connection between the 4 pin pigtail connector and the remote teach box.
- GuardShield receiver with a ten-inch dual connector pigtail. The dual connector contains a four-pin micro quick disconnect as well as a standard eight-pin quick-disconnect GuardShield Receiver.
- Modified mounting bracket for receiver bottom endcap



Figure 6: GuardShield Remote Teach Components

Note: The GuardShield remote teach box can not be retrofitted. It is possible to purchase the components separately. If a GuardShield system has already been purchased, the transmitter is a standard transmitter. The receiver part numbers vary by protective height. Refer to the Remote Teach System table for a list of component parts of a remote teach system.

System Delivery

The GuardShield Remote Teach system is delivered with the GuardShield transmitter and receiver configured in the standard GuardShield operating mode of "Guard Only," which is Automatic reset, and all features not activated.

The two meter patchcord (889D-F4ACDM-2), Remote Teach (440L-M8600) keyswitch box and mounting hardware are packaged with each GuardShield Remote Teach system along with a standard GuardShield transmitter and remote teach receiver.

Remote Teach Box—Key Switch Positions

The GuardShield remote teach box utilizes a Rockwell Automation 800FM series, three-position IP66 rated keyswitch. There are three keyswitch positions on the GuardShield Remote Teach box as shown below.

RUN: This keyswitch position is required for the GuardShield light curtain to operate in its normal operating mode.

CONFIGURE: This keyswitch position simulates the opening of the GuardShield DIP switch door. This position sends a signal to the GuardShield firmware to change from the RUN mode of operation to a configuration mode of operation in this mode, all outputs are in the OFF state.

TEACH: This keyswitch position performs the function of changing the operating mode configuration of the GuardShield light curtain.



Figure 7: KeySwitch Label Positions

System Installation

The GuardShield light curtain transmitter and receiver should be properly mounted to the machinery to be guarded per the GuardShield Installation Instructions.

After aligning the GuardShield safety light curtains and attaining a "Green" state, the GuardShield safety light curtain is transmitting infrared light and the GuardShield receiver OSSDs are high, it is possible to reconfigure the GuardShield.

Using the T8 Torx bit supplied with each GuardShield bracket kit, open the GuardShield Receiver door and set DIP switch four to the ON position. This DIP switch allows the activation and configuration of a monitored fixed blanked area within the GuardShield protective height.

Make any additional DIP switch settings at this time.

NOTE: If EDM or Reset functions are to be configured through DIP switch settings, assure that the proper receiver wire connections are made.

IMPORTANT	It is not possible to blank out the synch beam, which is the first beam adjacent to the GuardShield diagnostic LEDs.

Note: If the Transmitter's configuration needs to be changed from the factory settings, set the DIP switches in the transmitter and follow the standard teach process

Remote Teach Procedure

1. Position object in the GuardShield sensing field, assure that the synchronization beam is not obstructed
2. Turn keyswitch to the configure position. The receiver's red LED will be flashing and the yellow blanking LED will be illuminated.
3. Turn and hold keyswitch in the Teach position
4. The GuardShield receiver's yellow blanking LED will begin flashing.
5. When the yellow blanking LED stops flashing, **release the keyswitch to the configure position within two seconds**.
6. The GuardShield receiver's yellow blanking LED will flash three times to confirm that the new fixed blanking configuration has been set.
7. Turn the keyswitch to the RUN position, the green LED on the GuardShield receiver will illuminate.
8. Using the supplied test rod, confirm the fixed blanking area and any other settings are configured as expected.

It is possible to configure and activate both fixed and one or two beam floating blanking on the GuardShield light curtain.

NOTE: Once the GuardShield is configured by changing factory DIP switch positions and performing the Teach function, the GuardShield will be reconfigured. Any future Teach procedure will only change the configuration of the fixed blanking area.

IMPORTANT	After teaching the GuardShield a new configuration, confirm that the configuration that was expected to be configured has actually been configured.

IMPORTANT	Fixed blanking creates a "hole" in the detection area of the GuardShield. It is necessary to assure that access to the hazard being protected against is prevented by means of barrier guarding. It should not be possible to access the hazard through the fixed blanked area.

Remote Teach System

Cat. No.	Description
440L-S4J0160YR	GuardShield Remote Teach system, 160 mm protective height 14 mm resolution
440L-S4J0320YR	GuardShield Remote Teach system, 320 mm protective height 14 mm resolution
440L-S4J0480YR	GuardShield Remote Teach system, 480 mm protective height 14 mm resolution
440L-S4J0640YR	GuardShield Remote Teach system, 640 mm protective height 14 mm resolution
440L-S4J0800YR	GuardShield Remote Teach system, 800 mm protective height 14 mm resolution
440L-S4J0960YR	GuardShield Remote Teach system, 960mm protective height 14 mm resolution
440L-S4J1120YR	GuardShield Remote Teach system, 1120 mm protective height 14 mm resolution
440L-S4J1280YR	GuardShield Remote Teach system, 1280 mm protective height 14 mm resolution
440L-S4J1440YR	GuardShield Remote Teach system, 1440 mm protective height 14 mm resolution
440L-S4J1600YR	GuardShield Remote Teach system, 1600 mm protective height 14 mm resolution
440L-S4J1760YR	GuardShield Remote Teach system, 1760 mm protective height 14 mm resolution
440L-S4K0160YR	GuardShield Remote Teach system, 160 mm protective height 30 mm resolution
440L-S4K0320YR	GuardShield Remote Teach system, 320 mm protective height 30 mm resolution
440L-S4K0480YR	GuardShield Remote Teach system, 480 mm protective height 30 mm resolution
440L-S4K0640YR	GuardShield Remote Teach system, 640 mm protective height 30 mm resolution
440L-S4K0800YR	GuardShield Remote Teach system, 800 mm protective height 30 mm resolution
440L-S4K0960YR	GuardShield Remote Teach system, 960mm protective height 30 mm resolution
440L-S4K1120YR	GuardShield Remote Teach system, 1120 mm protective height 30 mm resolution
440L-S4K1280YR	GuardShield Remote Teach system, 1280 mm protective height 30 mm resolution
440L-S4K1440YR	GuardShield Remote Teach system, 1440 mm protective height 30 mm resolution
440L-S4K1600YR	GuardShield Remote Teach system, 1600 mm protective height 30 mm resolution
440L-S4K1760YR	GuardShield Remote Teach system, 1760 mm protective height 30 mm resolution

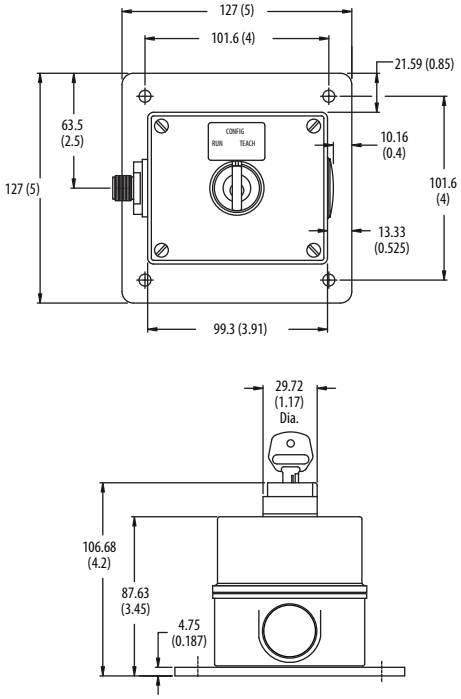
Remote Teach System Component Parts

Catalog Number	Description
800F-AKR3825	Replacement Key
440L-M8600	Remote Teach Box
889D-F4ACDM-2	Two meter patchcord

Remote Teach Receiver

Catalog Number	Description
440L-R4J0160YR	Receiver, GuardShield Remote Teach, 160 mm protective height, 14 mm resolution
440L-R4J0320YR	Receiver, GuardShield Remote Teach, 320 mm protective height, 14 mm resolution
440L-R4J0480YR	Receiver, GuardShield Remote Teach, 480 mm protective height, 14 mm resolution
440L-R4J0640YR	Receiver, GuardShield Remote Teach, 640 mm protective height, 14 mm resolution
440L-R4J0800YR	Receiver, GuardShield Remote Teach, 800 mm protective height, 14 mm resolution
440L-R4J0960YR	Receiver, GuardShield Remote Teach, 960mm protective height, 14 mm resolution
440L-R4J1120YR	Receiver, GuardShield Remote Teach, 1120 mm protective height, 14 mm resolution
440L-R4J1280YR	Receiver, GuardShield Remote Teach, 1280 mm protective height, 14 mm resolution
440L-R4J1440YR	Receiver, GuardShield Remote Teach, 1440 mm protective height, 14 mm resolution
440L-R4J1600YR	Receiver, GuardShield Remote Teach, 1600 mm protective height, 14 mm resolution
440L-R4J1760YR	Receiver, GuardShield Remote Teach, 1760 mm protective height, 14 mm resolution
440L-R4K0160YR	Receiver, GuardShield Remote Teach, 160 mm protective height, 30 mm resolution
440L-R4K0320YR	Receiver, GuardShield Remote Teach, 320 mm protective height, 30 mm resolution
440L-R4K0480YR	Receiver, GuardShield Remote Teach, 480 mm protective height, 30 mm resolution
440L-R4K0640YR	Receiver, GuardShield Remote Teach, 640 mm protective height, 30 mm resolution
440L-R4K0800YR	Receiver, GuardShield Remote Teach, 800 mm protective height, 30 mm resolution
440L-R4K0960YR	Receiver, GuardShield Remote Teach, 960mm protective height, 30 mm resolution
440L-R4K1120YR	Receiver, GuardShield Remote Teach, 1120 mm protective height, 30 mm resolution
440L-R4K1280YR	Receiver, GuardShield Remote Teach, 1280 mm protective height, 30 mm resolution
440L-R4K1440YR	Receiver, GuardShield Remote Teach, 1440 mm protective height, 30 mm resolution
440L-R4K1600YR	Receiver, GuardShield Remote Teach, 1600 mm protective height, 30 mm resolution
440L-R4K1760YR	Receiver, GuardShield Remote Teach, 1760 mm protective height, 30 mm resolution

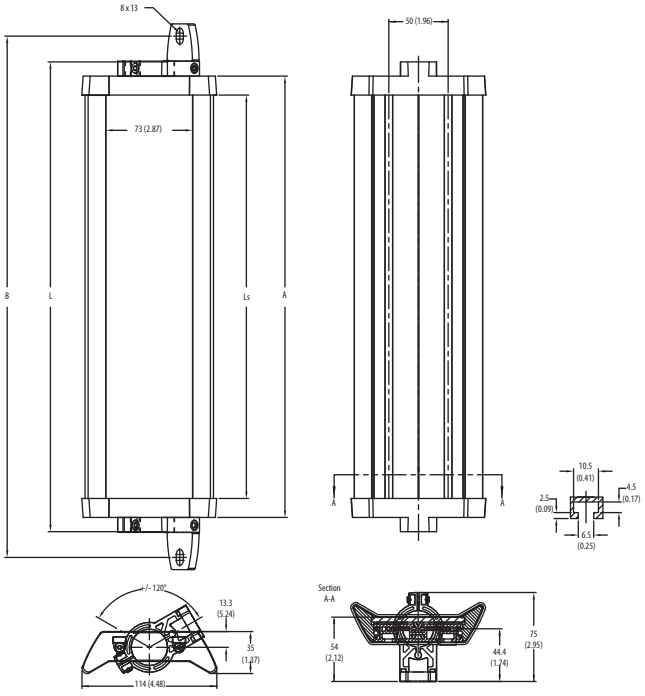
Dimensions [mm (in.)]



Optional Accessories

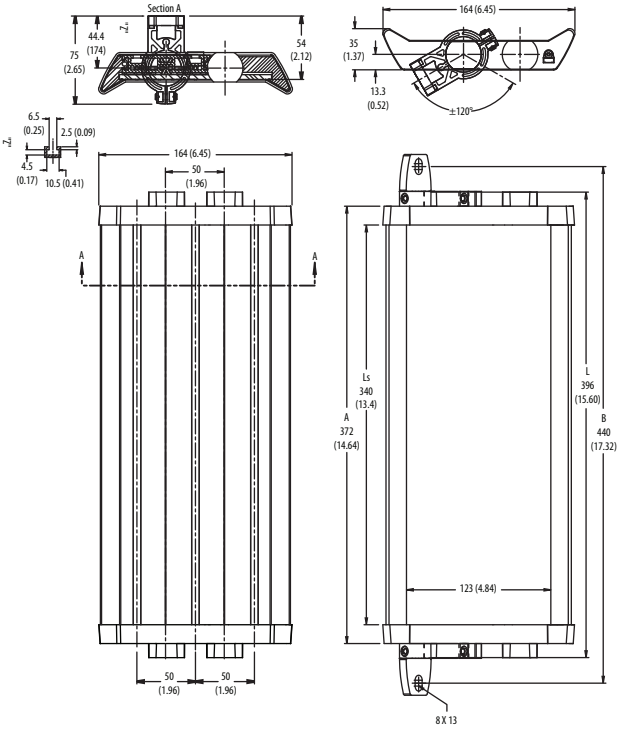
	Description	Cat. No.
	Steel L-shaped end cap mounting bracket (4 per package) Note: 4 brackets supplied with each GuardShield pair.	440L-AF6101
	Aluminum middle mounting bracket for vibratory applications	440L-AF6108
	Power supply: Output—24V DC, 3 Amps, 72 W	1606-XLP72E
	Laser alignment tool	440L-ALAT
	GuardShield laser alignment tool bracket	440L-AF6109
	Mounting stand	440L-AMSTD
	Vertical shock mount kit	440L-AF6120
	Horizontal shock mount kit	440L-AF6121
	Middle vertical mount kit	440L-AF6122
	Middle horizontal mount kit	440L-AF6123
	GuardShield weld shield pair	440L-AGWS0160
		440L-AGWS0320
		440L-AGWS0480
		440L-AGWS0640
		440L-AGWS0800
		440L-AGWS0960
		440L-AGWS1120
		440L-AGWS1280
		440L-AGWS1440
		440L-AGWS1600
		440L-AGWS1760
	GuardShield washdown enclosure kit Note: Can be used on Standard GuardShield POC and PAC.	440L-AGST320
		440L-AGST480
		440L-AGST640
		440L-AGST800
		440L-AGST960
	M12 Receiver Termination Plug—8 pin for standard cascading GuardShield receiver (if used as a standalone pair or if the last segment pair in a cascading system).	898D-81CU-DM
	M12 Receiver Termination Plug—5-pin for cascading GuardShield with ArmorBlock Guard I/O connectivity (required on the top connector of the receiver if the cascading pair is used as a standalone system or as the last segment pair in the cascading system).	898D-418U-DM

Mirror 440L-AM075



Model No.	Series	Description	L	L_S	A	B
440L-AM0750300	A	Mirror, 300 mm, 4 m	396	340	372	440
440L-AM0750450	A	Mirror, 450 mm, 4 m	546	490	522	590
440L-AM0750600	A	Mirror, 600 mm, 4 m	696	640	672	740
440L-AM0750750	A	Mirror, 750 mm, 4 m	846	790	822	890
440L-AM0750900	A	Mirror, 900 mm, 4 m	996	940	972	1040
440L-AM0751050	A	Mirror, 1050 mm, 4 m	1146	1090	1122	1190
440L-AM0751200	A	Mirror, 1200 mm, 4 m	1296	1240	1272	1340
440L-AM0751350	A	Mirror, 1350 mm, 4 m	1446	1390	1422	1490
440L-AM0751500	A	Mirror, 1500 mm, 4 m	1596	1540	1572	1640
440L-AM0751650	A	Mirror, 1650 mm, 4 m	1746	1690	1722	1790
440L-AM0751800	A	Mirror, 1800 mm, 4 m	1896	1840	1872	1940

Mirror 440L-AM125



Model No.	Series	Description	L	L_S	A	B
440L-AM1250300	A	Mirror, 300 mm, 15 m	396	340	372	440
440L-AM1250450	A	Mirror, 450 mm, 15 m	546	490	522	590
440L-AM1250600	A	Mirror, 600 mm, 15 m	696	640	672	740
440L-AM1250750	A	Mirror, 750 mm, 15 m	846	790	822	890
440L-AM1250900	A	Mirror, 900 mm, 15 m	996	940	972	1040
440L-AM1251050	A	Mirror, 1050 mm, 15 m	1146	1090	1122	1190
440L-AM1251200	A	Mirror, 1200 mm, 15 m	1296	1240	1272	1340
440L-AM1251350	A	Mirror, 1350 mm, 15 m	1446	1390	1422	1490
440L-AM1251500	A	Mirror, 1500 mm, 15 m	1596	1540	1572	1640
440L-AM1251650	A	Mirror, 1650 mm, 15 m	1746	1690	1722	1790
440L-AM1251800	A	Mirror, 1800 mm, 15 m	1896	1840	1872	1940

Corner Mirror for Multi-Sided Guarding

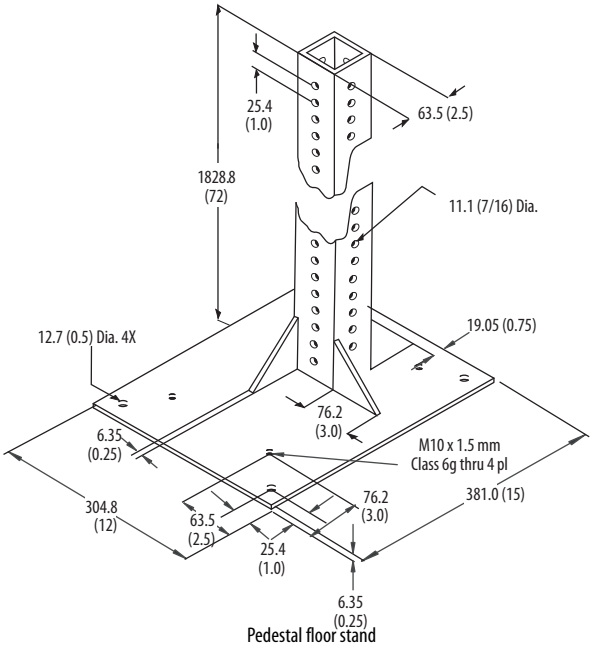
Specially constructed glass mirrors for 2- and 3-sided safeguarding applications.

Note: Each mirror reduces maximum scan range by 10% per mirror. Each corner mirror suppled with two end-cap mounting brackets.

GuardShield Light Curtain Cat. No.	Narrow Mirror Short-Range 0…4 m	Cat. No.	Wide Mirror Long-Range 4…15 m	Cat. No.
440L-P4⇨0160Y① 440L-P2K④0160YD		440L-AM0750300		440L-AM1250300
440L-P4⇨0320Y① 440L-P2K④0320YD		440L-AM0750450		440L-AM1250450
440L-P4⇨0480Y① 440L-P2K④0480YD 440L-P4A2500YD		440L-AM0750600		440L-AM1250600
440L-P4⇨0640Y① 440L-P2K④0640YD		440L-AM0750750		440L-AM1250750
440L-P4⇨0800Y① 440L-P2K④0800YD		440L-AM0750900		440L-AM1250900
440L-P4⇨0960Y① 440L-P2K④0960YD 440L-P4A3400YD		440L-AM0751050		440L-AM1251050
440L-P4⇨1120Y① 440L-P2K④1120YD		440L-AM0751200		440L-AM1251200
440L-P4⇨1280Y① 440L-P2K④1280YD		440L-AM0751350		440L-AM1251350
440L-P4⇨1440Y① 440L-P2K④1440YD		440L-AM0751500		440L-AM1251500
440L-P4⇨1600Y① 440L-P2K④1600YD		440L-AM0751650		440L-AM1251650
440L-P4⇨1760Y① 440L-P2K④1760YD		440L-AM0751800		440L-AM1251800

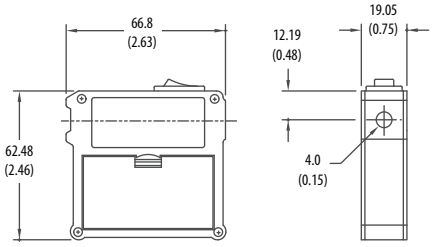
⇨ = J or K; ① = D or R; ④ = A or D

Mounting Stand—440L-AMSTD

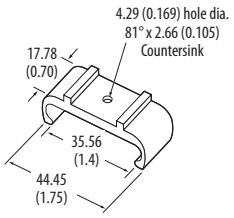


Pedestal floor stand

Laser Alignment Tool



Laser Alignment Tool (LAT)—440L-ALAT



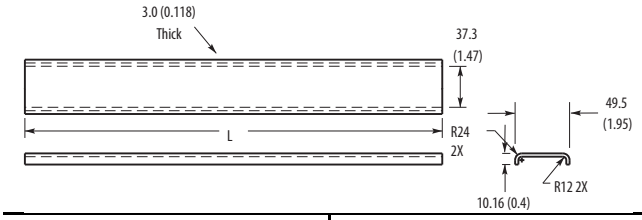
GuardShield LAT Bracket—440L-AF6109

Weld Shields

The GuardShield weld shields are sold as pairs in the same lengths as the protective heights of the GuardShield safety light curtain.

These polycarbonate weld shields are designed as disposable devices whose purpose is to protect the front window of the GuardShield from damage.

Dimensions [mm (in.)]

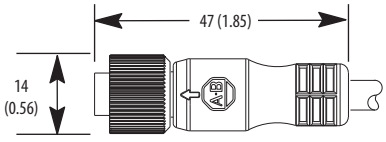


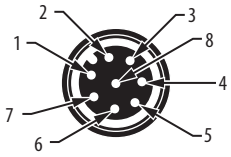
GS Weld Shield Cat. No.	Dimension "L" [mm (in.)]
440L-AGWS0160	175.3 (6.9)
440L-AGWS0320	335.3 (13.20)
440L-AGWS0480	495.3 (19.50)
440L-AGWS0640	655.3 (25.80)
440L-AGWS0800	815.3 (32.10)
440L-AGWS0960	975.4 (38.40)
440L-AGWS1120	1135.4 (44.70)
440L-AGWS1280	1295.4 (51.00)
440L-AGWS1440	1455.4 (57.30)
440L-AGWS1600	1615.4 (63.60)
440L-AGWS1760	1778 (70.00)

Patchcords/Connectors

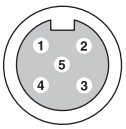
The GuardShield transmitter host patchcord has 4-pin DC micro over-molded quick-disconnect connectors offered in lengths of 1/3 meter, 1 meter and 2 meters. The GuardShield receiver host patchcord has 8-pin DC micro over-molded quick-disconnect connectors offered in lengths of 1/3 meter, 1 meter and 2 meters.

Connections [mm (in.)]



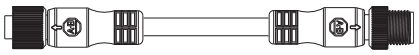
Top View	Color	Pin No.	Signal Receiver
	White	1	Auxiliary Output
	Brown	2	+24V DC
	Green	3	Ground
	Yellow	4	EDM
	Gray	5	OSSD 1
	Pink	6	OSSD 2
	Blue	7	0V DC
	Red	8	Start/Restart

ArmorBlock Guard IO

Top View	Color	Pin No	Signal Receiver
	Brown	1	+ 24V
	White	2	OSSD 2
	Blue	3	0 V
	Black	4	OSSD 1
	Gray	5	NC

Interconnecting Patchcords—Cascading Segments

Cat. No.	Description
Transmitter Patchcord	
889D-F4HLDM-0M3	4 pin M12 patchcord, 12 inches
889D-F4HLDM-1	4 pin M12 patchcord, 1 meter
889D-F4HLDM-2	4 pin M12 patchcord, 2 meters
Receiver Patchcord	
889D-F8ABDM-0M3	8 pin M12 patchcord, 12 inches
889D-F8ABDM-1	8 pin M12 patchcord, 1 meter
889D-F8ABDM-2	8 pin M12 patchcord, 1 meter



Example of Patchcord

Termination Plug—Cascadable Eight-Pin GuardShield Receiver



Note: The termination plug is required on the top receiver connector if used as a stand alone pair or the last segment pair in a cascadable system

Interconnecting Patchcords—ArmorBlock I/O Connection

Cat. No.	Description
889D-F5ACDM-0M3	5 pin M12 patchcord, 12 inches
889D-F5ACDM-1	5 pin M12 patchcord, 1 meter
889D-F5ACDM-2	5 pin M12 patchcord, 2 meters
889D-F5ACDM-5	6 pin M12 patchcord, 5 meters
889D-F5ACDM-10	7 pin M12 patchcord, 10 meters

Note: Transmitter and receiver use same five-pin patchcords. Select one cat. no. for each.

Termination Plug—Cascadable Five-pin ArmorBlock I/O

Cat. No.	Description
898D-418U-DM	Termination plug, 5-pin M12 receiver quick disconnect

Note: The termination plug is required on the top receiver connector if used as a standalone pair or the last segment pair in a cascadable system.

For Connection to Receiver

Cat. No.	Description [m (ft)]
889D-F8AB-2	8-pin DC Micro Straight Female Cordset, 2 (6.5)
889D-F8AB-5	8-pin DC Micro Straight Female Cordset, 5 (16.4)
889D-F8AB-10	8-pin DC Micro Straight Female Cordset, 10 (32.8)
889D-F8AB-15	8-pin DC Micro Straight Female Cordset, 15 (49.2)
889D-F8AB-20	8-pin DC Micro Straight Female Cordset, 20 (65.6)
889D-F8AB-30	8-pin DC Micro Straight Female Cordset, 30 (98.4)
889D-R8AB-2	8-pin/8-wire DC Micro Right Angle Female Cordset, 2 (6.5)
889D-R8AB-5	8-pin/8-wire DC Micro Right Angle Female Cordset, 5 (16.4)
889D-R8AB-10	8-pin/8-wire DC Micro Right Angle Female Cordset, 10 (32.8)
889D-R8AB-15	8-pin/8-wire DC Micro Right Angle Female Cordset, 15 (49.2)
889D-R8AB-20	8-pin/8-wire DC Micro Right Angle Female Cordset, 20 (65.6)
889D-R8AB-30	8-pin/8-wire DC Micro Right Angle Female Cordset, 30 (98.4)

For Connection to Transmitter

Cat. No.	Description
889D-F4AC-2	4-pin DC Micro Straight Female Cordset, 2 (6.5)
889D-F4AC-5	4-pin DC Micro Straight Female Cordset, 5 (16.4)
889D-F4AC-10	4-pin DC Micro Straight Female Cordset, 10 (32.8)
889D-F4AC-15	4-pin DC Micro Straight Female Cordset, 15 (49.2)
889D-F4AC-20	4-pin DC Micro Straight Female Cordset, 20 (65.6)
889D-F4AC-30	4-pin DC Micro Straight Female Cordset, 30 (98.4)
889D-R4AC-2	4-pin DC Micro Right Angle Female Cordset, 2 (6.5)
889D-R4AC-5	4-pin DC Micro Right Angle Female Cordset, 5 (16.4)
889D-R4AC-10	4-pin DC Micro Right Angle Female Cordset, 10 (32.8)
889D-R4AC-15	4-pin DC Micro Right Angle Female Cordset, 15 (49.2)
889D-R4AC-20	4-pin DC Micro Right Angle Female Cordset, 20 (65.6)
889D-R4AC-30	4-pin DC Micro Right Angle Female Cordset, 30 (98.4)

Rockwell Automation

EC Declaration of Conformity

The undersigned, representing the manufacturer	*and the authorised representative established within the Community*
Rockwell Automation, Inc. ***2 Executive Drive*** ***Chelmsford, MA 01824*** ***USA***	***Rockwell Automation BV*** ***Rivium 1e Straat, 23*** ***2209 LE Capelle aan den IJssel*** ***Netherlands***

Herewith declare that the Products:	***GuardShield™ Type 4 Safety Light Curtains***
Product identification (brand and catalogue number/part number):	***Allen-Bradley / Guardmaster 440L Series*** *(reference the attached list of catalogue numbers)*

Product Safety Function:	*440L Series Type 4 safety light curtains are active optoelectronic protection devices (AOPDs) with resolutions of 14mm and 30mm, or multiple beams with various beam spacings. These safety light curtains are self-checking and cascadable, and are suitable for applications up to Safety Category 4 (EN ISO 13849-1) and SIL3 (EN 61508).*

are in conformity with the essential requirements of the following EC Directive(s) when installed in accordance with the installation instructions contained in the product documentation:

2004/108/EC	*EMC Directive*
2006/42/EC	*Machinery Directive*

and that the standards and/or technical specifications referenced below have been applied:

EN 55022:1998 +A1:2000 +A2:2003	*Information technology equipment – Radio disturbance characteristics - Limits and methods of measurement*
EN 61496-1:2004 + A1:2008	*Safety of machinery – Electro-sensitive protective equipment – Part 1: General requirements and tests*
CLC/TS 61496-2:2006	*Safety of machinery – Electro-sensitive protective equipment – Part 2:*
IEC 61496-2:2006	*Particular requirements for equipment using active opto-electronic protective devices (AOPDs)*
EN 61508:2001	*Functional safety of electrical/electronic/programmable electronic safety-related systems*
EN 62061:2005	*Safety of machinery – Functional safety of safety-related electrical, electronic and programmable control systems*
EN ISO 13849-1:2008 / AC:2009	*Safety of machinery – Safety related parts of control systems – Part 1: General principles for design*

The authorised representative is authorized to compile the Technical File.

Conformance of a type sample belonging to the above mentioned product family with the regulations from the EC Machinery Directive has been certified by:

TÜV NORD CERT GmbH & Co. KG *Langemarckstr. 20, D-45141* *Essen, Germany* *ID-No.: 0044*	*EC Type Examination Certificate No.* *44 205 10 383326 000*

Manufacturer:	*Authorised Representative in the Community:*
Signature	***Signature***
Name: Daniel L. Nachtigall	*Name:* Viktor Schiffer
Position: Technical Leader – Certification Engineering	*Position:* Engineering Manager
Date: 17-Jun-2010	*Date:* 21-Jun-2010
Place: Milwaukee, WI USA	*Place:* Haan, Germany

Document Control Number: SEN-0339-H-EN (Original) 1 / 2

Rockwell Automation

Catalogue number	*Series* [1]	*Description*
440L-*4*****		*GuardShield Type4 light curtains per Nomenclature*

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

MODEL NOMENCLATURE:

440L	-	P	4	J	L	1600	Y	D
1		2	3	4	5	6	7	8

1	Designates Product Type 440L – GuardShield safety light curtains
2	Light Curtain Type P – Transmitter/receiver pair R – Receiver T – Transmitter S – Remote Teach System C – Cascaded sensor pair F – Cascaded receiver G – Cascaded transmitter
3	Optoelectronic Safety Type 4 – Type 4
4	Beam Resolution J – 14mm K – 30mm A – Perimeter Access Control
5	Electronic Unit Type Blank – Standard L - Laser
6	Protection Height or Number of Beams and Beam Gap 0160 – 160mm height 0320 – 320mm height 0480 – 480mm height 0640 – 640mm height 0800 – 800mm height 0960 – 960mm height 1120 – 1120mm height 1280 – 1280mm height 1440 – 1440mm height 1600 – 1600mm height 2500 – Two beams, 500mm gap 3400 – Three beams, 400mm gap
7	Environmental Rating Y – IP65
8	Connection Options A – 5 pin, M12 quick disconnect D – Micro quick disconnect connector R – Pigtail w/Y-connector cable

GuardShield is a trademark of Rockwell Automation, Inc.

www.rockwellautomation.com

Power, Control and Information Solutions Headquarters

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Publication PN-73917
10000085454 Ver 01
August 2012

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