

GuardShield Type 4 and GuardShield Remote Teach

Catalog Numbers 440L-P4zxxxxyy, 440L-C4xxxxyy, 440L-S4xxxxyy

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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 light curtain. A qualified person conducts the inspection and commissioning.

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GuardShield Safety Light Curtain

The GuardShield family of safety light curtains is a general-purpose presence sensing device, which is designed for use on hazardous machinery providing point of operation, and perimeter and access detection.

It is a self-contained, two-box, Type 4 electro sensitive protective equipment (ESPE) with DIP switch selectable operating modes.

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

Table 1 - Features

Feature	Description
Integrated laser alignment	An integrated visible laser to support the alignment
Cascade	Cascade allows the serial connection of several GuardShield light curtain segments to one long system
Remote Teach	Provides a remote teach-in box to configure teach-in blanking
ArmorBlock Guard I/O module connectivity	For network connectivity

Some of the features are available in combinations. For a complete offering, see [Table 48...](#)[Table 53](#) on pages [22...](#)[25](#) and [Table 62](#) on page [31](#).

According to ANSI Z590.3, Z690.3, ISO 14121, and ISO 12100, the GuardShield light curtain Type 4 may be used in safety applications in which a risk analysis has reached:

- PLe in a safety Category 4 (EN ISO13849-1)
- SIL 3 (EN 62061)

Summary of Changes

This publication contains new and updated information. Changed 18m range to 16 m in the [Technical Specifications on page 22](#).

Description

This installation instruction covers the operation and installation of the:

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

IMPORTANT Save these instructions for use at a future time.

Features of the GuardShield light curtain, which are integrated into the system 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:

- Proper mounting
- Configuration
- Electrical installation
- Commissioning
- Operation
- 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 integrated. Only qualified personnel can install this equipment.

Safety Precaution Principles

The following instructions are preventive warnings to achieve the safe and proper operation of the GuardShield light curtain. 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 can result in dangerous operation.

ATTENTION: Identifies information about practices or 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: A potentially hazardous situation exists, which, if not stopped, can lead to serious or deadly injury.
Failure to observe can result in dangerous operation.



ATTENTION: The GuardShield light curtain must not be used with machines that cannot be stopped electrically in an emergency.

The safety distance between the GuardShield light curtain and a dangerous machine movement has to be maintained always. 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 light curtain 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 light curtain to flammable or explosive gases.

Regular safety inspections are imperative (see maintenance).

Do not repair or modify the GuardShield light curtain. The GuardShield safety light curtain is not field repairable and can only be repaired at the factory. Removal of either of the GuardShield light curtain endcaps voids the warranty terms of this product.

Specialist Personnel

Only a qualified person can install the GuardShield safety light curtain. A qualified person is defined as a person who:

- Has undergone the appropriate technical training
- The responsible machine operator has instructed in the operation of the machine and the currently valid safety guidelines
- 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 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 16 m (52 ft) for the 30 mm (1.18 in.) resolution GuardShield light curtain. The protective field height is between 160 mm (6.3 in.) and 1760 mm (69.2 in.) in increments of 160 mm.

The GuardShield light curtain with an Integrated Laser Alignment system is offered in protective heights from 320...1600 mm (12.6...63 in.). All GuardShield light curtains with ArmorBlock Guard I/O module have Integrated Laser Alignment.

The device is a Type 4 ESPE as defined by IEC 61496-1 and IEC 61496-2. Therefore it is allowed for use with controls:

- In safety Cat 4 up to PLe in accordance with EN ISO 13849-1
- SIL CL3 in accordance with EN 62061

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. See the [Examples of Range of Use on page 3](#) for an illustration of the protective modes.

Depending on the application, mechanical protection devices can be required and 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 on page 2](#). It is only used by qualified personnel and only on the machine that's 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 become null and void.

General Protective Notes and Protective Measures

IMPORTANT Observe the following items to be sure 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
- 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 (for example, on use, mounting, installation, or integration into the existing machine controller) must be observed.
- Specialist personnel or specially qualified and authorized personnel conduct the tests and record/document the tests to be sure that they 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.

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 anywhere 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 protective field.

- The restart button must be located outside the hazardous area. This location removes the possibility of operation 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 module connectivity.

IMPORTANT Additional measures can be necessary to be sure that the ESPE does not fail to danger when other forms of light radiation are present in a particular application. For instance, with cableless control devices on cranes, radiation from weld spatter, or effects from strobe lights use.

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.

IMPORTANT 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, for instance, transmitter and receiver (see [Figure 1 on page 4](#)) with the same protective 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 the GuardShield light curtain receives and processes. The first beam next to the status indicators synchronizes optically the timing of emission and reception of the infrared light pulses. This beam is referred to as the synchronization beam. Because the GuardShield light curtain transmitter and receiver are optically synchronized, no electrical connection is required between the transmitter and receiver.

The GuardShield light curtain receiver has two safety outputs, Output Signal Switching Devices (OSSDs) and one nonsafety auxiliary output. When the GuardShield light curtain 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 have short circuit protection. Interruption of the sensing field causes the receiver to switch the sourced current OFF (0V DC).

When you restore the sensing field in Guard only (automatic reset) configuration, it causes the OSSD safety outputs to switch from the OFF to the active high ON state (+24V DC).

Figure 1 - Components of a Standard GuardShield Light Curtain Safety System

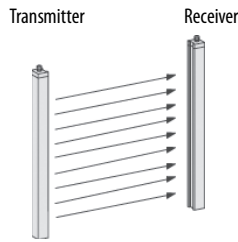
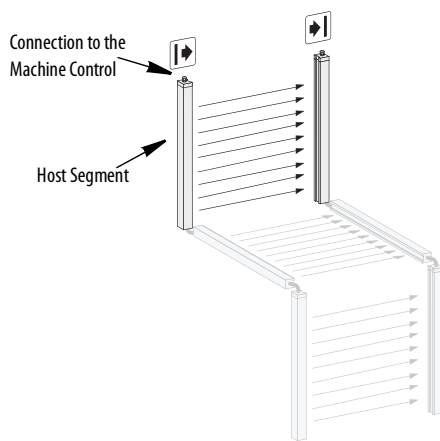


Figure 2 - Components of a Cascaded GuardShield Light Curtain System⁽¹⁾



The black front window indicates the upper and lower limit of the protective field of the standard GuardShield light curtain system.

The yellow borders on the laser label and target label indicate the limits of the protective height on the GuardShield light curtain with an Integrated Laser Alignment system.

The width of the protective field is derived from the length of the light path between sender and receiver. This width must not exceed the maximum rated width of the protective field that is provided in the [Technical Specifications on page 22](#).

Cascading

The GuardShield light curtain, Type 4 POC is also available in cascade segments which allow a number of GuardShield light curtain transmitters and receivers to be interconnected in series (see [Figure 2](#)). This product configurability allows the GuardShield light curtain to protect multiple sides of a machine or simply adds flexibility when positioning the GuardShield light curtain in various applications.

Standard GuardShield light curtain cascade segments are offered in protective heights from 320...1760 mm (12.6...69.29 in.) in both 14 mm (0.55 in.) and 30 mm (1.18 in.) resolutions. Cascade segments of 160 mm (6.3 in.) are not offered, however a 160 mm GuardShield light curtain can be used as the last segment in a cascading system.

Cascading GuardShield light curtains with an integrated laser alignment system are offered in protective heights from 320...1600 mm (12.6...63

in.). 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 (69.29 in.), 14 mm (0.55 in.) resolution GuardShield light curtain interconnected segments. The individual segments can have mixed resolutions, for instance, 14 mm and 30 mm (1.18 in.) as long as the pairs have the same protective heights and resolutions.

Cascade 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 cascade segments are used as standalone pairs or as the last segment in a cascade system, it is necessary to use a termination plug on the top connector of the cascade receiver. It is also possible to use a standard GuardShield light curtain Type 4 POC pair as the last segment in a cascading system.

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

GuardShield Light Curtain 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) with control circuitry. It detects reflected laser light from a temporary blockage of the emitted laser light. This detection is most commonly accomplished by placing a finger over the laser overlay window. There is also an automatic shutdown feature. This feature switches the laser diode from the high-power state to the low-power state if there is no finger or other interruption that is detected for five minutes.

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



ATTENTION: Use of controls or adjustments or performance of procedures other than specified, can result in hazardous radiation exposure.

Safety Functions

The GuardShield safety light curtain offers various functions, which are integral to the system.

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

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

Guard Only (Automatic Reset)

When in the guard only mode of operation, the light curtain operates as an on/off device. This operation means that the OSSD outputs switch off/on automatically according to an obstruction or clear view of the

(1) Figure indicates three cascade segments.

detection field. The GuardShield light curtain is configured at the factory in Guard Only (automatic reset) mode.

Start Interlock

The start interlock stops 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 light curtain to enter the ON state.

The ON state is accomplished with one of two methods.

- Actuation of a momentary N.O. push button (see [Figure 26 on page 14](#))
- Interruption and restoration of the protective field within one second.

After the first manual reset after power-up, the light curtain continues operating in the Guard Only (automatic reset) mode.

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 status indicator on the GuardShield light curtain receiver (see [Figure 42 on page 18](#)).

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

Restart Interlock (Manual Reset)

The restart interlock mode of operation stops the OSSD outputs from switching to ON after interruption and clearance of the protective field. A manual reset of the GuardShield light curtain system is required. Reset of the system is accomplished through a momentary N.O. push button (see [Figure 26 on page 14](#)) or key switch. Configuration and activation of this mode of operation is through DIP switch settings (see [Table 39 on page 17](#)). The illumination of a yellow status indicator on the GuardShield light curtain receiver indicates the restart interlock mode.

Restart interlock is not available on middle and end segments of a cascading GuardShield light curtain system. However, it is possible to configure this operating mode in the host segment, which allows the whole cascading system to operate in this mode (see [Figure 42 on page 18](#)).

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

Relay Monitoring (MPCE/EDM)

The relay monitor function is an input signal to the GuardShield light curtain receiver. This function is used to monitor the state of the protective machinery primary control contactors or other final switching device (see [Figure 25 on page 14](#)). Detection of unsafe conditions such as welded contacts, cause the GuardShield light curtain to enter a lockout condition (OSSDs OFF). Activation of this mode of operation is through DIP switch setting in the GuardShield light curtain receiver (see [Table 37 on page 17](#)).

EDM is not available in the middle and end segments of a cascading GuardShield light curtain system. However, it is possible to configure

this operating mode in the host segment, which allows 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 module connectivity.

System Testing

The GuardShield light curtain performs a complete system self-test at power-up. The output switch 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)

An external test signal to the GuardShield light curtain transmitter triggers a test cycle of the system. Supplying or removing a signal (+24V DC) via a N.C. or N.O. switch at the test input (see [Figure 33 on page 16](#)) deactivates the transmitter during the test signal. Applying this test signal simulates an interruption of the protective sensing field. The polarity of the test input must be configured via a DIP switch that is located in the GuardShield light curtain transmitter (see [Table 38 on page 17](#)). The default setting is that the transmitter works in normal operation if no signal is applied to the test input.

External test signal is not available in the middle and end segments of a cascading GuardShield light curtain system. However, it is possible to configure this feature in the host segment (see [Figure 2 on page 4](#)), which allows 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 that is configured in the same condition. For instance, all "active high" or all "active low" condition.

Beam Coding

If several safety light curtains are operating close to one another, the infrared light of the transmitter from one GuardShield light curtain system can be seen by the receiver of another system. This situation would cause a nuisance stop. To stop this optical interference, the GuardShield light curtain is able to have the transmitter generate different beam patterns, which are 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 response time, which can also increase the required safety distance. See [Determine the Safety Distance on page 8](#).

Blanking

The GuardShield safety light curtain can be configured with 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 light curtain segment pair functions as a standalone safety light curtain with its OSSDs connected in series to the host segment OSSDs. Therefore, it is necessary to configure fixed and/or floating blanking in each individual pair segment. To configure, first align all segment pairs and secure the brackets. It is then possible to open a segment pair receiver door with the security tool that is provided. Set the appropriate DIP switches and perform the teach function (see [Teach-in Procedure Function on page 18](#)). The successful completion of the teach function changes the operating mode of that segment pair only.

Teach-in Fixed Blanking

The teach-in fixed blanking mode of operation is activated through DIP switch settings that are located in the GuardShield light curtain receiver (see [Table 37 on page 17](#)). The beams to be blanked are “taught” by depressing the teach button that is located in the GuardShield light curtain receiver endcap while the object is in the GuardShield light curtain sensing field (see [Figure 35](#) and [Figure 36 on page 17](#)).

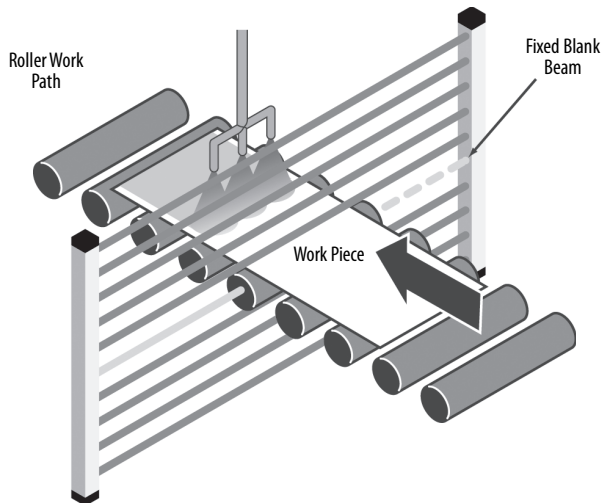
The fixed blanking mode of operation is monitored. If any part or all of the taught object is removed from the sensing field, the GuardShield light curtain OSSD outputs go to the OFF state.

The GuardShield light curtain fixed blanking mode of operation is not activated until the teach function (see [Table 40 on page 18](#)) is complete and the access door is closed.

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

The configuration and activation of fixed blanking creates a “hole” in the GuardShield light curtain protective field. If the fixed object in the protective field does not fill the area between the transmitter and receiver, it is necessary to obstruct access to the hazard by additional means. You can accomplish this obstruction by “hard guarding” the open area. “Hard guards” refer to mechanical barriers.

Figure 3 - 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 light curtain enters a Fault state

Fixed Blanking enables the blanking out of fixed objects in the sensing area of the light curtain. [Table 7 on page 7](#) shows the reaction of the monitored machine with Fixed Blanking deactivated and activated.

IMPORTANT IEC 62046 provides information on additional means that can be required to stop 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 that are located in the GuardShield light curtain receiver (see [Receiver—Factory Settings on page 17](#)). Floating blanking allows one or two beams that are located anywhere in the protective field to be blanked out. For instance, blocked beams ignored and GuardShield light curtain remains with outputs active.

[Table 8 on page 7](#) depicts the state for the OSSD safety outputs for one- and two- beam floating blanking for different situations.

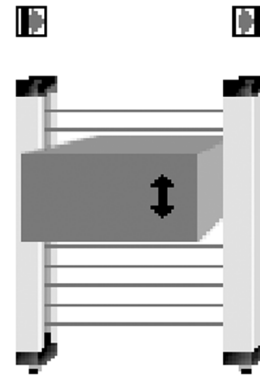
IMPORTANT It is not possible to activate multiple beam floating blanking on a 30 mm (1.18 in.) resolution GuardShield light curtain system.

Actuation of the floating blanking mode of operation changes the resolution of the GuardShield light curtain.

Table 4 - Effective Resolution

GuardShield Light Curtain 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 5 - Floating Blanking



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

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

Table 6 - Description of Symbols

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

Table 7 - Status of OSSD Safety Output for Different Situations in Case of Teach-in Fixed Blanking

Case	1	2	3	4	5	6	7	8
Infrared Beam	No Blanking	Fixed Teach-in Blanking						
N	○	○	○	○	○	○	○	○
N+1	○	⊠	⊠	⊠	⊠	⊠	⊠	⊠
N+2	⊗	⊠	⊠	⊠	⊠	⊠	⊠	⊠
N+3	○	○	○	○	○	○	○	○
N+4	○	○	○	○	⊗	○	⊠	⊠
N+5	○	○	○	○	○	○	○	⊗
N+6	○	○	○	○	○	○	○	○
Status OSSDs	OFF	ON	OFF	OFF	OFF	OFF	ON	OFF

Table 8 - Status of OSSD Safety Outputs for Different Uses in Different Cases of Floating Blanking

Case	1	2	3	4	5	6	7	8	9	10	11	12
Infrared Beam	Reduced Resolution Deactivated	Floating Blanking 1 Beam				Floating Blanking 2 Beams						
N	○	○	○	○	○	○	○	○	○	○	○	○
N+1	○	○	⊗	⊗	⊗	○	⊗	⊗	⊗	⊗	⊗	⊗
N+2	⊗	○	○	○	⊗	○	○	○	⊗	⊗	⊗	○
N+3	○	○	○	⊗		○	○	⊗		⊗		⊗
N+4	○	○	○	○	○	○	○	○	○	○	⊗	
N+5	○	○	○	○	○	○	○	○	○	○	○	⊗
N+6	○	○	○	○	○	○	○	○	○	○	○	○
Status OSSDs	OFF	ON	ON	OFF	OFF	ON	ON	ON	ON	OFF	OFF	OFF

Response Time

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

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

Table 9 - Response Time for Finger Resolution (14 mm) [mm (in.)]

Resolution	Protective Height	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

Table 10 - Response Time for Hand Resolution (30 mm) [mm (in.)]

Resolution	Protective Height	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 (T_s) must include the stopping times of all devices in the stop circuit. Not including all device and control system elements when calculating T_s results in an inaccurate safety distance calculation.

Determine the Safety Distance

The light curtain must be mounted with proper safety distance

- From the point of danger
- From reflective surfaces

US Safety Distance Formula



ATTENTION: The GuardShield Type 4 safety light curtains must be mounted at a sufficient distance from the pinch point or point of operation hazard. A sufficient distance helps confirm that the machine stops before a finger, hand, arm, or body reaches the hazard.

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

IMPORTANT According to EN ISO 13855, regardless of the calculated safety distance, never mount GuardShield Type 4 safety light curtains closer than 100 mm (4 in.) from the point of operation or pinch point hazard.

In the United States, there are two formulas that are used to 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 we recommend, 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:

$$D_s = 63 XT$$

D_s Safety Distance

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

T Is the total stop time of all devices in the safety circuit, which is measured in seconds. This value must include all components that are involved to stop the hazardous motion of the machinery. For a mechanical power press, it is the stop time that is measured at approximately the 90° position of the crankshaft rotation.

IMPORTANT The T number must include the response times of all devices, including:

- Response time of the safety light curtain
- Safety light curtain controller (if used)
- Control circuit of the machine, and
- Any other devices that react to stop the hazardous motion of the machinery.



WARNING: Not including the response time of a device or devices in the stop time calculation results in insufficient safety distance for the application, which results in operator injury.

The ANSI Safety Distance Formula

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

$$D_s = K \times (T_s + T_c + T_r + T_{spm}) + D_{pf}$$

- D_s 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 1600.2 mm (63 in.) per second when the operator begins reaching toward the point of operation hazard from rest. **NOTE:** ANSI B11.19 2000 E8.3.2.3 and Annex D states “One of the accepted values for K is the hand speed constant (it is considered as the horizontal motion of the hand and arm while seated). The common value of K is 1.6 m/s (63 in./s). Although other values (typically greater) are also used. The hand speed constant does not include other body movements, which can affect the actual approach speed. Consideration of the above factors should be included when determining the speed constant for a given application. The employer should consider all factors, including the physical ability of the operator, when determining the value of K to be used.”
- T_s Stop time of the machine tool that is measured at the final control element. Measurement starts at maximum machine velocity.
- T_c Response time of the control system
- T_r Response time of the presence sensing device (safety light curtain) and its interface, if any. The device manufacturer states the value or you measure it.
- T_{spm} Additional time is allowed for the stop performance monitor to compensate for variations in normal stopping time T_s . Check ANSI B11.19 Annex D for details.
- D_{pf} 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 object sensitivity of the safety light curtain. Object sensitivity (resolution) is the smallest diameter object, which is detected anywhere in the sensing field.

IMPORTANT A stop time measuring device measures $T_s + T_c + T_r + T_{spm}$.

Example (for US):

In a perpendicular safety-light curtain application with object sensitivity (effective resolution) less than 64 mm (2.5 in.), the D_{pf} can be approximated based on the following formula:

$$D_{pf}(\text{inches}) = 3.4 \times (\text{Object Sensitivity} - 0.276),$$

But not less than 0.

For GuardShield Type 4 light curtain:

Object sensitivity = 30 mm (1.18 in.)

$$D_{pf} = 3.4 \times (1.18 - 0.276 \text{ in.}) = 3.08 \text{ in.}$$

$$T_s = 241 \text{ ms} = 0.241 \text{ s}$$

$$T_c = 10 \text{ ms} = 0.01 \text{ s}$$

$$T_r = 20 \text{ ms} = 0.02 \text{ s}$$

$$T_{spm} = 20\% \text{ of } T_s \text{ (calculated by the machine manufacturer)} = 49 \text{ ms} = 0.049 \text{ s}$$

$$K = 63 \text{ in./s (determined by the machine manufacturer)}$$

$$D_s = 63 \times (0.241 + 0.01 + 0.02 + 0.049) + 3.08 \text{ in.}$$

$$= 63 \times 0.32 + 3.08 \text{ in.}$$

$$= 20.16 + 3.08 \text{ in.}$$

$$= 23.24 \text{ in. (600 mm)}$$

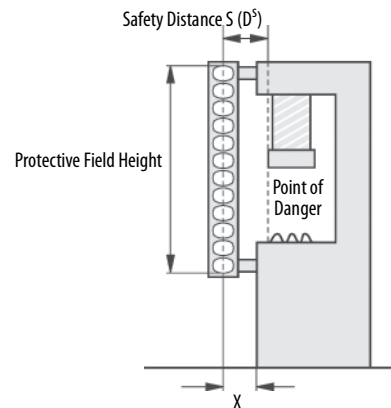
European Safety Distance Formula

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

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

- Stopping/run-down time of the machine. (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, for example, GuardShield Type 4 light curtain (see [Response Time on page 8](#)).
- Response time of the safety circuit:
- Reach or approach speed.
- Resolution of the light curtain.

Figure 11 - Safety Distance from the Point of Danger



IMPORTANT An operator is not able to stand between the protective field and the point of operation. EN ISO 13855 requires a maximum distance “X” (see [Figure 11 on page 9](#)) of $\leq 70 \text{ mm (2.76 in.)}$ at an installation height of 300 mm (11.9 in.). Check EN ISO 13855 for other installation heights.

How to Calculate the Safety Distance S

According to EN ISO 13855 and EN ISO 13857:

First, calculate S using the following formula:

$$S = 2000 \times T + 8 \times (d - 14) \text{ [mm]}$$

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:
 $S = 1600 \times T + 8 \times (d - 14)$ [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 (for Europe):

Stopping/run-down time of the machine = 290 ms

Response time safety circuit = 10 ms

Response time light curtain = 20 ms

Resolution of the light curtain = 30 mm (1.18 in.)

$T = 290 \text{ ms} + 30 \text{ ms} = 320 \text{ ms} = 0.32 \text{ s}$

$S = 2000 \times 0.32 + 8 \times (30 - 14) = 768 \text{ mm (30.24 in.)}$

$S > 500$ mm (19.7 in.), therefore:

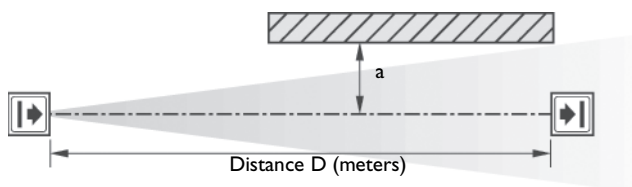
$S = 1600 \times 0.32 + 8 \times (30 - 14) = \underline{\underline{640 \text{ mm (25.1 in.)}}}$

Minimum Distance from Reflecting Surfaces

The infrared light from the sender is reflected off shiny surfaces and received by the system receiver. If this condition occurs, it can result in an object not being detected when it enters the GuardShield Type 4 light curtain sensing field.

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

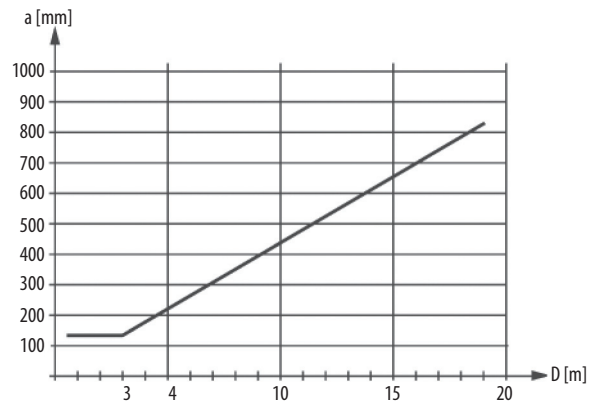
Figure 12 - Minimum Distance from Reflecting Surfaces



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 13 - Graph, Minimum Distance from Reflective Surfaces



The effective aperture angle for the GuardShield Type 4 light curtain system is within $\pm 2.5^\circ$ at a mounting distance of > 3.0 m (9.8 ft). Calculate the minimum distance to reflective surfaces depending on the distance between the transmitter and the receiver. Use an aperture angle of $\pm 2.5^\circ$, or take the appropriate value from [Table 14](#).

Table 14 - Minimum Safety Distance to Reflective Surfaces

Distance between Transmitter and Receiver (Range L) [m (ft)]	Minimum Distance (a) [mm (in.)]
0.2...3.0 (0.65...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)

IMPORTANT Formula: $a = \tan 2.5^\circ \times D$ [mm] = $0.0437 \times D$ [mm]
a = minimum distance to reflective surfaces
D = distance between transmitter and receiver

Installation and Mounting

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

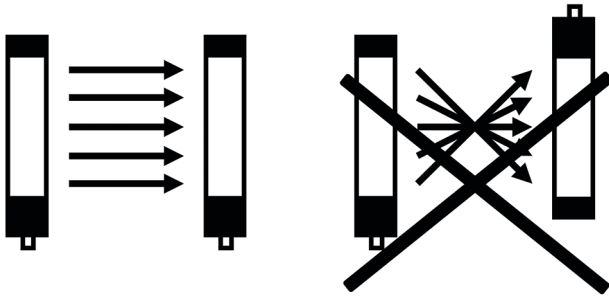
The standard GuardShield light curtain has an amber status indicator in the receiver (see [Figure 42 on page 18](#)), which is used as an alignment aid. This status indicator begins to flash when the infrared light from the transmitter is seen by the receiver. This status indicator turns off when optimal alignment is attained.

Alignment Procedure: Standard GuardShield light curtain

Mount and connect both transmitter and receiver. The transmitter and receiver must be:

- Parallel to each other
- Positioned at the same height
- Connected to the same end (see [Figure 15 on page 11](#))

Figure 15 - Inverse Mounting



1. Turn on power to GuardShield light curtain system.
2. Rotate the transmitter while watching the amber indicator on the receiver (see [Figure 42 on page 18](#)) to find the points where the indicator changes from ON (amber) to OFF.
3. Determine the maximum left- and right-turn angles and position unit in center.
4. Tighten all hardware to fix the alignment.
5. Then do the same alignment procedure with the receiver.
6. Cycle power to confirm that the system powers up and goes to the ON state (alignment indicator is OFF).

The GuardShield light curtain is also offered with an integrated laser alignment system. This alignment system has a constant low-powered Class 1, eye safe laser located in the top of the transmitter and in the bottom of the receiver. Each laser emits a low level of visible light. Simply block 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 to high powered. If this light is at a low level, interruption causes the laser to emit a highly visible level of light. Interruption of the visible light in the same location causes the laser to switch to a low level of emission. The emission of visible light also changes to a low level after five minutes of activation.

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

An external laser (440L-ALAT) and mounting bracket (450L-ALAT-C) is offered as an accessory for aligning the GuardShield light curtain without Integrated Laser Alignment (see [Laser Alignment Tool on page 35](#)).

Alignment Procedure for GuardShield Light Curtain with Integrated Laser Alignment

1. Properly locate the GuardShield light curtain pair from the point of operation hazard after performing the safety distance calculation.
2. Use the GuardShield light curtain mounting brackets to mount the transmitter and receiver so that they are facing one another and are positioned in the same direction (see [Figure 15 on page 11](#)). A reference would be that the indicator light-emitting diodes are opposite one another.

Turn on each laser by placing a finger or hand in front of each laser.

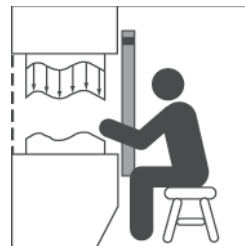
For optimal alignment, adjust the transmitter and receiver in such a way that both visible laser beams meet the laser targets opposite each laser. A small deviation around the target is allowable.

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

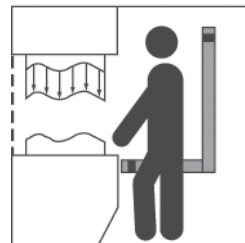
IMPORTANT The installation of the GuardShield safety light curtain must be such that access to the hazard is only possible through the sensing field of the GuardShield light curtain. Auxiliary safe guarding can be required with the GuardShield light curtain to meet this requirement.

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

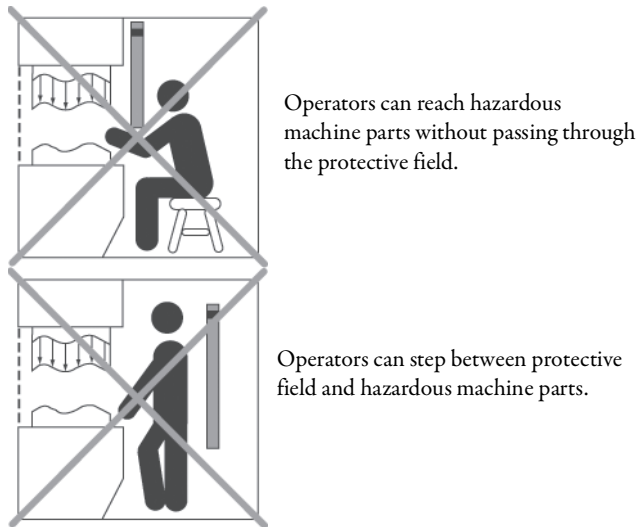
Figure 16 - Correct Installation



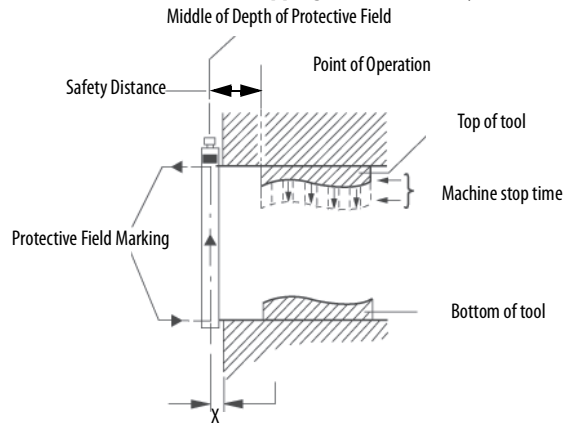
Operators cannot reach hazardous machine parts without passing through the protective field.



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

Figure 17 - Incorrect Installation

The GuardShield light curtain must be mounted at the proper distance from the point of operation hazard. This distance is referred to as the Safety Distance (see [Determine the Safety Distance on page 8](#)).

Figure 18 - Determine Machine Stopping Time and Safety Distance

IMPORTANT You are not able to stand between the protective field and the point of operation. EN ISO 13855 requires a maximum distance "X" (see [Figure 18](#)) of ≤ 70 mm (2.76 in.) at an installation height of 300 mm (11.9 in.). Check EN ISO 13855 for other installation heights.

Configuration of Operating Modes in Cascading Systems

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

- Beam coding
- Floating blanking
- Fixed blanking

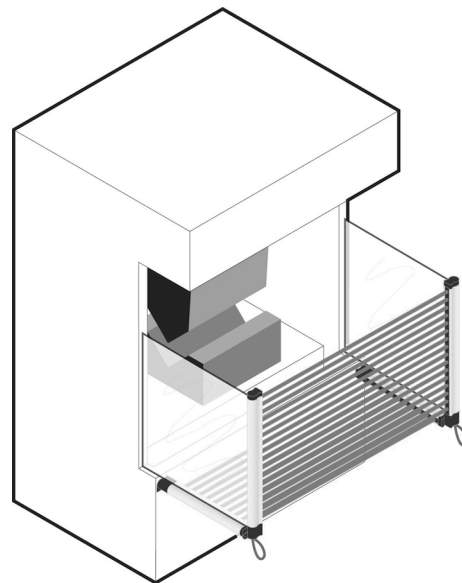
All other possible operating modes of a standard GuardShield light curtain, if configured in a middle or end segment, cause lockout or off conditions. This condition requires the cycling of power and a reconfiguration of the segment.

Two Segment Cascading GuardShield Light Curtain Systems

If the GuardShield light curtain pair is vertically mounted so that a person can 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. Installation of a safety mat or safety laser scanner are possible solutions. However they are costly solutions as they are separate safety systems that are integrated into the safety circuit. The most cost-effective solution is to interconnect an additional light curtain in series to the vertical pair. Select a Host or cascade pair of GuardShield safety light curtains with a protective height and resolution that is based on the results of a risk assessment. Then select the horizontal protective height of the pair of light curtains. This pair provides detection from the vertical pair to the front of the machine hazard. Typically, this pair of light curtains can have a 30 mm (1.18 in.) resolution as their purpose is to detect the presence of a person and not fingers.

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

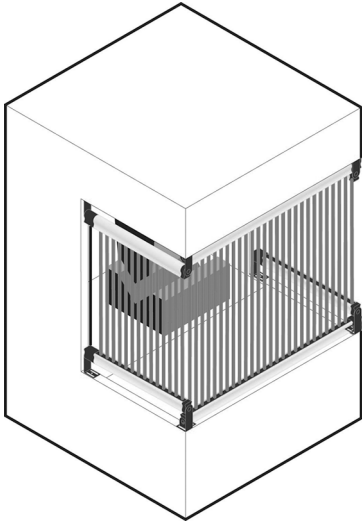
Figure 19 - Example for a Setup with Two Cascaded Segments (L-shape Setup)

L-shaped two segment GuardShield light curtain cascade systems offer protection when it is possible to stand between the vertical light curtain and the machine hazard

Three Segment GuardShield Light Curtain Cascading Systems

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

Figure 20 - Top and Bottom Mounting of Three GuardShield light curtain Segments (U-shape Setup)



Top and bottom mounting of three GuardShield light curtain segments is possible. This configuration provides three-sided machine guarding without the use of corner mirrors.

Mounting and Alignment of Cascading GuardShield Light Curtain

IMPORTANT It is necessary to align cascade segments in a particular order. Begin by aligning the last segment in the system. Once the last receiver status indicator is green; secure mounting brackets of that pair. Next align the middle segment pair. When the middle-segment receiver status indicator is green, secure those brackets. Finally align the host segment. When that receiver status indicator is green, secure those brackets.

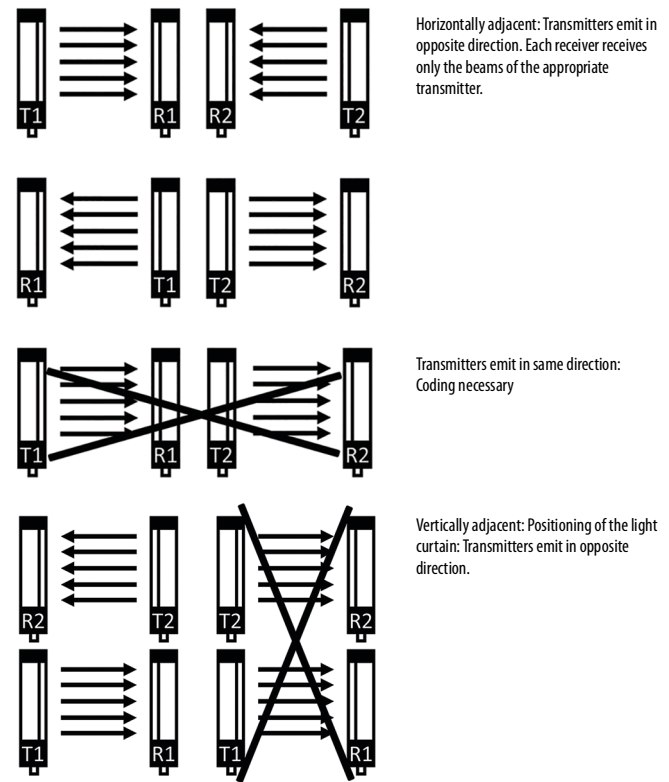
Test system by interrupting sensing field of last segment and verify that all receiver OSSD status indicators are red.

Next interrupt the sensing field of the middle segment pair (if any) and confirm that the middle segment and host segment receiver OSSD status indicators are red. The last segment-pair receiver status indicator remains green. Finally, interrupt the sensing field of the host segment receiver and confirm that the receiver OSSD status indicators are red (middle and end segment pairs indicate green).

Multiple GuardShield Light Curtains

When two or more GuardShield light curtains are mounted close to one another, it is possible for the receiver of one pair to receive infrared light from the transmitter of another pair. The GuardShield light curtain feature of beam coding overcomes this optical interference. Beam coding changes the pulse pattern of infrared light that a GuardShield light curtain transmitter emits.

Figure 21 - Multiple GuardShield Light Curtain Alignment Options



Mounting Brackets

By default, the GuardShield light curtain is mounted using right angle brackets (Figure 22) that are attached to the endcaps of both transmitter and receiver. It can be necessary to use additional brackets (see Figure 23) to mount the GuardShield light curtain at a proper safety distance from the machinery hazard. For applications with shock and/or vibrations, also see Table 66.

Figure 22 - Mounting Brackets (AF-6101)

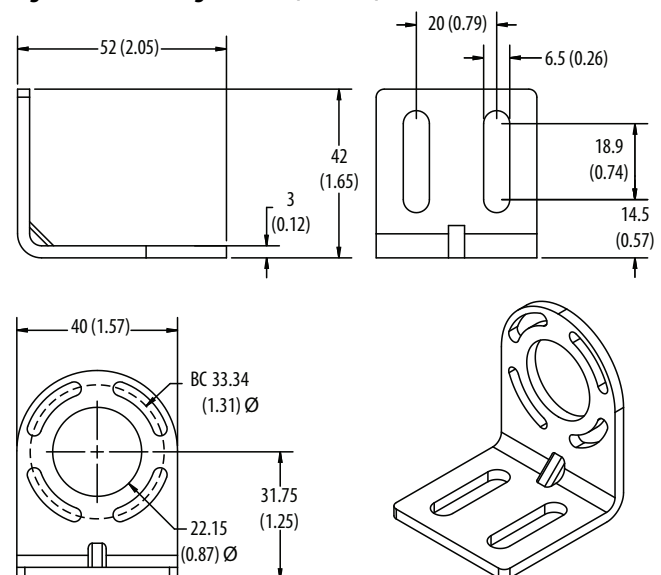
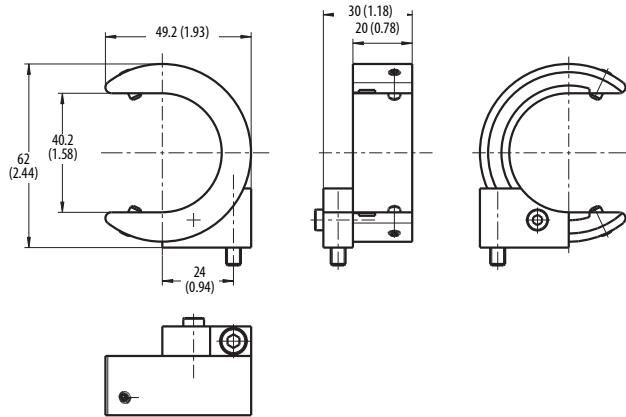
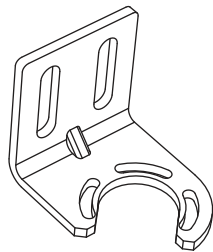


Figure 23 - Optional Middle Mounting Bracket (440L-AF6108)



Middle mounting brackets can be used in vibration applications for protective heights of 1120 mm (44.09 in.) and larger.

Figure 24 - GuardShield Light Curtain Remote Teach Receiver Bracket
See [GuardShield Light Curtain Remote Teach](#) on page 29.



Electrical Installation Power Supply

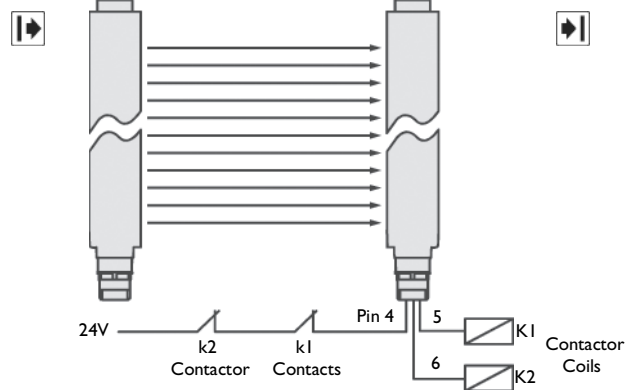
The external voltage supply (+24V DC) must meet the requirements of IEC 61496-1. In addition, the following requirements have to be fulfilled:

- The power supply bridges a short-term power failure of 20 ms.
- The power supply has double insulation between the primary and the secondary side.
- Helps protect the power supply 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 \pm 20%.

EDM Connection

See [Relay Monitoring \(MPCE/EDM\)](#) on page 5.

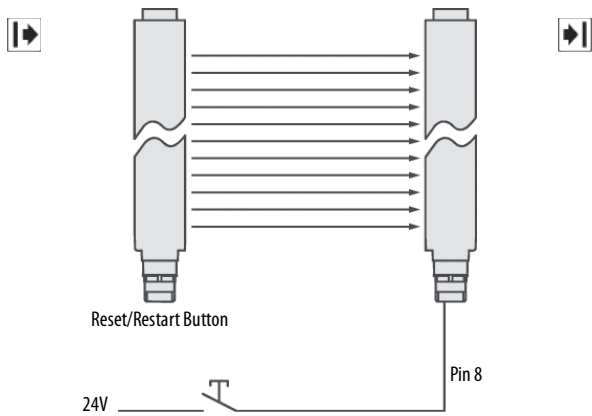
Figure 25 - Connecting the Contact Elements to the EDM



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

Figure 26 - Connecting the Reset Button/Restart Button

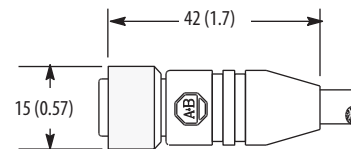
See [Start Interlock](#) and [Restart Interlock \(Manual Reset\)](#) on page 5.



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

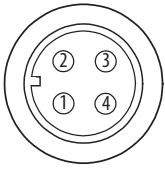
Connections [mm (in.)]

Figure 27 - Cables/Connectors



The GuardShield light curtain transmitter connector is a four-pin DC micro connector that is offered in cable lengths of 2...30 m (6.56...98.4 ft). The GuardShield light curtain receiver connector is an 8-pin DC micro connector that is offered in cable lengths of 2...30 m (6.56...98.4 ft).

Table 28 - GuardShield Light Curtain Standard and GuardShield Light Curtain with ArmorBlock Guard I/O Module 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

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

Table 29 - Standard GuardShield Light Curtain Receiver Connector

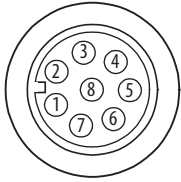
Receiver Connection Face View of Female DC Micro	Color	Pin No.	Signal
			Receiver
	White	1	Auxiliary Output
	Brown	2	+24V DC
	Green	3	Ground
	Yellow	4	EDM
	Gray	5	OSSD 1
	Pink	6	OSSD 2
	Blue	7	0V DC
	Red	8	Start/Restart

Table 30 - GuardShield Light Curtain Receiver Connector for ArmorBlock Guard I/O Module Connectivity

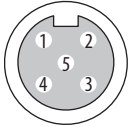
Top View	Color	Pin No.	Signal
			Receiver
	Brown	1	+24V
	White	2	OSSD 2
	Blue	3	0V
	Black	4	OSSD 1
	Gray	5	NC

Table 31 - Interconnect Patchcords for Cascading GuardShield Light Curtain

Cat. No.	Description
Transmitter Patchcord	
889D-F4HLD-0M3	4-pin M12 patchcord, 12 inches
889D-F4HLD-1	4-pin M12 patchcord, 1 meter
889D-F4HLD-2	4-pin M12 patchcord, 2 meters
Receiver Patchcords	
889D-F8ABD-0M3	8-pin M12 patchcord, 12 inches
889D-F8ABD-1	8-pin M12 patchcord, 1 meter
889D-F8ABD-2	8-pin M12 patchcord, 2 meters
Shorting Plug (Required for cascading GuardShield light curtain if last pair in cascade system or standalone pair.)	
Receiver	
898D-81CU-DM	Termination plug 8-pin M12 quick-disconnect

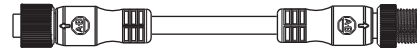
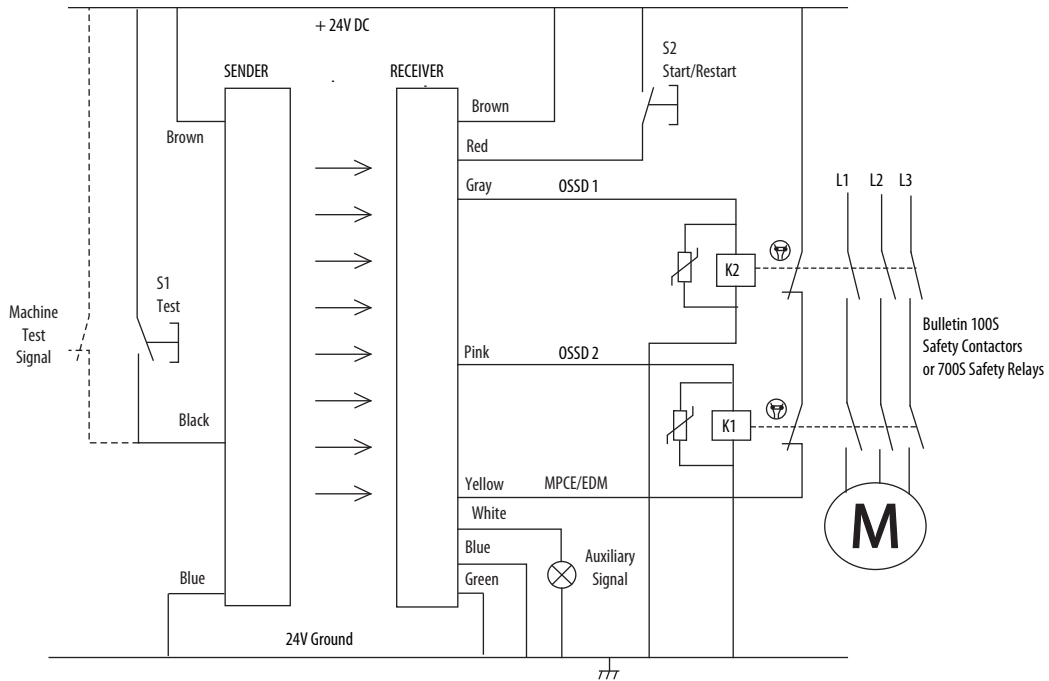
Figure 32 - Example of Patchcord for Interconnecting Cascading GuardShield Light Curtain

Figure 33 - Typical Wiring Diagram—Direct to Contactors with EDM

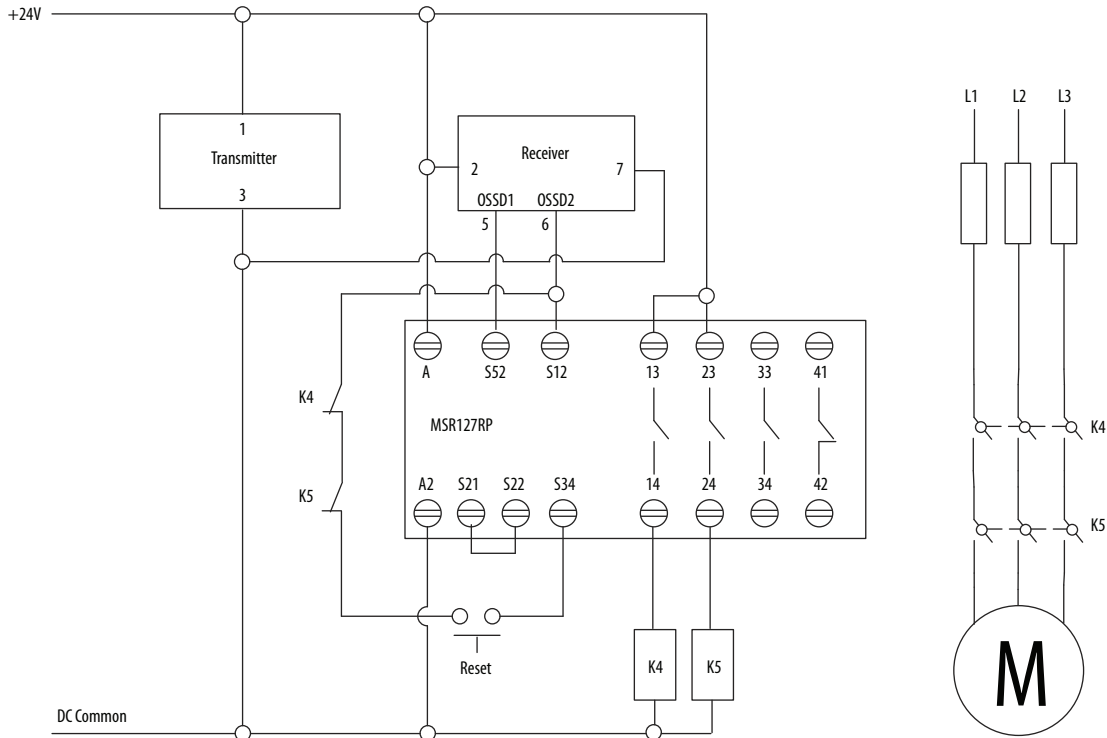


➤ Nonsafety auxiliary output (white) can be connected to a lamp, motor, or status to a PLC.

2 S1 test is only connected based on risk assessment.

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

Figure 34 - Typical Wiring Diagram—To MSR127 Safety Relay Module



System Configuration

Figure 35 - DIP Switch Selection Settings—Transmitter

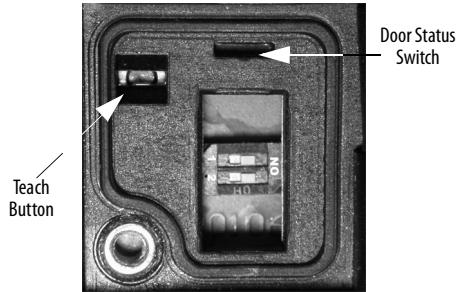
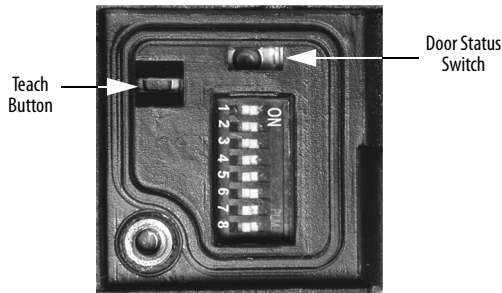


Figure 36 - DIP Switch Selection Settings—Receiver



After you mount, electrically connect, and align the GuardShield safety light curtain, it is now possible to configure your system.

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

IMPORTANT The configuration door screw is a captive screw. 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 light curtain receiver.

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

DIP switch identification and function are explained in [Table 37...Table 39](#) on [page 17](#).

Follow the [Teach-in Procedure Function on page 18](#) to reconfigure the GuardShield light curtain.

IMPORTANT After each reconfiguration of the GuardShield light curtain, 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.

Table 37 - 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 (see Table 39 on page 17)
2		ON	
3	MPCE/EDM Monitoring disable	ON	EDM Disabled
4	Teach-in Fixed Blanking Activate	OFF	Teach-in Fixed Blanking Disabled
5	Floating Blanking Activate—Single Beam	OFF	Switches 5 and 6 cannot be activated "On" simultaneously.
6	Floating Blanking Activate—Two Beams	OFF	
7	Set Beam Coding	OFF	Beam Coding Disabled (this setting should match the setting of switch one in Table 38 on page 17).
8	Not used	OFF	—

Table 38 - Transmitter—Factory Settings

Switch	Switch Function	Default Setting	Description
1	Set Beam Coding	OFF	Disabled (this setting should match the setting of switch seven in Table 37 on page 17)
2	Machine Test Signal	OFF	OFF: TX stops transmitting when signal is High — Do not connect or connect normally open ON: Signal Low active—Connect N/C

Table 39 - Settings for Mode of Operation—Receiver

Switch 1	Switch 2	Condition	Operation
ON	ON	Guard Only (automatic reset)	ON/OFF Operation
OFF	ON	Start Interlock (Push Button Reset)	Only Interlock at startup—Reset by actuation of the push button switch. After the first manual reset, Guard Only (automatic reset) is active.
OFF	OFF	Restart Interlock (manual reset)	Interlock at interruption of sensing area — Reset by manual activation of the push button switch.
ON	OFF	Start Interlock	Interlock at startup—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 (see [Teach-in Procedure Function on page 18](#)).

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

Cascading Segment DIP Switch Settings

There are a few operating modes that cannot be configured in the middle and end segments of a cascading GuardShield light curtain

system. The following Operating modes if configured cause the light curtain to fault;

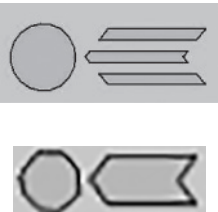
- EDM
- Start and restart interlock

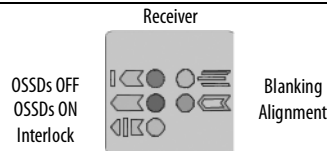
Power must be cycled and the segment pair must be retaught to deactivate the mode.

IMPORTANT Configuration of the EDM in a middle or end segment causes an EDM fault in that configured segment even if EDM is also configured and functions in the Host segment. Interruption of the middle or end segment, which has EDM also configured, causes the middle or end segment to go to a lock out condition. That condition cannot be reset without cycling power and reconfiguring the middle or end segment without the non-allowed configuration.

Configure the start or restart interlock in the middle or end segment causes a fault in the middle or end segment, which has that Operating mode configured. The status indicator shows a “Waiting for reset” fault, which cannot be reset even if the Host segment is also configured for the start or restart interlock. Due to the lack of an internal reset line in the middle or end segment, it is not possible to reset the middle or end segment before resetting the Host segment.

Table 40 - Teach-in Procedure Function

Step 1	Open the cover of the end cap Receiver: red status indicator flashes (OSSD OFF) Transmitter: orange status indicator flashes (POWER ON). See Figure 42 on page 18 .
Step 2	Select the desired DIP switch setting.
Step 3	Press and hold the Teach button. The yellow status indicator starts flashing at 10 Hz (10x per second): RX: Blanking indicator 
Step 4	After five seconds, the status indicator stops flashing. After the indicator stops flashing, release the teach button within two seconds. After three flashes of the yellow status indicator, the function is activated.
Step 5	Close and secure the cover. The indicator stops flashing.



The doors on the transmitter and receiver must be closed for the GuardShield light curtain to operate.

IMPORTANT If the GuardShield light curtain teach procedure is not properly completed, the unit remains in the previous operating mode.

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

Troubleshooting Guide

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

Table 41 - Error Descriptions

Condition No.	Error Description	Action
8	Internal fault, receiver	<ul style="list-style-type: none"> • Check configuration of transmitter and receiver • Replace receiver
9	Internal fault, transmitter	<ul style="list-style-type: none"> • Check configuration of transmitter and receiver • Check protective field transmitter/receiver • Check connections transmitter/receiver • Exchange transmitter
10	External fault	<ul style="list-style-type: none"> • Check connections of OSSD outputs for short circuit against +24V DC and GND (cable, connected devices) • Exchange receiver
11	External fault (MPCE/EDM error) The function Relay monitoring is activated and after clearing the OSSD the input Relay monitoring does not recognize a change of state.	<ul style="list-style-type: none"> • 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

Figure 42 - Status Indicator at Transmitter (Tx) and Receiver (Rx)

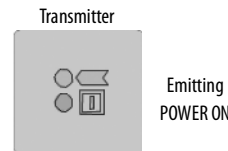


Table 43 - System Status Indicators

Condition No.	Receiver Status Indicators					Transmitter Status Indicators	
	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

Condition Nos. 8...13 (gray shading) are fault conditions

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

Condition No.	Description
1	Guard only (automatic reset) mode, light curtain unobstructed (aligned, not in interlock)
2	Guard only (automatic reset) mode, light curtain interrupted (aligned, not in interlock)
3	Guard only (automatic reset) mode, misaligned (not in interlock)
4	Guard only (automatic reset) 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)

IMPORTANT For fault conditions 8...13. See [Troubleshooting Guide on page 18](#).



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

IMPORTANT Before power-up of the GuardShield light curtain system, the responsible person reviews the following Checklist.

Checklist

Before the initiation of the GuardShield light curtain the responsible person works through the following checklist.

Cable check before initiation:

1. The power supply is a 24V DC device, which must comply to all applicable standards of the Machinery Directive 2006/42/EC, and the product standard (IEC 61496).
2. Proper polarity of the power supply at the GuardShield light curtain.
3. The transmitter connection cable is properly connected to the transmitter, the receiver connection cable is properly connected to the receiver.
4. The double insulation between the light curtain output and an external potential is confirmed.

5. The OSSD outputs are not connected to +24V DC.
6. The connected switching elements (load) are not connected to 24V DC.
7. No connection to a conventional power supply.
8. If two or more GuardShield light curtain are to be used, make sure that each system is properly installed, to avoid optical interference.

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

9. 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 light curtain before conducting the following inspection. Improper inspection can lead to serious or even deadly injury.

For safety reasons, all inspection results are recorded.

Only persons, who clearly understand the functioning of the GuardShield light curtain and of the machine, can conduct an inspection.

If the installer, planning engineer, and operator are different people, make sure that they have sufficient information available to conduct the inspection.

Daily Inspection

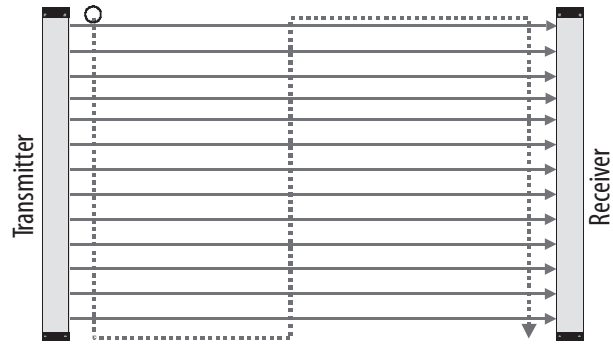
1. Approach to hazardous machine parts must only be possible through passage through the protective field of GuardShield light curtain.
2. Operators cannot step through the sensing area while working on dangerous machine parts.
3. The safety distance of the application is bigger than the calculated value.
4. The optic front cover is not scratched or dirty.

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

5. The protective field is interrupted.
The hazardous movement stops immediately if you interrupt the protective field by placing the test rod directly:
6.
 - In front of the transmitter
 - In front of the receiver
 - In between the transmitter and receiver
7. No hazardous machine movement while the test rod is anywhere within the protective field.
8. The power supply of the GuardShield light curtain is turned off.
9. If the blanking function is activated, check all sections of the protective field with the appropriate test rod (see [Figure 44 on page 20](#)).

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

Figure 44 - 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.

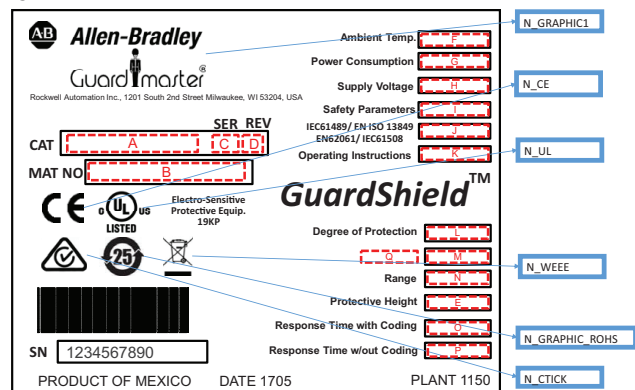
1. Machine stops or does not obstruct any safety function.
2. The latest machine or connection modifications have no effect on the control system.
3. The outputs of the GuardShield light curtain are properly connected to the machine.
4. The total response time of the machine is shorter than the calculated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

Cleaning

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

Date Code

Figure 45 - Product Label for Units Produced before 2017



Items that are marked in [Figure 45](#):

- Serial number
- Production data code







Use the codes in [Table 46](#) for older GuardShield light curtain units that don't have the date printed on the label.

Table 46 - Explanation of Data Code for Units Produced before 2017

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		S=2011
K=2005		T=2010
L=2006		U=2013
M=2007		V=2014
N=2008		W=2015
P=2009		Y=2016
R=2010		Z=2017

The product label in [Figure 47](#) is used for GuardShield light curtain safety light curtains that are manufactured after January 2017.

Figure 47 - Product Label

		Ambient Temp.	-10...+55C
		Power Consumption	7W
Rockwell Automation Inc., 1201 South 2nd Street Milwaukee, WI 53204, USA		Supply Voltage	24VDC+/-20%
SER REV		Safety Parameters	TYPE 4/Cat 4
CAT	440L-T4J0160YD A A	IEC61489/ EN ISO 13849	Pl/SIL CL3, SIL3
MAT NO	440L-T4J0160YD A	EN62061/ IEC61508	PN-73917
		GuardShield™	
		Degree of Protection	IP65
Electro-Sensitive Protective Equip. 19KP		Resolution	14mm
		Range	0.3-7M
		Protective Height	160mm
SN	1234567890	Response Time with Coding	≤30ms
PRODUCT OF MEXICO	DATE 1705	Response Time w/out Coding	≤20ms
			PLANT 1150

Items that are marked in [Figure 47](#):

- Serial number
- Production data code (YYWW = Year Year Week Week (for example, 1705 = Week 5 in Year 2017))

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 light curtain; 320...1600 mm for GuardShield light curtain 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...16.0 m (0.98...52.5 ft)		
Response Time	OSSD – ON to OFF: (Reaction times); 20...25 ms uncoded; 30...35 ms coded		
Power Supply	24V DC $\pm 20\%$; Power supply must meet the requirements of IEC 60204-1 and IEC 61496-1.		
Power Consumption	400 mA max. (unloaded)		
IR Transmitter	Infrared status indicator (wave length 870 nm)		
Aperture Angle	Within $\pm 2.5^\circ$ for transmitter and receiver		
Operating Condition	IR transmitter ON		
Functions	Guard Only: Start Interlock: Restart Interlock: Relay Monitoring: Coding: Test Function:	On/Off operation with clear/obstructed detection area Interlock at start up—Reset by actuation of momentary N.O. pushbutton switch (or interruption/restoration of light curtain) Interlock at interruption of sensing field—Reset by actuation of momentary N.O. push button switch Monitoring a switch contact of the installation May be necessary for multiplex alignment 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 (EDM)	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	OSSD ON-state	Constant ON when OSSD is in ON-state (green indicator)	
	OSSD OFF-state	Constant ON when OSSD is in OFF-state (red indicator)	
	Blanking	<ul style="list-style-type: none"> Lights up at interruption of protective field or if fault occurs Constant ON when Fixed Blanking is active Flashes, if Floating Blanking is active alone or together with Fixed Blanking (yellow indicator) 	
	Alignment Interlock	<ul style="list-style-type: none"> Lights up, if input signal is too weak (amber indicator) Lights up when light curtain is in start or restart interlock mode (yellow indicator) 	
Status Indicators Transmitter	Power ON Emitting	<ul style="list-style-type: none"> Lights up, when voltage is on (amber indicator) Constant ON when transmitter is active (yellow indicator) 	
QD Connectors	Transmitter: M12 plug 4 pin; receiver: M12 plug 8 pin; Standard GuardShield light curtain, GuardShield light curtain 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.). See Figure 57 on page 28 .		
Accessories Included	Test rod, mounting brackets, operating instructions, security tool to perform teach-in procedure		
Approvals	IEC 61496 Parts 1 and 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, PL e, EN/ISO 13849		
PFHd (mean probability of a dangerous failure/hr)	Standalone sys.: 9.51×10^{-9} ; Cascading sys. (host/guest): 1.95×10^{-8} ; Cascading sys. (host/guest/guest): 2.75×10^{-8}		
T _M (mission time)	20 years (EN ISO 13849)		
Transmitter Wave Length	870 nm		

Table 48 - Standard GuardShield Light Curtain

Sensor Pair	Transmitter	Receiver	Resolution [mm (in.)]	No. of Beams	Protective Heights [mm (in.)]	Pair Weight [kg (lb)]
Finger Resolution						
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)
Hand Resolution						
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)

Table 49 - Standard GuardShield Light Curtain with Integrated Laser Alignment System

Sensor Pair	Transmitter	Receiver	Resolution [mm (in.)]	No. of Beams	Protective Heights [mm (in.)]	Pair Weight [kg (lb)]
Finger Resolution						
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)
Hand Resolution						
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)

Table 50 - Standard GuardShield Light Curtain 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 (lb)]
Finger Resolution						
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)
Hand Resolution						
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)

Table 51 - Cascading GuardShield Light Curtain

Sensor Pair	Transmitter	Receiver	Resolution [mm (in.)]	No. of Beams	Protective Heights [mm (in.)]	Pair Weight [kg (lb)]
Finger Resolution						
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)
Hand Resolution						
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)

Table 52 - Cascading GuardShield Light Curtain with Integrated Laser Alignment

Sensor Pair	Transmitter	Receiver	Resolution [mm (in.)]	No. of Beams	Protective Heights [mm (in.)]	Pair Weight [kg (lbs)]
Finger Resolution						
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)
Hand Resolution						
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)

Table 53 - Cascading GuardShield Light Curtain with Integrated Laser Alignment and ArmorBlock IO Connection

Sensor Pair	Transmitter	Receiver	Resolution [mm (in.)]	No. of Beams	Protective Heights [mm (in.)]	Pair Weight [kg (lbs)]
Finger Resolution						
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)
Hand Resolution						
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)

Figure 54 - Cat. No. Explanation—Standard and Cascading GuardShield Light Curtain without Laser Alignment System

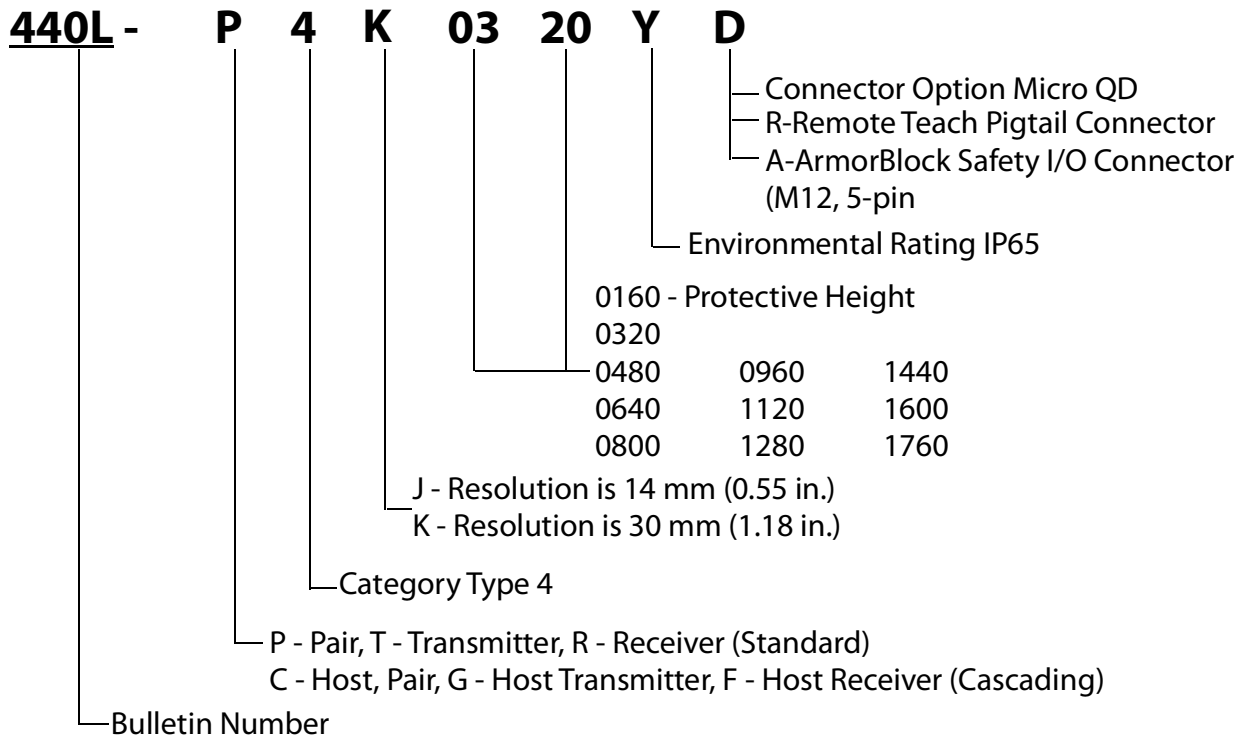


Figure 55 - Cat. No. Explanation—GuardShield Light Curtain with Integrated Laser Alignment System

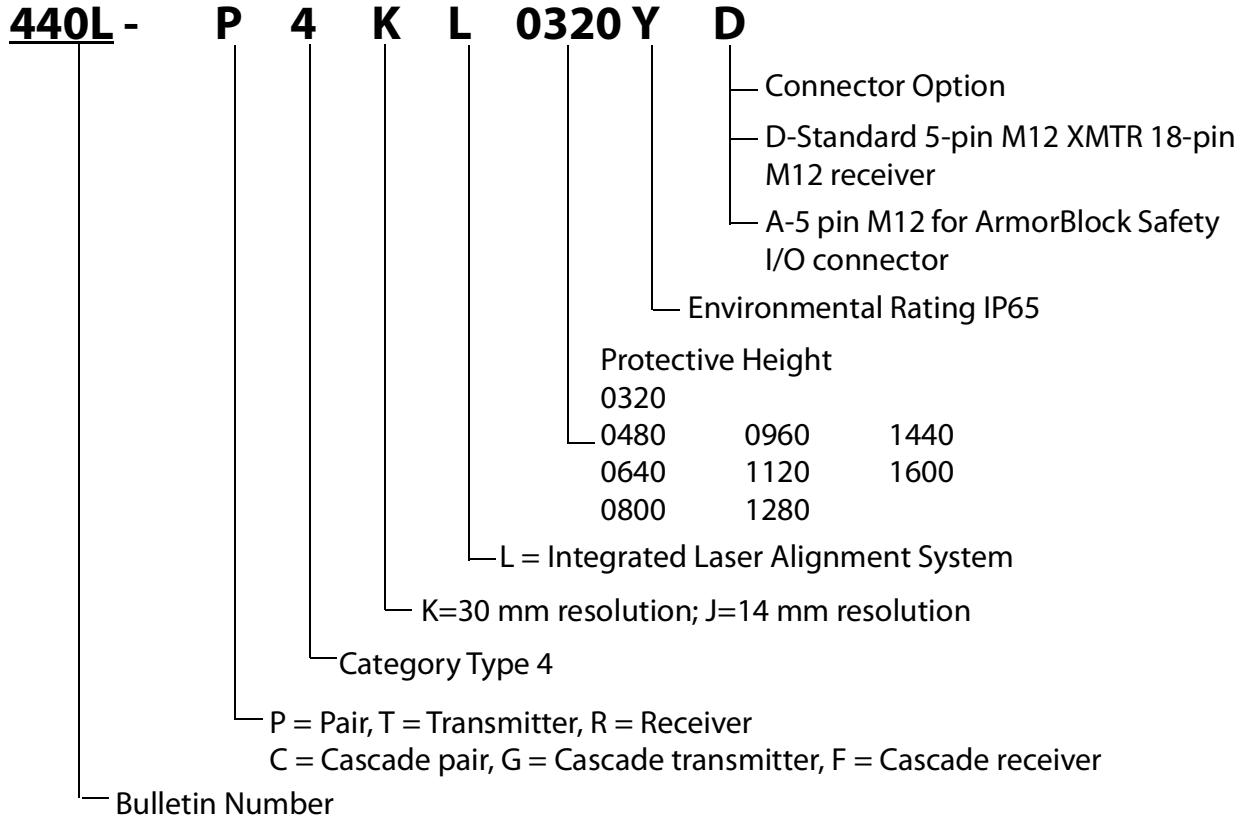
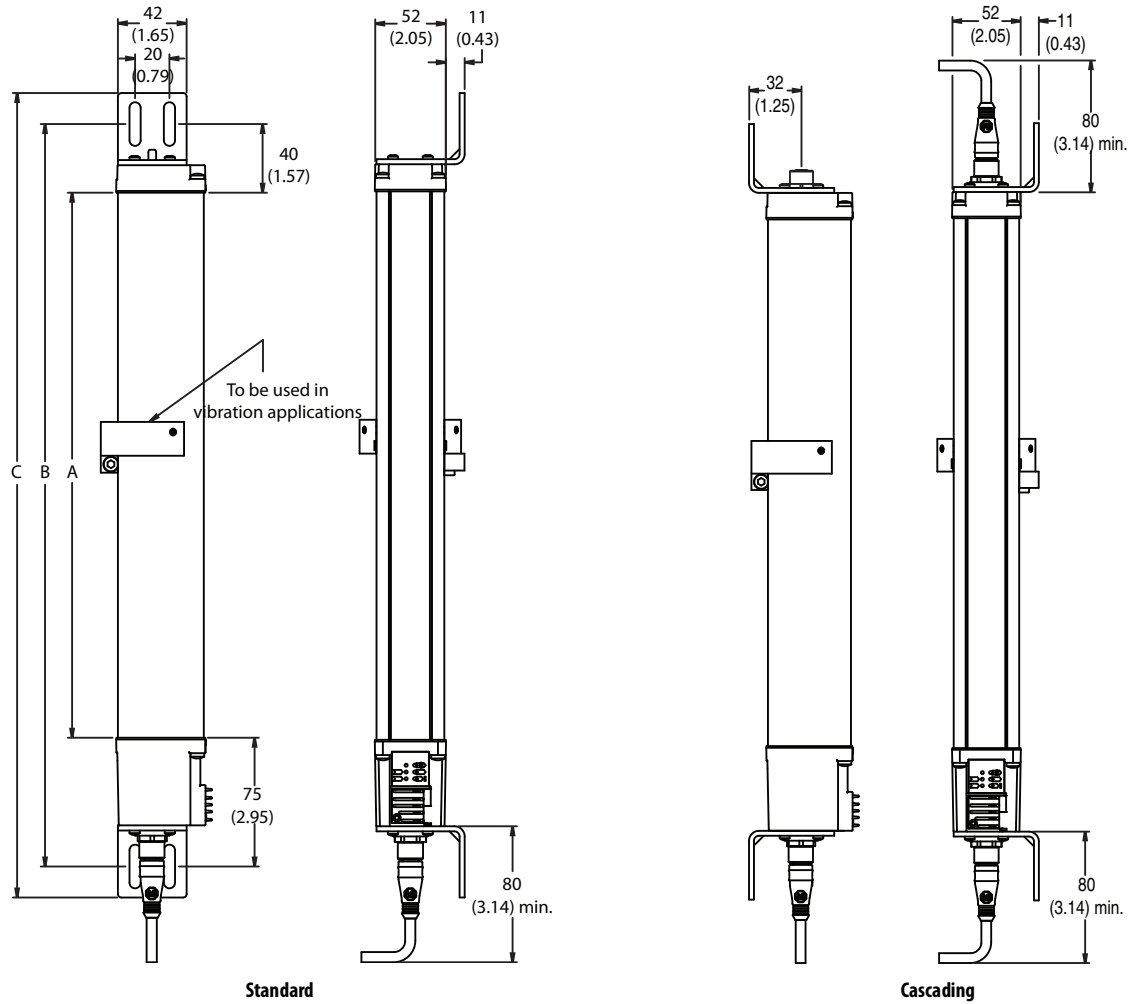


Figure 56 - Standard GuardShield Light Curtain and Cascaded GuardShield Light Curtain Dimensions [mm (in.)]



Type	A Protective Height	B Mounting Value	C Total Length
440L-†4†0160Y†	160 ±0.5 (6.3) ±0.02	276 (10.9)	312 ±1.5 (12.3) ±0.06
440L-†4†0320Y†	320 ±0.5 (12.6) ±0.02	436 (17.2)	472 ±1.5 (18.6) ±0.06
440L-†4†0480Y†	480 ±0.5 (18.9) ±0.02	596 (28.5)	632 ±1.5 (24.9) ±0.06
440L-†4†0640Y†	640 ±0.5 (25.2) ±0.02	756 (29.8)	792 ±1.5 (31.2) ±0.06
440L-†4†0800Y†	800 ±0.6 (31.5) ±0.02	916 (36.1)	952 ±1.5 (37.5) ±0.06
440L-†4†0960Y†	960 ±0.6 (37.8) ±0.02	1076 (42.4)	1112 ±1.5 (43.8) ±0.06
440L-†4†1120Y†	1120 ±0.6 (44.1) ±0.02	1236 (48.7)	1272 ±1.8 (50.1) ±0.07
440L-†4†1280Y†	1280 ±0.7 (50.4) ±0.02	1396 (55.0)	1432 ±1.8 (56.4) ±0.07
440L-†4†1440Y†	1440 ±0.7 (56.7) ±0.03	1556 (61.3)	1592 ±1.8 (62.7) ±0.07
440L-†4†1600Y†	1600 ±0.8 (63.0) ±0.03	1716 (67.6)	1752 ±2.0 (69.0) ±0.08
440L-†4†1760Y†	1760 ±0.8 (69.3) ±0.03	1876 (73.9)	1912 ±2.0 (75.3) ±0.08

† Replace with J or K.

† Replace with P, T, R, C, G, F.

† Replace with D or R.

Figure 57 - Standard GuardShield Light Curtain with Laser Dimensions [mm (in.)]

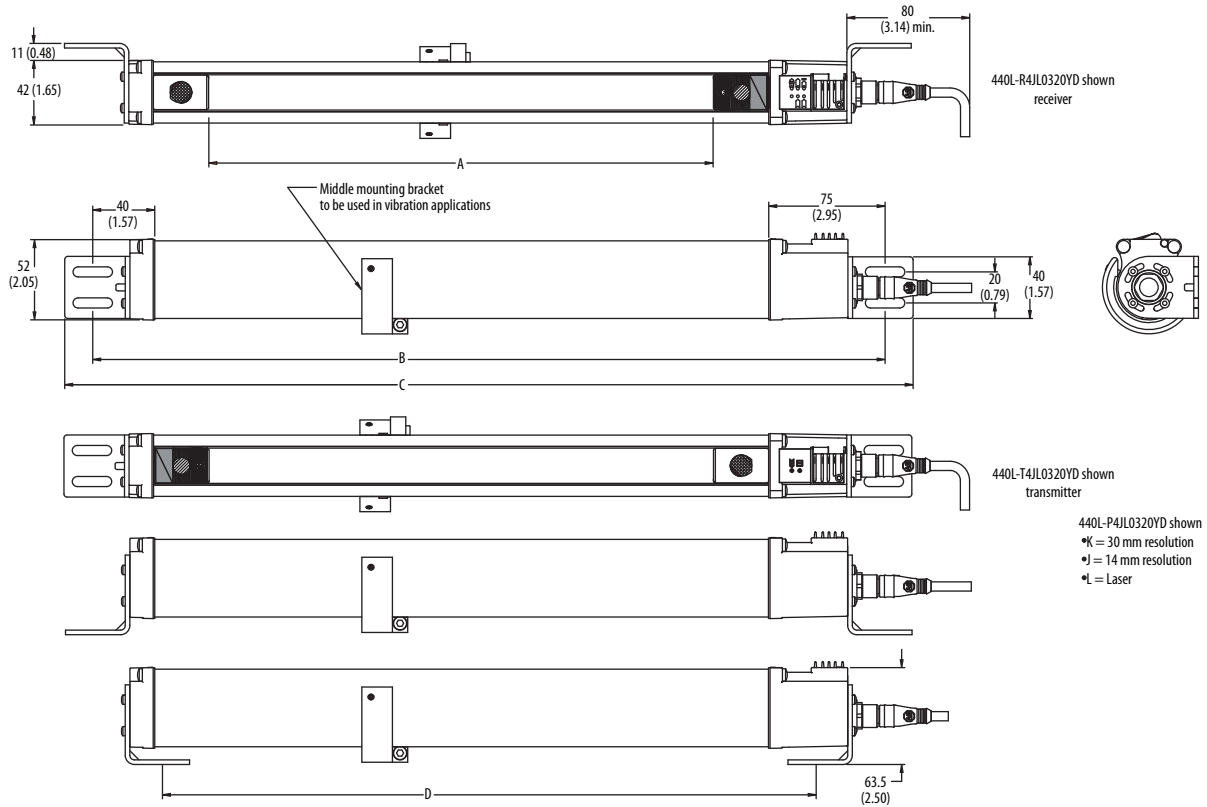
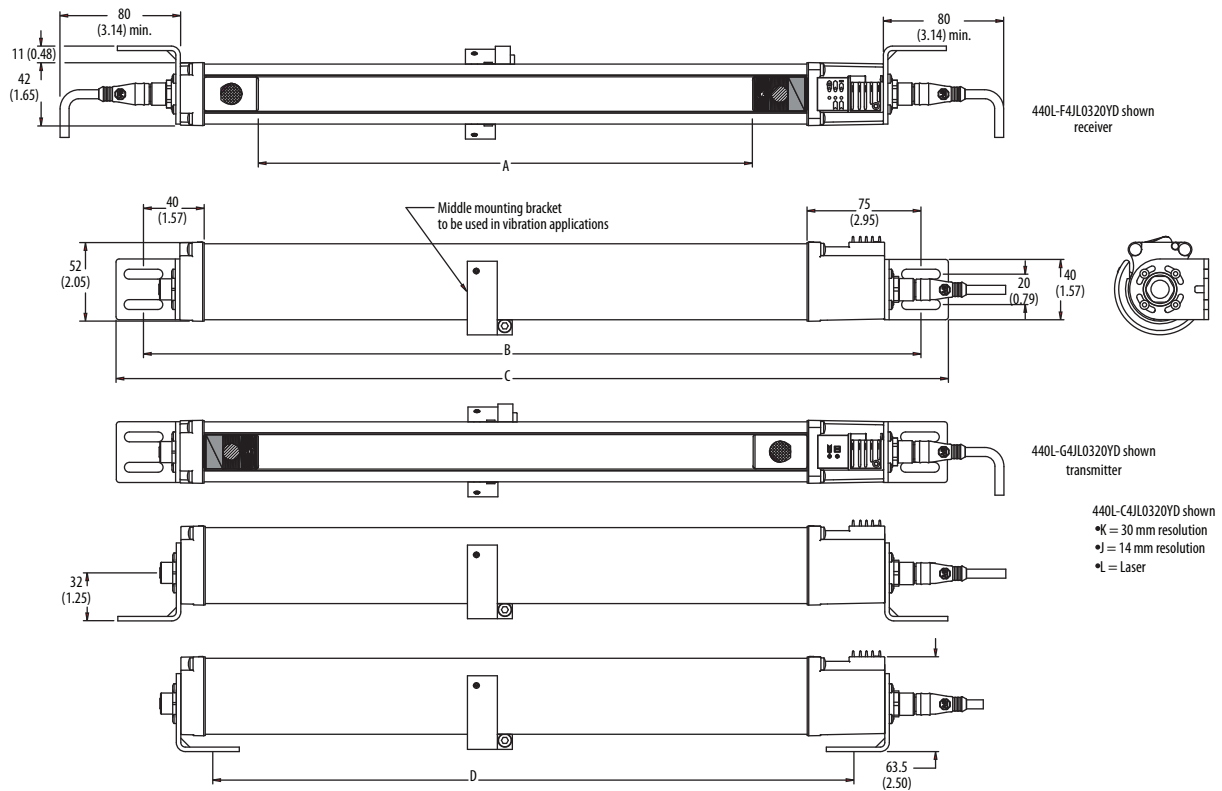


Figure 58 - Figure 57 and Figure 59 Dimensions [mm (in.)]

Catalog Number	A Protective Height	B Mounting Value	C Total Length
440L ⁽¹⁾ 4 ⁽²⁾ L0320Y ⁽³⁾	320 (12.6)	516 (20.3)	552 (21.7)
440L ⁽¹⁾ 4 ⁽²⁾ L0480Y ⁽³⁾	480 (18.9)	686 (26.6)	712 (28.0)
440L ⁽¹⁾ 4 ⁽²⁾ L0640Y ⁽³⁾	640 (25.2)	836 (32.9)	872 (34.3)
440L ⁽¹⁾ 4 ⁽²⁾ L0800Y ⁽³⁾	800 (31.5)	996 (39.2)	103 (4.1)
440L ⁽¹⁾ 4 ⁽²⁾ L0960Y ⁽³⁾	960 (37.8)	1156 (45.5)	119 (4.7)
440L ⁽¹⁾ 4 ⁽²⁾ L1120Y ⁽³⁾	1120 (44.1)	1316 (51.8)	1352 (53.2)
440L ⁽¹⁾ 4 ⁽²⁾ L1280Y ⁽³⁾	1280 (50.4)	1476 (58.1)	1512 (59.5)
440L ⁽¹⁾ 4 ⁽²⁾ L1440Y ⁽³⁾	1440 (56.7)	1636 (64.4)	1672 (65.8)
440L ⁽¹⁾ 4 ⁽²⁾ L1600Y ⁽³⁾	1600 (63)	1776 (69.9)	1832 (72.1)

- (1) Replace with J or K.
- (2) Replace with P, T, R, C, G, F.
- (3) Replace with D or A.

Figure 59 - Dimensions of Cascaded GuardShield Light Curtain with Laser



GuardShield Light Curtain Remote Teach

The GuardShield Remote Teach light curtain system provides a remote means of changing a fixed blanking configuration (see [Teach-in Fixed Blanking on page 6](#)) within the GuardShield safety light curtain. This key selector switch box stops the need to open the GuardShield light curtain receiver door and perform the Teach function (see [Figure 60 on page 29](#)).

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

An IP65 metal key selector switch box is located in the vicinity of the GuardShield light curtain receiver. The Remote Teach box is mounted in such a way as to allow the operator who performs the Teach function a clear view of the area being blanked out

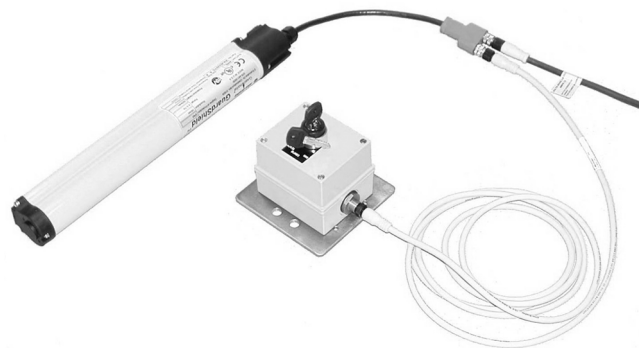
The GuardShield light curtain receiver requires a modified right angle mounting bracket to fit around the cable gland hardware on the receiver endcap (see [Figure 24 on page 14](#)). This bracket is supplied with each GuardShield Remote Teach light curtain receiver.

The GuardShield Remote Teach Box light curtain system consists of:

- Remote teach key selector switch box with mounting plate and two keys
- GuardShield light curtain transmitter
- Two meter patchcord for connection between the four-pin pigtail connector and the remote teach box.

- GuardShield light curtain receiver with a ten-inch dual connector pigtail. The dual connector contains a four-pin micro quick disconnect and a standard eight-pin quick-disconnect GuardShield light curtain Receiver.
- Modified mounting bracket for receiver bottom endcap

Figure 60 - GuardShield Remote Teach Light Curtain Components



IMPORTANT The GuardShield remote teach light curtain box can not be retrofitted. It is possible to purchase the components separately (see [Table 63 on page 31](#)). If a GuardShield light curtain system has already been purchased, the transmitter is a standard transmitter. The receiver part numbers vary by protective height (see [Table 64 on page 31](#)). Refer to the Remote Teach System table for a list of component parts of a remote teach system.

System Delivery

The GuardShield Remote Teach light curtain system is delivered with the GuardShield light curtain transmitter and receiver that is already configured in the standard GuardShield light curtain operating mode of “Guard Only.” This mode is Automatic reset and all features not activated.

The 2 m (6.56 ft) patchcord (889D-F4ACDM-2), Remote Teach (440L-M8600) key selector switch box and mounting hardware are packaged with each GuardShield Remote Teach light curtain system (see [Table 62 on page 31](#)) along with a standard GuardShield light curtain transmitter and remote teach receiver.

Remote Teach Box—Key Switch Positions

The GuardShield remote teach light curtain box uses a Rockwell Automation® 800FM series, three-position IP66 rated spring-loaded key selector switch. There are three key selector switch positions on the GuardShield Remote Teach light curtain box.

- **RUN:** This key selector switch position is required for the GuardShield light curtain to operate in its normal operating mode.
- **CONFIGURE:** This key selector switch position simulates the opening of the GuardShield light curtain DIP switch door. This position sends a signal to the GuardShield light curtain 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 key selector switch position performs the function of changing the operating mode configuration of the GuardShield light curtain.

Figure 61 - Key Selector Switch Label Positions
CONFIGURE

RUN TEACH

System Installation

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

After aligning the GuardShield safety light curtains and attaining a “green” state, the safety light curtain is transmitting infrared light and the receiver OSSDs are high. It is now possible to reconfigure the GuardShield light curtain.

Use the T8 TORX® bit supplied with each GuardShield light curtain bracket kit to open the GuardShield light curtain 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 light curtain protective height.

Make any additional DIP switch settings now.

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

It is not possible to blank out the synch beam, which is the first beam adjacent to the GuardShield light curtain diagnostic status indicators.

If the transmitter 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 light curtain sensing field, confirm that the synchronization beam is not obstructed
2. Turn key selector switch to the configure position. The red status indicator on the receiver flashes and the yellow blanking status indicator is illuminated.
3. Turn and hold key selector switch in the Teach position
4. The GuardShield light curtain receiver yellow blanking status indicator begins to flash.
5. When the yellow blanking status indicator stops flashing, release the key selector switch to the configure position within two seconds.
6. The GuardShield light curtain receiver yellow blanking status indicator flashes three times to confirm that the new fixed blanking configuration has been set.
7. Turn the key selector switch to the RUN position, the green status indicator on the GuardShield light curtain receiver illuminates.
8. Use the supplied test rod to 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.

IMPORTANT Once the GuardShield light curtain is configured by changing factory DIP switch positions and performing the Teach function (see [Teach-in Procedure Function on page 18](#)), the GuardShield light curtain will be reconfigured. Any future Teach procedure will only change the configuration of the fixed blanking area.

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

Fixed blanking creates a “hole” in the detection area of the GuardShield light curtain. 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.

Table 62 - Remote Teach System

Cat. No.	Description
440L-S4J0160YR	GuardShield Remote Teach light curtain system, 160 mm (6.3 in.) protective height 14 mm (0.55 in.) resolution
440L-S4J0320YR	GuardShield Remote Teach light curtain system, 320 mm (12.6 in.) protective height 14 mm (0.55 in.) resolution
440L-S4J0480YR	GuardShield Remote Teach light curtain system, 480 mm (18.9 in.) protective height 14 mm (0.55 in.) resolution
440L-S4J0640YR	GuardShield Remote Teach light curtain system, 640 mm (25.2 in.) protective height 14 mm (0.55 in.) resolution
440L-S4J0800YR	GuardShield Remote Teach light curtain system, 800 mm (31.5 in.) protective height 14 mm (0.55 in.) resolution
440L-S4J0960YR	GuardShield Remote Teach light curtain system, 960 mm (37.8 in.) protective height 14 mm (0.55 in.) resolution
440L-S4J1120YR	GuardShield Remote Teach light curtain system, 1120 mm (44.1 in.) protective height 14 mm (0.55 in.) resolution
440L-S4J1280YR	GuardShield Remote Teach light curtain system, 1280 mm (50.4 in.) protective height 14 mm (0.55 in.) resolution
440L-S4J1440YR	GuardShield Remote Teach light curtain system, 1440 mm (56.7 in.) protective height 14 mm (0.55 in.) resolution
440L-S4J1600YR	GuardShield Remote Teach light curtain system, 1600 mm (63 in.) protective height 14 mm (0.55 in.) resolution
440L-S4J1760YR	GuardShield Remote Teach light curtain system, 1760 mm (69.3 in.) protective height 14 mm (0.55 in.) resolution
440L-S4K0160YR	GuardShield Remote Teach light curtain system, 160 mm (6.3 in.) protective height 30 mm (1.18 in.) resolution
440L-S4K0320YR	GuardShield Remote Teach light curtain system, 320 mm (12.6 in.) protective height 30 mm (1.18 in.) resolution
440L-S4K0480YR	GuardShield Remote Teach light curtain system, 480 mm (18.9 in.) protective height 30 mm (1.18 in.) resolution
440L-S4K0640YR	GuardShield Remote Teach light curtain system, 640 mm (25.2 in.) protective height 30 mm (1.18 in.) resolution
440L-S4K0800YR	GuardShield Remote Teach light curtain system, 800 mm (31.5 in.) protective height 30 mm (1.18 in.) resolution
440L-S4K0960YR	GuardShield Remote Teach light curtain system, 960 mm (37.8 in.) protective height 30 mm (1.18 in.) resolution
440L-S4K1120YR	GuardShield Remote Teach light curtain system, 1120 mm (44.1 in.) protective height 30 mm (1.18 in.) resolution
440L-S4K1280YR	GuardShield Remote Teach light curtain system, 1280 mm (50.4 in.) protective height 30 mm (1.18 in.) resolution
440L-S4K1440YR	GuardShield Remote Teach light curtain system, 1440 mm (56.7 in.) protective height 30 mm (1.18 in.) resolution
440L-S4K1600YR	GuardShield Remote Teach light curtain system, 1600 mm (63 in.) protective height 30 mm (1.18 in.) resolution
440L-S4K1760YR	GuardShield Remote Teach light curtain system, 1760 mm (69.3 in.) protective height 30 mm (1.18 in.) resolution

Table 63 - Remote Teach System Component Parts

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

Table 64 - Remote Teach Receiver

Catalog Number	Description
440L-R4J0160YR	Receiver, GuardShield Remote Teach light curtain, 160 mm (6.3 in.) protective height, 14 mm (0.55 in.) resolution
440L-R4J0320YR	Receiver, GuardShield Remote Teach light curtain, 320 mm (12.6 in.) protective height, 14 mm (0.55 in.) resolution
440L-R4J0480YR	Receiver, GuardShield Remote Teach light curtain, 480 mm (18.9 in.) protective height, 14 mm (0.55 in.) resolution

440L-R4J0640YR	Receiver, GuardShield Remote Teach light curtain, 640 mm (25.2 in.) protective height, 14 mm (0.55 in.) resolution
440L-R4J0800YR	Receiver, GuardShield Remote Teach light curtain, 800 mm (31.5 in.) protective height, 14 mm (0.55 in.) resolution
440L-R4J0960YR	Receiver, GuardShield Remote Teach light curtain, 960 mm (37.8 in.) protective height, 14 mm (0.55 in.) resolution
440L-R4J1120YR	Receiver, GuardShield Remote Teach light curtain, 1120 mm (44.1 in.) protective height, 14 mm (0.55 in.) resolution
440L-R4J1280YR	Receiver, GuardShield Remote Teach light curtain, 1280 mm (50.4 in.) protective height, 14 mm (0.55 in.) resolution
440L-R4J1440YR	Receiver, GuardShield Remote Teach light curtain, 1440 mm (56.7 in.) protective height, 14 mm (0.55 in.) resolution
440L-R4J1600YR	Receiver, GuardShield Remote Teach light curtain, 1600 mm (63 in.) protective height, 14 mm (0.55 in.) resolution
440L-R4J1760YR	Receiver, GuardShield Remote Teach light curtain, 1760 mm (69.3 in.) protective height, 14 mm (0.55 in.) resolution
440L-R4K0160YR	Receiver, GuardShield Remote Teach light curtain, 160 mm (6.3 in.) protective height, 30 mm resolution
440L-R4K0320YR	Receiver, GuardShield Remote Teach light curtain, 320 mm (12.6 in.) protective height, 30 mm resolution
440L-R4K0480YR	Receiver, GuardShield Remote Teach light curtain, 480 mm (18.9 in.) protective height, 30 mm resolution
440L-R4K0640YR	Receiver, GuardShield Remote Teach light curtain, 640 mm (25.2 in.) protective height, 30 mm resolution
440L-R4K0800YR	Receiver, GuardShield Remote Teach light curtain, 800 mm (31.5 in.) protective height, 30 mm resolution
440L-R4K0960YR	Receiver, GuardShield Remote Teach light curtain, 960 mm (37.8 in.) protective height, 30 mm resolution
440L-R4K1120YR	Receiver, GuardShield Remote Teach light curtain, 1120 mm (44.1 in.) protective height, 30 mm resolution
440L-R4K1280YR	Receiver, GuardShield Remote Teach light curtain, 1280 mm (50.4 in.) protective height, 30 mm resolution
440L-R4K1440YR	Receiver, GuardShield Remote Teach light curtain, 1440 mm (56.7 in.) protective height, 30 mm resolution
440L-R4K1600YR	Receiver, GuardShield Remote Teach light curtain, 1600 mm (63.0 in.) protective height, 30 mm resolution
440L-R4K1760YR	Receiver, GuardShield Remote Teach light curtain, 1760 mm (69.3 in.) protective height, 30 mm resolution

Figure 65 - Remote Teach Box Dimensions [mm (in.)]

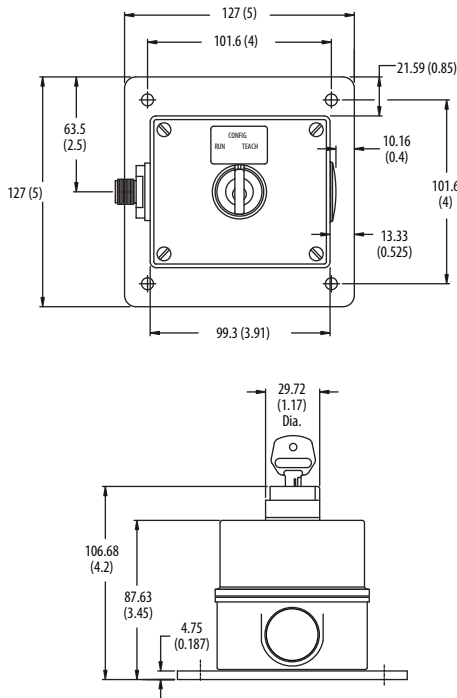














Table 66 - Accessories

	Description	Cat. No.
	Steel L-shaped end cap mounting bracket (4 per package) Note: 4 brackets supplied with each GuardShield light curtain pair.	440L-AF6101
	Aluminum middle mounting bracket for vibratory applications ⁽¹⁾	440L-AF6108
	Power supply: Output—24V DC, 3 Amps, 72 W	1606-XLP72E
	Laser alignment tool	440L-ALAT
	GuardShield light curtain laser alignment tool bracket	450L-ALAT-C
	Mounting stand	440L-AMSTD
	Vertical shock mount kit ⁽¹⁾	440L-AF6120
	Horizontal shock mount kit ⁽¹⁾	440L-AF6121
	Middle vertical mount kit ⁽¹⁾	440L-AF6122
	Middle horizontal mount kit ⁽¹⁾	440L-AF6123

Description	Cat. No.	
	440L-AGWS0160	
	440L-AGWS0320	
	440L-AGWS0480	
	440L-AGWS0640	
	440L-AGWS0800	
	440L-AGWS0960	
	440L-AGWS1120	
	440L-AGWS1280	
	440L-AGWS1440	
GuardShield light curtain Test Rod 14 mm	440L-AGWS1600	
	440L-AGWS1760	
	GuardShield light curtain Test Rod 30 mm	450L-AT-14
	GuardShield light curtain Test Rod 40 mm	450L-AT-30
	GuardShield light curtain Test Rod 40 mm	450L-AT-40
	GuardShield light curtain washdown enclosure kit ⁽³⁾	440L-AGST320
		440L-AGST480
		440L-AGST640
		440L-AGST800
	440L-AGST960	
	M12 Receiver Termination Plug—8 pin for standard cascading GuardShield light curtain 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 light curtain with ArmorBlock Guard I/O module 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

- (1) See GuardShield light curtain Shock Mounting Kits Installation Instructions, publication [440L-IN010](#).
- (2) See GuardShield Light Curtain Weld Shield Installation Instructions, publication [440L-IN009](#).
- (3) See GuardShield light curtain Washdown Enclosure Installation Instructions, publication [440L-IN014](#).

Figure 67 - Mirror 440L-AM075

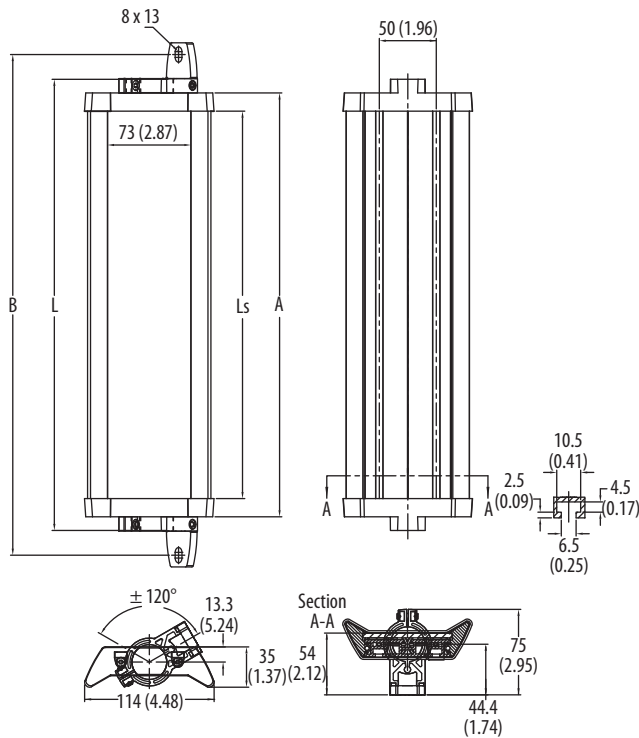


Table 68 - Mirror 440L-AM075 Dimensions

Model No.	Series	Description	L	L _S	A	B
440L-AM0750300	A	Mirror, 300 mm (11.81 in.), 15 m (49.21 ft)	396	340	372	440
440L-AM0750450	A	Mirror, 450 mm (17.72 in.), 15 m (49.21 ft)	546	490	522	590
440L-AM0750600	A	Mirror, 600 mm (23.62 in.), 15 m (49.21 ft)	696	640	672	740
440L-AM0750750	A	Mirror, 750 mm (29.53 in.), 15 m (49.21 ft)	846	790	822	890
440L-AM0750900	A	Mirror, 900 mm (35.43 in.), 15 m (49.21 ft)	996	940	972	1040
440L-AM0751050	A	Mirror, 1050 mm (41.34 in.), 15 m (49.21 ft)	1146	1090	1122	1190
440L-AM0751200	A	Mirror, 1200 mm (47.24 in.), 15 m (49.21 ft)	1296	1240	1272	1340
440L-AM0751350	A	Mirror, 1350 mm (53.15 in.), 15 m (49.21 ft)	1446	1390	1422	1490
440L-AM0751500	A	Mirror, 1500 mm (59.05 in.), 15 m (49.21 ft)	1596	1540	1572	1640
440L-AM0751650	A	Mirror, 1650 mm (64.96 in.), 15 m (49.21 ft)	1746	1690	1722	1790
440L-AM0751800	A	Mirror, 1800 mm (70.86 in.), 15 m (49.21 ft)	1896	1840	1872	1940

Figure 69 - Mirror 440L-AM125

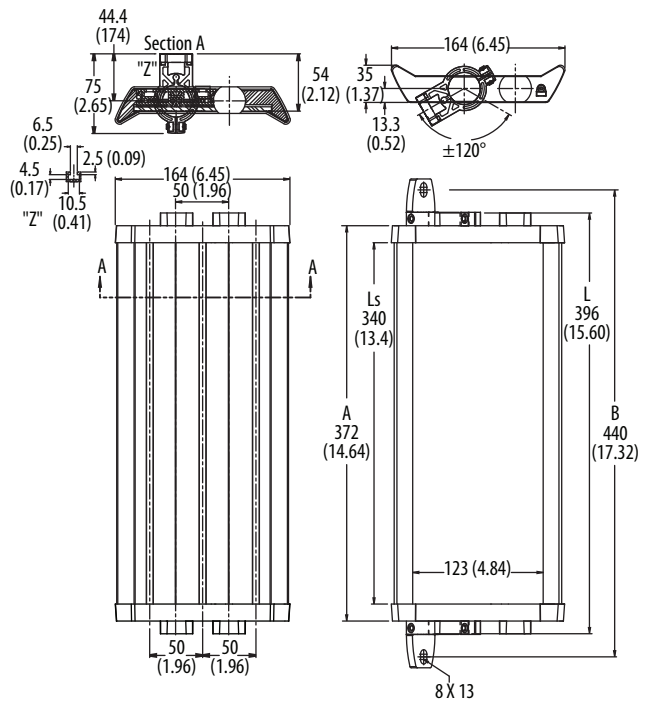




Table 70 - Mirror 440L-AM125 Dimensions

Model No.	Series	Description	L	L _S	A	B
440L-AM1250300	A	Mirror, 300 mm (11.81 in.), 15 m (49.21 ft)	396	340	372	440
440L-AM1250450	A	Mirror, 450 mm (17.72 in.), 15 m (49.21 ft)	546	490	522	590
440L-AM1250600	A	Mirror, 600 mm (23.62 in.), 15 m (49.21 ft)	696	640	672	740
440L-AM1250750	A	Mirror, 750 mm (29.53 in.), 15 m (49.21 ft)	846	790	822	890
440L-AM1250900	A	Mirror, 900 mm (35.43 in.), 15 m (49.21 ft)	996	940	972	1040
440L-AM1251050	A	Mirror, 1050 mm (41.34 in.), 15 m (49.21 ft)	1146	1090	1122	1190
440L-AM1251200	A	Mirror, 1200 mm (47.24 in.), 15 m (49.21 ft)	1296	1240	1272	1340
440L-AM1251350	A	Mirror, 1350 mm (53.15 in.), 15 m (49.21 ft)	1446	1390	1422	1490
440L-AM1251500	A	Mirror, 1500 mm (59.05 in.), 15 m (49.21 ft)	1596	1540	1572	1640
440L-AM1251650	A	Mirror, 1650 mm (64.96 in.), 15 m (49.21 ft)	1746	1690	1722	1790
440L-AM1251800	A	Mirror, 1800 mm (70.86 in.), 15 m (49.21 ft)	1896	1840	1872	1940

Table 71 - Corner Mirror for Multi-sided Guarding

Specially constructed glass mirrors for two- and three-sided safeguard applications.

IMPORTANT Each mirror reduces maximum scan range by 10% per mirror.
Each corner mirror supplied 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†0160Y† 440L-P2K†0160YD		440L-AM0750300		440L-AM1250300
440L-P4†0320Y† 440L-P2K†0320YD		440L-AM0750450		440L-AM1250450
440L-P4†0480Y† 440L-P2K†0480YD 440L-P4A2500YD		440L-AM0750600		440L-AM1250600
440L-P4†0640Y† 440L-P2K†0640YD		440L-AM0750750		440L-AM1250750
440L-P4†0800Y† 440L-P2K†0800YD		440L-AM0750900		440L-AM1250900
440L-P4†0960Y† 440L-P2K†0960YD 440L-P4A3400YD		440L-AM0751050		440L-AM1251050
440L-P4†1120Y† 440L-P2K†1120YD		440L-AM0751200		440L-AM1251200
440L-P4†1280Y† 440L-P2K†1280YD		440L-AM0751350		440L-AM1251350
440L-P4†1440Y† 440L-P2K†1440YD		440L-AM0751500		440L-AM1251500
440L-P4†1600Y† 440L-P2K†1600YD		440L-AM0751650		440L-AM1251650
440L-P4†1760Y† 440L-P2K†1760YD		440L-AM0751800		440L-AM1251800

- † *□●* * * * * ▷◁ * * * * * □ □ * *
- † *□●* * * * * ▷◁ * * * * * □ □ * *
- † *□●* * * * * ▷◁ * * * * * □ □ * *

Mounting

Figure 72 - Swivel Mount Bracket 442L-AF6106 Dimensions [mm (in.)]

One kit (two brackets) is shipped with each mirror.

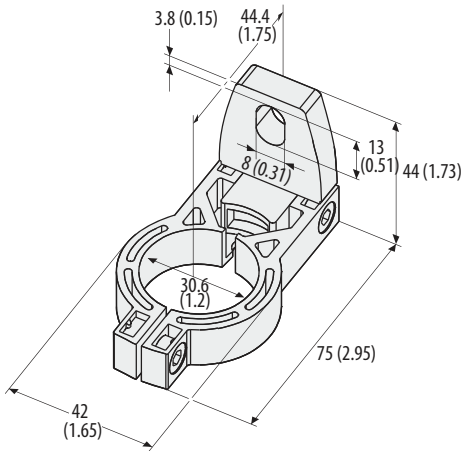
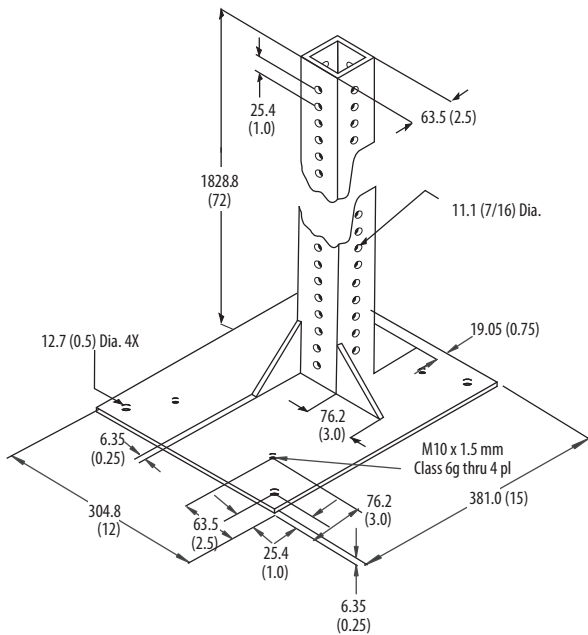


Figure 73 - Mounting Stand 440L-AMSTD Dimensions [mm (in.)]



Laser Alignment Tool

Figure 74 - Laser Alignment Tool 440L-ALAT [mm (in.)]

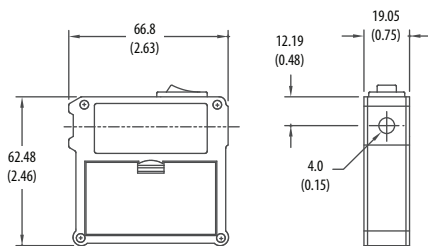


Figure 75 - Laser Alignment Tool Clamp 450L-ALAT-C

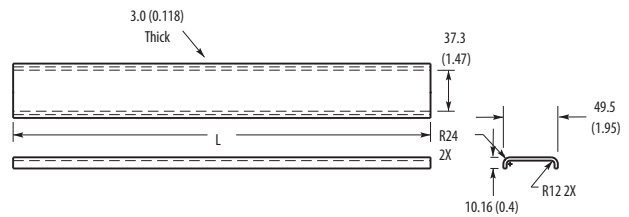


Weld Shields

The GuardShield light curtain weld shields are sold as pairs in the same lengths as the protective heights of the GuardShield safety light curtain. For detailed information, see GuardShield Light Curtain Weld Shield Installation Instructions, publication [440L-IN009](#).

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

Figure 76 - Weld Shield 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 light curtain transmitter host patchcord has 4-pin DC micro-over-molded quick-disconnect connectors that are offered in lengths of 0.3 m (0.98 ft), 1 m (3.28 ft), and 2 m (6.56 ft). The GuardShield light curtain receiver host patchcord has 8-pin DC micro-over-molded quick-disconnect connectors that are offered in lengths of 0.3 m (0.98 ft), 1 m (3.28 ft), and 2 m (6.56 ft).

Figure 77 - Connections [mm (in.)]

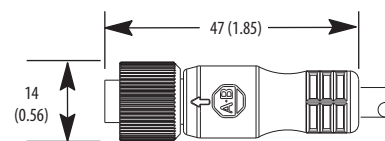


Table 78 - Eight-pin Receiver Pinouts

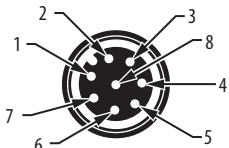
Top View	Color	Pin No.	Signal
			Receiver
	White	1	Auxiliary Output
	Brown	2	+24V DC
	Green	3	Ground
	Yellow	4	EDM
	Gray	5	OSSD 1
	Pink	6	OSSD 2
	Blue	7	0V DC
	Red	8	Start/Restart

Table 79 - ArmorBlock Guard IO Pinouts

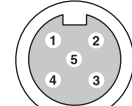
Top View	Color	Pin No	Signal
			Receiver
	Brown	1	+ 24V
	White	2	OSSD 2
	Blue	3	0 V
	Black	4	OSSD 1
	Gray	5	NC

Table 80 - Patchcord Connectors — Cascading Segments

Cat. No.	Description [m (ft)]
Transmitter Patchcord Connectors	
889D-F4HLDM-0M3	4-pin M12 patchcord, 0.3 (0.98)
889D-F4HLDM-1	4-pin M12 patchcord, 1 (3.28)
889D-F4HLDM-2	4-pin M12 patchcord, 2 (6.56)
Receiver Patchcord Connectors	
889D-F8ABDM-0M3	8-pin M12 patchcord, 0.3 (0.98)
889D-F8ABDM-1	8-pin M12 patchcord, 1 (3.28)
889D-F8ABDM-2	8-pin M12 patchcord, 1 (3.28)

Figure 81 - Example of Patchcord Connectors

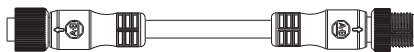


Figure 82 - Termination Plug—Cascadable Eight-pin GuardShield Light Curtain Receiver



IMPORTANT The termination plug is required on the top receiver connector if used as a stand alone pair or the last segment pair in a cascable system.

Table 83 - Patchcords Connectors — ArmorBlock I/O Connection

Cat. No.	Description [m (ft)]
889D-F5ACDM-0M3	5-pin M12 patchcord, 0.3 (0.98)
889D-F5ACDM-1	5-pin M12 patchcord, 1 (3.28)

889D-F5ACDM-2	5-pin M12 patchcord, 2 (6.56)
889D-F5ACDM-5	5-pin M12 patchcord, 5 (16.4)
889D-F5ACDM-10	5-pin M12 patchcord, 10 (32.81)

IMPORTANT Transmitter and receiver use same five-pin patchcords. Select one catalog number for each.

Table 84 - Termination Plug—Cascadable Five-pin ArmorBlock I/O

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

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

Table 85 - Cable Connectors for 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)

Table 86 - Cable Connectors for Transmitter

Cat. No.	Description [m (ft)]
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)

Disposal

The GuardShield safety light curtain has been designed according to the main environmental protection directives (for example, RoHS). Always

dispose of unserviceable devices in compliance with local/national rules and regulations.

Certification

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

- c-UL-us Listed Industrial Control Equipment, which is certified for US and Canada
- CE Marked for all applicable directives (see [Compliance to European Union Directives](#))
- C-Tick Marked
- RCM marked (Australia)
- TÜV Nord Certified for Functional Safety up to SIL 3 for use in safety applications up to and including SIL cl3 in accordance with EN 61508 and EN 62061, Performance Level e and Category 4 in accordance with ISO 13849-1, ESPE Type 4 safety light curtain in accordance with EN IEC 61496.

Compliance to European Union Directives

Rockwell Automation B.V. (address: Rivium Promenade 160, 2909 LM Capelleaan den Ijssel, The Netherlands) declares that this product is in conformity with the provisions of the following EC directives (including all applicable amendments):

- 2004/108/EC EMC Directive (EMC)
- 2006/42/EC Machinery Directive (MD)

And that the respective standards and/or technical specifications have been applied. It is approved for installation within the European Union and EEA regions. All relevant directives and standards are listed in the Declaration of Conformity, which is available on http://literature.rockwellautomation.com/idc/groups/literature/documents/ct/440l-ct003_-en-e.pdf.

Notes:

Notes:

Rockwell Automation Support

Use the following resources to access support information.

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

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Waste Electrical and Electronic Equipment (WEEE)



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

Rockwell Automation maintains current product environmental information on its website at <http://www.rockwellautomation.com/rockwellautomation/about-us/sustainability-ethics/product-environmental-compliance.page>.

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