

# Presence Sensing Safety Devices

## Safety Light Curtains

### GuardShield™ Safety Light Curtains



#### Description

The Allen-Bradley Guardmaster GuardShield safety light curtain is an economical, fully featured, Type 4 safety light curtain in a uniquely styled housing. GuardShield safety light curtains are general purpose presence sensing devices designed for use on hazardous machinery providing point of operation, as well as perimeter and access guarding. This self-contained, two box, safety light curtain has DIP switch selectable operating modes and is available in both 14 mm and 30 mm resolutions.

Modes of operation such as fixed and floating blanking, beam coding, start/restart interlock, external device monitoring (EDM), machine test signal, are selected by DIP-switch settings. These DIP-switches are located beneath a security door, which are conveniently located on both the transmitter and receiver end caps.

The GuardShield's torsionally rigid, extruded aluminium, polyurethane powder coated housing, combined with an environmental rating of IP65, allows the GuardShield to be used in guarding applications across a broad range of industries.

#### Features

- Fixed blanking—teachable
- Floating blanking
  - One beam floating blanking on 30 mm resolution
  - Two beam floating blanking on 14 mm resolution
- Beam coding
- External Device Monitoring (EDM)
- Start/restart interlock
- Possible to interconnect (Cascade) up to three GuardShield segment pairs
- M12 quick-disconnect connectors

#### Specifications

Safety Ratings	
Standards	IEC/EN 61496 Parts 1 & 2, UL 61496Parts 1 & 2, UL 1998
Safety Classification	Type 4 per IEC/EN61496, Category 4 device per EN 954-1
Certifications	cULus, UL 61496, UL 1998, TÜV, and CE marked for all applicable directives
Power Supply	
Input Power, Max.	24V DC $\pm 20\%$
Maximum Residual Ripple	0.05 Vss
Power Consumption	0.4 A max (no load)
Outputs	
Safety Outputs	2 OSSD, 0.5 A, short-circuit protected
Non-Safety Outputs	1 OSSD, 0.5 A max.
Output Voltage, Min.	Uv - 2V
Switching Current @ Voltage, Min.	500 mA @ 24V DC
Operating Characteristics	
Response Time	14 mm; 160 mm...1440 mm 20 ms, 1600 mm and 1760 mm, 25 ms. 30 mm; 20 ms. Add 10 ms when beam coding activated.
Status Indicators	ON State, OFF State, Blanking, Alignment, Interlock
Protected Height [mm (in.)]	160...1760 (6.3...69.3), in 160 (6.3) increments
Resolution [mm (in.)]	14 (0.55) or 30 (1.18)
Scanning Range/Resolution	0.3...7 m / 14 mm (0.98...22.9 ft / 0.55 in.) 0.3...16 m / 30 mm (0.98...52 ft / 1.18 in.)
Synchronization	Optical, first beam adjacent to LEDs.
Wavelength	870 nm
Environmental	
Enclosure Type Rating	IP65
Relative Humidity	15...95% (noncondensing)
Operating Temperature [C (F)]	-10...55° (14...131°)
Vibration	IEC60068-2-6: Frequency 10...55 Hz; Amplitude: 0.35 mm (0.01 in.)
Shock	IEC60068-2-29: Acceleration 10 g, pulse duration 16 ms 10...55 Hz
Physical Characteristics	
Mounting	End-cap brackets supplied
Weight	Varies by protective height
Housing Cross Section	40 mm x 50 mm (1.57 in. x 1.96 in.)
Connection Type	Transmitter: 4-pin M12 micro QD; Receiver: 8-pin M12 micro QD
Cable Length	30 m (100 ft) max.

## Product Selection

### 1. Safety Light Curtains—Standard System


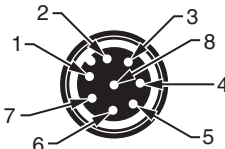
The Allen-Bradley Guardmaster GuardShield safety light curtains are ordered as pairs—transmitter and receiver—and shipped under one part number. After selecting the appropriate light curtain pair, ensure that required interfaces and accessories are ordered as well.

Protected Height [mm (in.)]	Resolution [mm (in.)]	Number of Beams	Cat. No.	Protected Height [mm (in.)]	Resolution [mm (in.)]	Number of Beams	Cat. No.
160 (6.3)	14 (0.55)	16	440L-P4J0160YD	160 (6.3)	30 (1.18)	8	440L-P4K0160YD
320 (12.6)	14 (0.55)	32	440L-P4J0320YD	320 (12.6)	30 (1.18)	16	440L-P4K0320YD
480 (18.9)	14 (0.55)	48	440L-P4J0480YD	480 (18.9)	30 (1.18)	24	440L-P4K0480YD
640 (25.2)	14 (0.55)	64	440L-P4J0640YD	640 (25.2)	30 (1.18)	32	440L-P4K0640YD
800 (31.5)	14 (0.55)	80	440L-P4J0800YD	800 (31.5)	30 (1.18)	40	440L-P4K0800YD
960 (37.8)	14 (0.55)	96	440L-P4J0960YD	960 (37.8)	30 (1.18)	48	440L-P4K0960YD
1120 (44.1)	14 (0.55)	112	440L-P4J1120YD	1120 (44.1)	30 (1.18)	56	440L-P4K1120YD
1280 (50.4)	14 (0.55)	128	440L-P4J1280YD	1280 (50.4)	30 (1.18)	64	440L-P4K1280YD
1440 (56.7)	14 (0.55)	144	440L-P4J1440YD	1440 (56.7)	30 (1.18)	72	440L-P4K1440YD
1600 (63.0)	14 (0.55)	160	440L-P4J1600YD	1600 (63.0)	30 (1.18)	80	440L-P4K1600YD
1760 (69.1)	14 (0.55)	176	440L-P4J1760YD	1760 (69.1)	30 (1.18)	88	440L-P4K1760YD

**Note:** The GuardShield transmitter requires a 4-pin cable and the receiver requires an 8-pin cable.

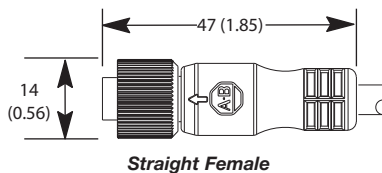
**Note:** To select a transmitter or receiver substitute the "P" in the above Cat. Nos. a "T" for transmitter and an "R" for receiver.

### 2. Cordsets—Two Required (one for transmitter and one for receiver)

Female Connector (Sensor End)		Cable			Cat. No.
Face View of Female	Connector Style	Pin/Wire Color	Wire Rating	Length [m (ft)]	
Transmitter					
	Straight	1 Brown 2 White 3 Blue 4 Black	22 AWG 300V 4 A	2 (6.5)	889D-F4AC-2
				5 (16.4)	889D-F4AC-5
				10 (32.8)	889D-F4AC-10
				15 (49.2)	889D-F4AC-15
				20 (65.6)	889D-F4AC-20
				30 (98.4)	889D-F4AC-30
Receiver					
	Straight Female	1 White 2 Brown 3 Green 4 Yellow 5 Grey 6 Pink 7 Blue 8 Red	24 AWG 30V AC/36V DC 1.5 A	2 (6.5)	889D-F8AB-2
				5 (16.4)	889D-F8AB-5
				10 (32.8)	889D-F8AB-10
				15 (49.2)	889D-F8AB-15
				20 (65.6)	889D-F8AB-20
				30 (98.4)	889D-F8AB-30








#### Cordsets Approximate Dimensions [mm (inches)]

Dimensions are not intended to be used for installation purposes.




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3. Safety Relay Interfaces—Optional













Relay	Safety Outputs	Auxiliary Outputs	Terminals	Power Supply	Reset	Cat. No.				
 <b>MSR127</b>	3 N.O.	1 N.C.	Removable (Screw)	24V AC/DC	Auto./Manual	440R-N23132				
					Monitored Manual	440R-N23135				
			Removable (Screw)	115V AC	Auto./Manual	440R-N23131				
					Monitored Manual	440R-N23134				
				230V AC	Auto./Manual	440R-N23130				
					Monitored Manual	440R-N23133				
  <b>MSR126</b>	2 N.O.	None	Fixed	24V AC/DC	Auto./Manual	440R-N23117				
				115V AC		440R-N23116				
				230V AC		440R-N23115				
				24V AC/DC		440R-N23114				
				115V AC		440R-N23113				
				230V AC		440R-N23112				
				24V AC/DC	Monitored Manual	440R-N23123				
				115V AC		440R-N23122				
				230V AC		440R-N23121				
				24V AC/DC		440R-N23120				
				115V AC		440R-N23119				
				230V AC		440R-N23118				
				 <b>MSR131RTP</b>	3 N.O.	2 N.C., 2 PNP Solid State	Removable (Screw)	24V AC/DC	Auto./Manual or Monitored Manual	440R-C23139
								115V AC		440R-C23137
								230V AC		440R-C23136
				 <b>MSR211★</b>	2 N.O.	1 N.C.	Removable	24V DC from the base unit	Auto./Manual or Monitored Manual	440R-H23177
 <b>MSR221</b>	—	—	Removable	24V DC from the base unit	Selected on the base unit	440R-H23179				
 <b>MSR310</b>	MSR300 Series Output Modules	3 PNP Solid State	Removable	24V DC	Auto./Manual or Monitored Manual	440R-W23219				
 <b>MSR320★</b>	—	2 PNP Solid State	Removable	24V DC from the base unit	Selected on the base unit	440R-W23218				

\* Able to connect to two safety light curtains.

4. Safety Relay Interfaces—Optional (Used for muting applications)

Relay	Input Voltage	PSDI	Muting	Outputs	More Details	Cat. No.
 MSR22LM	24V DC	Yes	Yes	2 N.O. Safety 1 N.C. Aux.	5-17	440R-P23071

5. Accessories—Optional

	Description	Cat. No.
	Steel L-shaped end cap mounting bracket (4 per package) <b>Note:</b> 4 brackets supplied with each GuardShield pair.	440L-AF6101
	Aluminum middle mounting bracket for vibratory applications	440L-AF6108
	Power supply: Output—24V DC, 3 Amps, 72 W	1606-XLP72E
	Laser alignment tool	440L-ALAT
	GuardShield laser alignment tool bracket	440L-AF6109
	Mounting stand	440L-AMSTD
	Vertical shock mount kit	440L-AF6120
	Horizontal shock mount kit	440L-AF6121
	Middle vertical mount kit	440L-AF6122
	Middle horizontal mount kit	440L-AF6123
	GuardShield weld shield pair	440L-AGWS0160 440L-AGWS0320 440L-AGWS0480 440L-AGWS0640 440L-AGWS0800 440L-AGWS0960 440L-AGWS1120 440L-AGWS1280 440L-AGWS1440 440L-AGWS1600 440L-AGWS1760
	GuardShield Washdown Enclosure Kit  <b>Note:</b> Not for cascaded GuardShields.	440L-AGST320 440L-AGST480 440L-AGST640 440L-AGST800 440L-AGST960
	M12 Receiver Termination Plug	898D-81CU-DM

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#### 6. Corner Mirror for Multi-Sided Guarding

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

**Note:** Each mirror reduces maximum scan range by 10% per mirror. Each corner mirror 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

\* = J or K; \* = D or R; ± = A or D

#### 7. Cascading GuardShield Safety Light Curtains

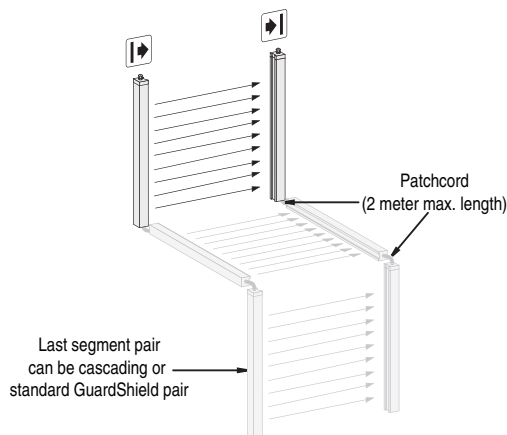
A cascading GuardShield safety light curtain is a standard GuardShield safety light curtain with additional M12 connectors located on top of each safety light curtain. The connector on the top of the safety light curtains allow the interconnection of up to a total of three pair of GuardShield safety light curtains with a common pair of OSSDs. The ability to interconnect GuardShield pairs reduces overall system wiring and simplifies the safety circuit resulting in a lower overall cost of a multiple safety light curtain system. This product configurability also allows a GuardShield safety light curtain system to protect multiple sides of a machine or simply adds flexibility when positioning GuardShield in various applications.

The complete cascading GuardShield system has the full functionality of a standard GuardShield (beam coding, EDM, start/restart interlock, fixed and floating blanking). There are a couple of operating modes which can not be configured in the middle and end segments (EDM and Start / Restart Interlock) and must only be configured in the Host (first) pair. The system will still have these operating modes active if configured in the host or first GuardShield pair. This host or first pair is the pair of cascading GuardShield light curtains, which have the output cordsets connected and wired to the safety relay, safety PLC or FSDs. Configuring of the EDM operating mode in the end and middle segments will cause the system to go to a lock-out condition after the first interruption of the sensing field. Configuration of the start/restart interlock operating mode in the end and middle segments will cause the system to stay in a red condition awaiting reset after the interruption of the sensing field.

The cascading GuardShield safety light curtains are ordered as pairs (transmitter and receiver) and are shipped under one cat. No. After selecting the appropriate pair of cat. nos. for a cascading GuardShield system, select the interconnecting transmitter and receiver patchcord cat. nos. to connect the GuardShield pairs. The transmitter patchcord is a 4-pin M12 patchcord offered in lengths of

1/3 meter, 1 meter and 2 meters. The receiver patchcord is an 8-pin M12 patchcord offered in lengths of 1/3 meter, 1 meter and 2 meters.

If the end pair of a cascading system is a cascading pair of GuardShield light curtains, it is necessary to attach a termination adaptor to the top M12 connector located on the receiver. Be sure to order all other required interfaces and accessories.



Up to three GuardShield POC segments can be interconnected.

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

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

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

A maximum of three GuardShield light curtains can be interconnected with a common pair of OSSDs. The maximum number of beams allowed in a cascading system is 528 beams,

which equates to three 1760 mm cascading GuardShields in 14 mm resolution. The individual segments can have mixed resolutions, i.e., 14 mm and 30 mm as long as the pairs have the same protective heights and resolutions.

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

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



#### GuardShield Cascading Cat. Nos.

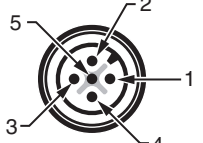
Protected Height [mm (in.)]	Resolution [mm (in.)]	Number of Beams	Pair Weight [kg (lbs)]	Cat. No.		
				Sensor Pair	Transmitter	Receiver
320 (12.59)	14 (0.55)	32	0.9 (1.9)	440L-C4J0320YD	440L-G4J0320YD	440L-F4J0320YD
480 (18.09)	14 (0.55)	48	1.1 (2.4)	440L-C4J0480YD	440L-G4J0480YD	440L-F4J0480YD
640 (25.19)	14 (0.55)	64	1.6 (3.5)	440L-C4J0640YD	440L-G4J0640YD	440L-F4J0640YD
800 (31.49)	14 (0.55)	80	2.0 (4.4)	440L-C4J0800YD	440L-G4J0800YD	440L-F4J0800YD
960 (37.79)	14 (0.55)	96	2.5 (5.5)	440L-C4J0960YD	440L-G4J0960YD	440L-F4J0960YD
1120 (44.09)	14 (0.55)	112	2.9 (6.4)	440L-C4J1120YD	440L-G4J1120YD	440L-F4J1120YD
1280 (50.39)	14 (0.55)	128	3.4 (7.5)	440L-C4J1280YD	440L-G4J1280YD	440L-F4J1280YD
1440 (56.69)	14 (0.55)	144	3.8 (8.4)	440L-C4J1440YD	440L-G4J1440YD	440L-F4J1440YD
1660 (62.99)	14 (0.55)	160	4.3 (9.5)	440L-C4J1600YD	440L-G4J1600YD	440L-F4J1600YD
1760 (69.29)	14 (0.55)	176	4.7 (10.4)	440L-C4J1760YD	440L-G4J1760YD	440L-F4J1760YD
320 (12.59)	30 (1.18)	16	0.9 (1.9)	440L-C4K0320YD	440L-G4K0320YD	440L-F4K0320YD
480 (18.89)	30 (1.18)	24	1.1 (2.4)	440L-C4K0480YD	440L-G4K0480YD	440L-F4K0480YD
640 (25.19)	30 (1.18)	32	1.6 (3.5)	440L-C4K0640YD	440L-G4K0640YD	440L-F4K0640YD
800 (31.49)	30 (1.18)	40	2.0 (4.4)	440L-C4K0800YD	440L-G4K0800YD	440L-F4K0800YD
960 (37.79)	30 (1.18)	48	2.5 (5.5)	440L-C4K0960YD	440L-G4K0960YD	440L-F4K0960YD
1120 (44.09)	30 (1.18)	56	2.9 (6.4)	440L-C4K1120YD	440L-G4K1120YD	440L-F4K1120YD
1280 (50.39)	30 (1.18)	64	3.4 (7.5)	440L-C4K1280YD	440L-G4K1280YD	440L-F4K1280YD
1440 (56.69)	30 (1.18)	72	3.8 (8.4)	440L-C4K1440YD	440L-G4K1440YD	440L-F4K1440YD
1600 (62.99)	30 (1.18)	80	4.3 (9.5)	440L-C4K1600YD	440L-G4K1600YD	440L-F4K1600YD
1760 (69.29)	30 (1.18)	88	4.7 (10.4)	440L-C4K1760YD	440L-G4K1760YD	440L-F4K1760YD

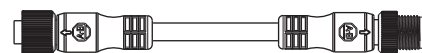
#### 8. Patchcords/Connectors

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

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

Face View of Female	Description	Cat. No.
<b>Transmitter Patchcord</b>		
	4-pin M12 patchcord, 12 inches	889D-F4ACDM-0M3
	4-pin M12 patchcord, 1 meter	889D-F4ACDM-1
	4-pin M12 patchcord, 2 meter	889D-F4ACDM-2
<b>Receiver Patchcord</b>		
	8-pin M12 patchcord, 12 inches	889D-F8ABDM-0M3
	8-pin M12 patchcord, 1 meter	889D-F8ABDM-1
	8-pin M12 patchcord, 2 meter	889D-F8ABDM-2

Face View of Female	Description	Cat. No.
<b>Receiver</b>		
	Termination plug 8-pin M12 quick disconnect	898D-81CU-DM



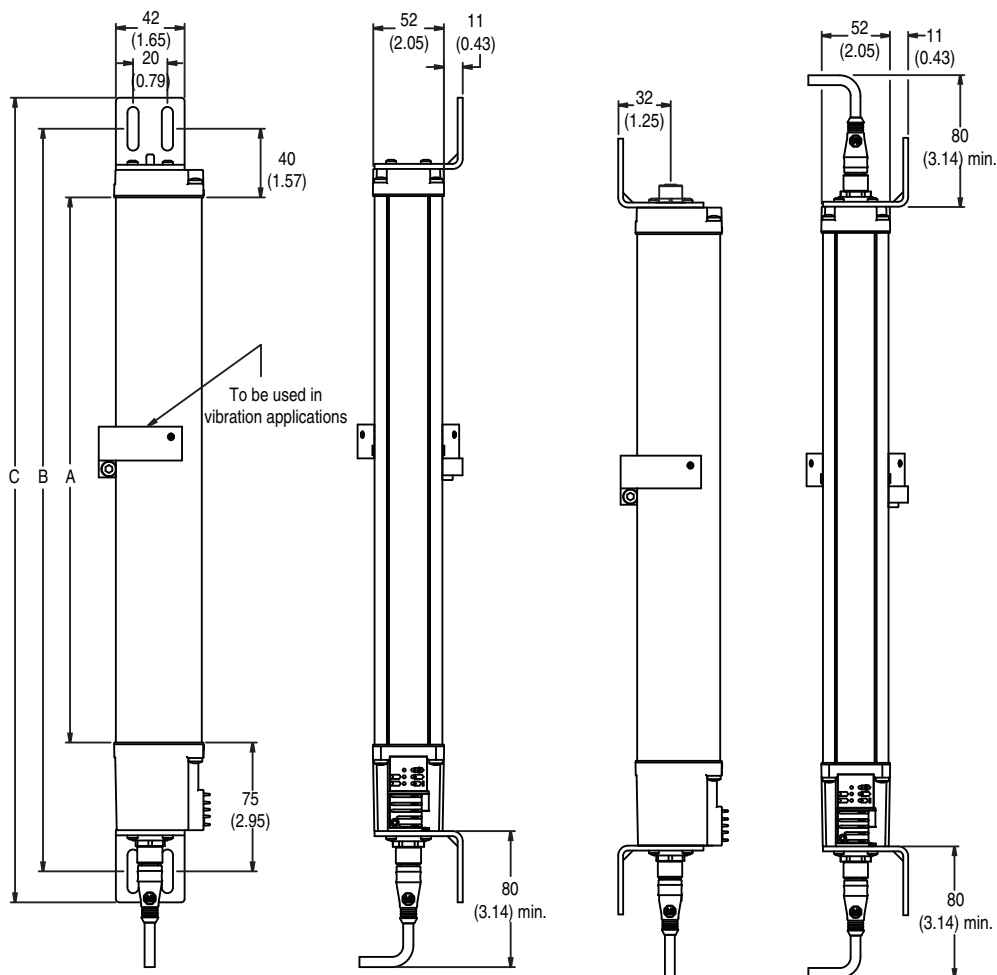
Example of Patchcord

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**Approximate Dimensions [mm (inches)]**

Dimensions are not intended to be used for installation purposes.

**Safety Light Curtain**



**Note:** Middle mounting bracket should be used in vibration applications on GuardShield light curtain protective heights of 1120 mm and larger.

Cat. No.	A Protective Height—mm	B Mounting Value—mm	C Total Length—mm
440L- <b>*4</b> ‡0160YD	160 ±0.5	276	312 ±1.5
440L- <b>*4</b> ‡0320YD	320 ±0.5 (12.6 ±0.02)	436	472 ±1.5
440L- <b>*4</b> ‡0480YD	480 ±0.5	596	632 ±1.5
440L- <b>*4</b> ‡0640YD	640 ±0.5	756	792 ±1.5
440L- <b>*4</b> ‡0800YD	800 ±0.6	916	952 ±1.5
440L- <b>*4</b> ‡0960YD	960 ±0.6	1076	1112 ±1.5
440L- <b>*4</b> ‡1120YD	1120 ±0.6	1236	1272 ±1.8
440L- <b>*4</b> ‡1280YD	1280 ±0.7	1396	1432 ±1.8
440L- <b>*4</b> ‡1440YD	1440 ±0.7	1556	1592 ±1.8
440L- <b>*4</b> ‡1600YD	1600 ±0.8	1716	1752 ±2.0
440L- <b>*4</b> ‡1760YD	1760 ±0.8	1876	1912 ±2.0

\* P = Pair, T = Transmitter, R = Receiver

‡ P = Pair, T = Transmitter, R = Receiver, C = Host Pair, G = Host Transmitter, F = Host Receiver

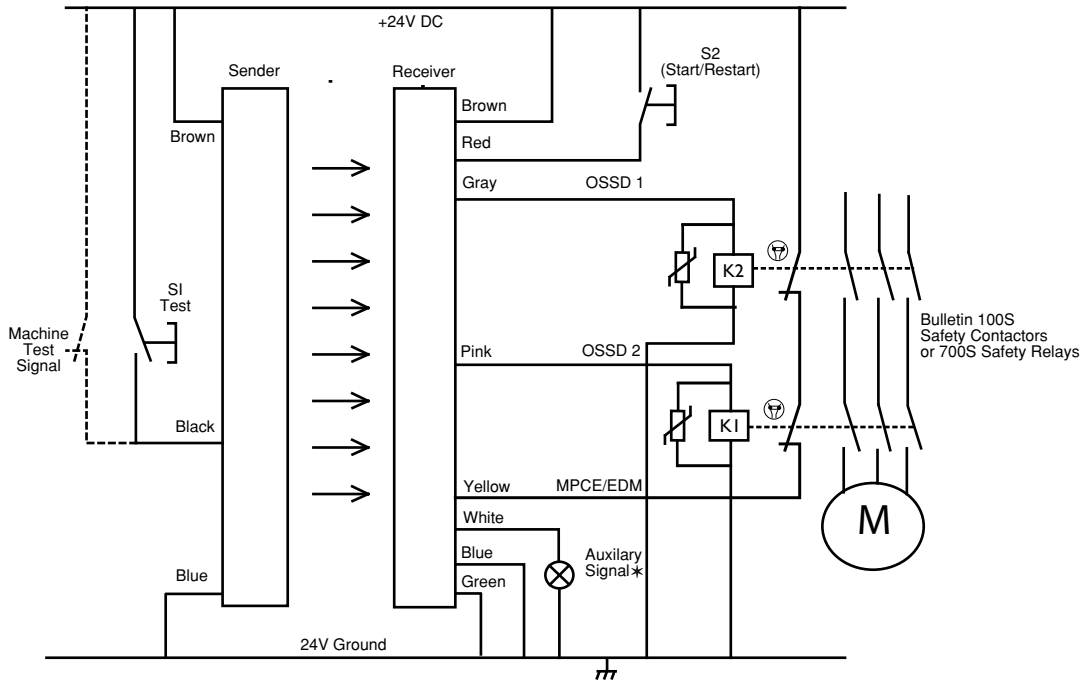
‡ J = 14 mm resolution or K = 30 mm resolution

**Note:** 160 mm is not available for cascading GuardShield light curtains.



### Wiring Diagram for Connection of OSSDs Directly to Contactors (FSDs)

Wiring diagram is not intended to be used for installation purposes.



\* Auxiliary output is nonsafety. Can be connected to a lamp, motor or status to a PLC.

K1, K2                      Safety relay or safety contactor for OSSD 1 and OSSD 2 connection  
 S1                          Switch for external system test (optional)  
 S2                          Switch for reset of light curtain from start/restart interlock

### Wiring Diagram for Connection of OSSDs Directly to a Safety Relay Module

