



■ Description

The MiniSafe MS4700 simple three-box light curtain system is unique due to its superior response time – as fast as 8 msec –with excellent resolution of 12 mm. This speed and resolution allow this light curtain to be mounted closer to points of hazardous operation.

The MiniSafe MS4700 and MSF4700 series consists of an identical length transmitter and receiver, combined with an LCM series controller and appropriate interconnecting cables. (Multi-segmented versions are also available. The in-line connector cables allow the mounting of the transmitter and receiver in crowded locations where a standard connector would not fit. The controller end of the cable is not terminated, which allows the length to be easily shortened in the field.

For easy alignment, the MiniSafe features Omron STI's patented Individual Beam Indicator lights.

■ Applicable Controllers

The LCM series controller includes virtually every desirable safety light curtain feature. The only option available is a DeviceNet™ interface.

The MiniSafe MS4700 and MSF4700 series systems have been EC type examined to the requirements of category 4, EN 954-1 (type 4, IEC 61496).

MiniSafe®

MS4700 and MSF4700

- Rugged transmitter and receiver—35 x 50 mm (1.4 x 2.0 in.)
- Excellent resolutions of 12 mm (0.47 in.), 14 mm (0.55 in.), 20 mm (0.79 in.), and 30 mm (1.2 in.)
- Protected heights from 100 to 1800 mm (3.9 to 71.2 in.)
- Compact size: 35 x 50 mm (1.4 x 2 in.)
- Individual Beam Indicators
- In-line connector cables
- Adjustable mounting brackets
- Exact Channel Select and Floating Blanking
- Available outputs:
 - 2 PNP safety outputs
 - 1 N.O. and 1 N.O./N.C. safety relay outputs
- 2 auxiliary outputs (1 NPN, 1 PNP), follow or alarm mode
- Auxiliary relay output (1 N.O. and 1 N.C.) follow or alarm mode
- Choice of operating modes:
 - Automatic start
 - Restart interlock
 - Start/restart interlock
- MPCE monitoring
- Two-digit diagnostic display
- Simple 3-box design

Options

- DeviceNet™ Interface
- Multiple stored channel select patterns (non-CE versions)
- Muting through RM-3

A Go to the Engineering Guide
For in-depth information on safety standards and use.

■ DeviceNet Option

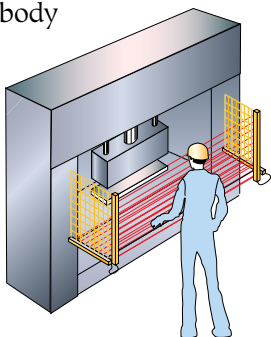
DeviceNet™ allows the LCM series controller to communicate non-safety related data across this popular fieldbus. As the de facto standard for factory fieldbus communications, DeviceNet™ is widely employed in the automotive, semiconductor and other industries.

Monitoring of the DeviceNet™ equipped light curtain provides the process control system with the following *non-safety* information: manufacturer; product name; operating mode; detection zone status; safety output status; MPCE monitoring enabled/disabled; floating blanking active/inactive; exact channel select active/inactive; transmitter, receiver, controller, and relay faults; error codes and descriptions.

DeviceNet™ and the LCM series controller provide a powerful automation solution.

■ Application

In this application, two rugged sets of MiniSafe Flexible series transmitters and receivers form an L-shaped guard zone. Should the machine operator penetrate the vertical segment, a stop signal will be sent to the guarded machine. The horizontal segment guards the operator should he attempt to place his body between the vertical segment and the point of hazardous operation.



■ Specifications for Transmitter and Receiver

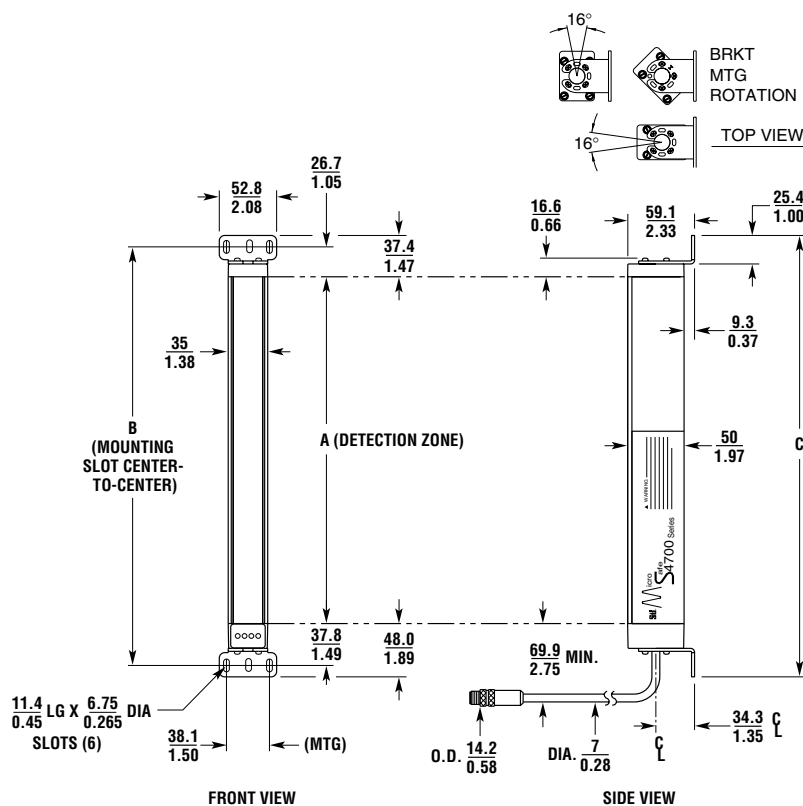
Performance	
Protected Height:	12 mm — 100 to 1600 mm (3.9 to 62.9 in.) 14 mm — 150 to 1809 mm (5.9 to 71.2 in.) 20 mm — 150 to 1809 mm (5.9 to 71.2 in.) 30 mm — 150 to 1809 mm (5.9 to 71.2 in.)
Operating Range:	MS47SR and MSF4700 12 mm — 0.2 to 3 m (0.7 to 10 ft.) (<i>not available on MSF4700</i>) 14 mm — 0.3 to 5 m (1 to 17 ft.) for MS47SR; 0.3 to 3 m (1 to 10 ft) for MSF4700 20 mm — 0.3 to 7 m (1 to 23 ft.) 30 mm — 0.3 to 7 m (1 to 23 ft.) MS47LR 12 mm — 0.2 to 5 m (0.7 to 17 ft.) 20 mm — 0.3 to 12 m (1 to 39 ft.) 30 mm — 0.3 to 12 m (1 to 39 ft.)
Resolution:	12 mm — 0.47 in.* 14 mm — 0.55 in.* 20 mm — 0.79 in.* 30 mm — 1.2 in.*
* Use of exact channel select and or floating blanking may increase this value.	
Effective Aperture Angle:	±2.5° transmitter and receiver
Light Source:	850 nm LED
Light Source Life:	100,000 hours
Indicators:	Channel select or float blanking – yellow; Interlock or fault – yellow; Machine stop – red; Individual beam indicators – red; Machine run – green
Mechanical	
Enclosure:	IP65 transmitter and receiver enclosure only. Polyurethane powder-painted aluminum yellow 3.
Cable Length:	Transmitter – maximum 30 m (100 ft.); standard 3 m (10 ft.) Receiver – maximum 30 m (100 ft.); standard 3 m (10 ft.)
Cable Connections:	Circular style, 6 conductor for transmitter, 9 conductor for receiver
Environmental	
Protection Rating:	IP65; NEMA 4, 12 transmitter and receiver only, IP20 or IP65 controller
Operating Temperature:	0 to 55°C (32 to 133°F)
Storage Temperature:	-25 to 75°C (-13 to 167°F)
Relative Humidity:	95% maximum, non-condensing
Vibration:	5–60 Hz maximum on all 3 axes
Shock:	10 g for 0.016 seconds; 1,000 shocks for each axes on two axes
Conformity/Approvals	
Approvals:	IEC61496
Conforming to Standards:	ANSI/RIA R15.06-1999, ANSI B11.19-2003, OSHA 1910.27(c), OSHA 1910.212
Other Approvals:	EC type examined to the requirements of category 4, EN 954-1 (type 4, IEC61496), UL listed.

Specifications are subject to change without notice.

MS4700 and MSF4700

■ Dimensions—mm/in.

MS4700 Dimensions



MiniSafe MS4700 Dimensions

MS4700-12		
A mm/in.	B mm/in.	C mm/in.
102/4.0	167/6.6	187/7.4
202/8.0	267/10.5	287/11.3
302/11.0	367/14.4	387/15.2
402/15.8	467/18.4	487/19.2
502/19.8	567/22.3	587/23.1
602/23.7	667/26.3	687/27.0
702/27.6	767/30.2	787/31.0
802/31.6	867/34.1	887/34.9
902/35.5	967/38.1	987/38.9
1002/39.5	1067/42.0	1087/42.8
1102/43.4	1167/45.9	1187/46.7
1202/47.3	1267/49.9	1287/50.7
1302/51.3	1367/53.8	1387/54.6
1402/55.2	1467/57.8	1487/58.5
1502/59.1	1567/61.7	1587/62.5
1602/63.1	1667/65.6	1687/66.4

MS4700-14 and MS4700-20		
A mm/in.	B mm/in.	C mm/in.
159/6.3	224/8.8	244/9.6
235/9.3	300/11.8	320/12.6
309/12.2	374/14.7	394/15.5
385/15.2	450/17.7	470/18.5
459/18.1	524/20.6	544/21.4
535/21.1	600/23.6	620/24.4
609/24.0	674/26.5	694/27.3
685/27.0	750/29.5	770/30.3
759/29.9	824/32.4	844/33.2
835/32.9	900/35.4	920/36.2
909/35.8	974/38.3	994/39.1
985/38.9	1050/41.3	1070/42.1
1059/41.7	1124/44.3	1144/45.0
1135/44.7	1200/47.2	1220/48.0
1209/47.6	1274/50.2	1294/50.9
1285/50.6	1350/53.1	1370/53.9
1359/53.5	1424/56.1	1444/56.9
1435/56.5	1500/59.1	1520/59.8
1509/59.4	1574/62.0	1594/62.8
1585/62.4	1650/65.0	1670/65.7
1659/65.3	1724/67.9	1744/68.7
1735/68.3	1800/70.9	1820/71.7
1809/71.2	1874/73.8	1894/74.6

MS4700-30		
A mm/in.	B mm/in.	C mm/in.
159/6.3	224/8.8	244/9.6
309/12.2	374/14.7	394/15.5
459/18.1	524/20.6	544/21.4
609/24.0	674/26.5	694/27.3
759/29.9	824/32.4	844/33.2
909/35.8	974/38.3	994/39.1
1059/41.7	1124/44.3	1144/45.0
1209/47.6	1274/50.2	1294/50.9
1359/53.5	1424/56.1	1444/56.9
1509/59.4	1574/62.0	1594/62.8
1659/65.3	1724/67.9	1744/68.7
1809/71.2	1874/73.8	1894/74.6

A Go to the Engineering Guide
For in-depth information on safety standards and use.

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safety light curtains



This drawing is available in CAD format at www.sti.com/curtains/MS4700/



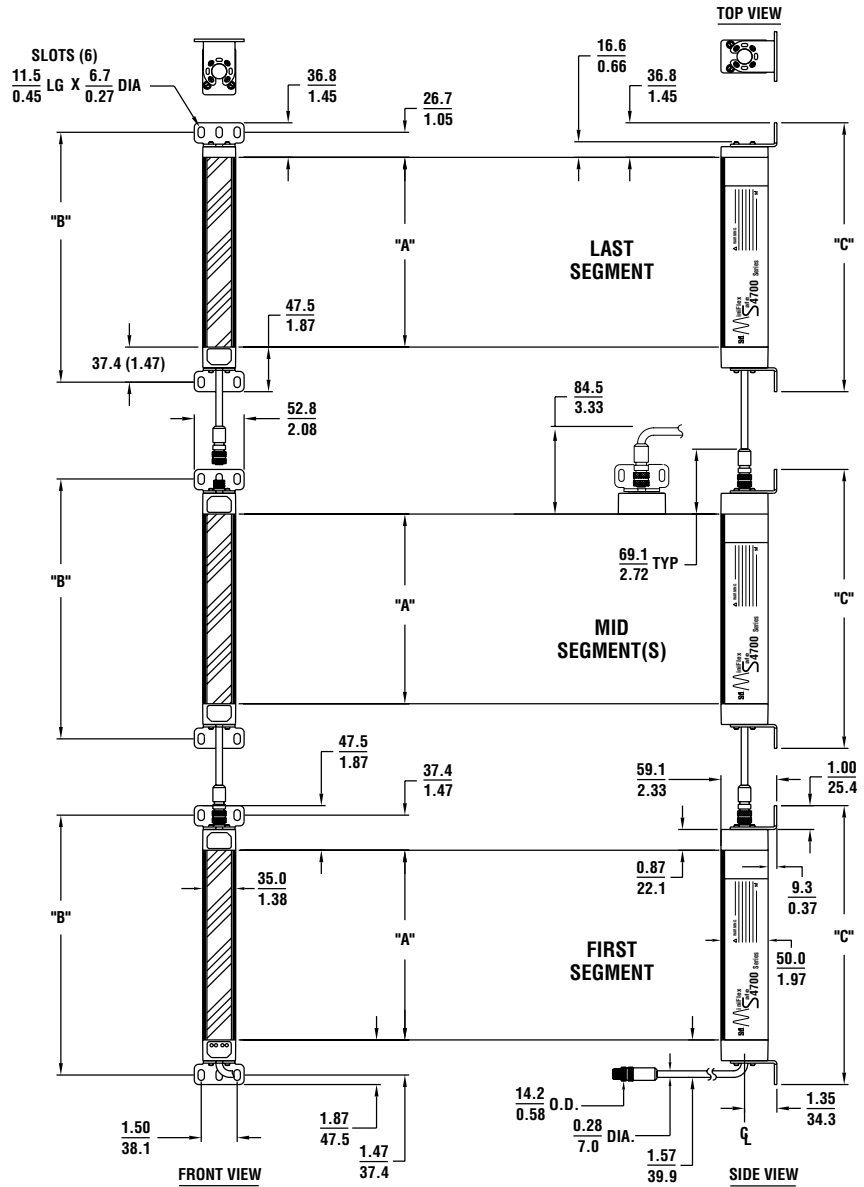
For dimensions on the LCM Series Controller, see page D106

MSF4700 Dimensions

 For dimensions on the LCM Series Controller, see page D106

MiniSafe Flexible MSF4700 Dimensions

MSF4700-14 MSF4700-20 A mm/in.	MSF4700-30 A mm/in.
159/6.3	159/6.3
235/9.3	309/12.2
309/12.2	459/18.1
385/15.2	609/24.0
459/18.1	759/29.9
535/21.1	909/35.8
609/24.0	1059/41.7
685/27.0	1209/47.6
759/29.9	1359/53.5
835/32.9	1509/59.41
909/35.8	1659/65.3
985/38.8	1809/71.2
1059/41.7	
1135/44.7	
1209/47.6	
1285/50.6	
1359/53.5	
1435/56.5	
1509/59.41	
1585/62.4	
1659/65.3	
1735/68.3	
1809/71.2	



D
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DIMENSIONS: $\frac{\text{mm (+/-0.3)}}{\text{INCHES (+/-0.01)}}$

LAST SEGMENT
A = DETECTION ZONE
 $B = A + \frac{64.1 \pm 5.0}{2.53 \pm 0.20}$
 $C = A + \frac{84.3}{3.32}$

MID SEGMENT(S)
A = DETECTION ZONE
 $B = A + \frac{74.8 \pm 5.0}{2.95 \pm 0.20}$
 $C = A + \frac{95.0}{3.74}$

FIRST SEGMENT
A = DETECTION ZONE
 $B = A + \frac{74.8 \pm 5.0}{2.95 \pm 0.20}$
 $C = A + \frac{95.0}{3.74}$



■ Ordering

To order a MiniSafe MS4700 or MSF4700 system, simply fill in the fields in the model number sequence given below. Each field is numbered and information on completing a specific field can be found in the sections which follow.

 For specifications and dimensions on the LCM Series Controller, see page D106

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safety light curtains

MS4700 Sequence:

$\underline{\quad}$ - $\underline{\quad}$ - $\underline{\quad}$ - $\underline{\quad}$ - $\underline{\quad}$ X - $\underline{\quad}$ R - $\underline{\quad}$
 ① ② ③ ④ ⑤ ⑤ ⑦

Example: MS47-12-300-LCM1-10X-10R-RM1

This standard MiniSafe system has 12 mm (0.47 in.) minimum object resolution, a 300 mm (13.78 in.) coverage height, an LCM-1 controller, 10 m transmitter and receiver cables, and an RM-1 relay output module.

MSF4700 Sequence:

$\underline{\quad}$ - $\underline{\quad}$ - $\underline{\quad}$ - $\underline{\quad}$ - $\underline{\quad}$ - $\underline{\quad}$ X - $\underline{\quad}$ R - $\underline{\quad}$ XI - $\underline{\quad}$ RI - $\underline{\quad}$
 ① ② ③ ② ③ ② ③ ④ ⑤ ⑤ ⑥ ⑥ ⑦

Example:

MSF47-20300-30900-20300-LCM1-10X-10R-030100XI-030100RI-RM1

This system has a 30 mm minimum object resolution and 309 mm long first segment, 30 mm minimum object resolution and 909 mm long middle segment and a 20 mm minimum object resolution and 309 mm long last segment, an LCM1 controller, 10 m transmitter and receiver cables, a 3 m and a 10 m interconnect transmitter and receiver cables, and an RM-1 relay output module.

A Go to the Engineering Guide
For in-depth information on safety standards and use.

① Information required. Represents the system operating range. Operating range is based on the minimum object resolution of the system. Designators are described below.

Designator	Description
MS47SR	Range based on minimum object resolution of the system. 12 mm—0.2 to 3 m (0.7 to 10 ft.). <i>For applications where the transmitter and receiver will be mounted less than 3 m (9.9 ft.) apart.</i> 14 mm—0.3 to 5 m (1 to 17 ft.). 20 mm—0.3 to 7 m (1 to 23 ft.). <i>For applications where the transmitter and receiver will be mounted less than 7 m (23 ft.) apart.</i> 30 mm—0.3 to 7 m (1 to 23 ft.). <i>For applications where the transmitter and receiver will be mounted less than 7 m (23 ft.) apart.</i>
MS47LR	Range based on minimum object resolution of the system. 12 mm—0.2 to 5 m (0.7 to 17 ft.). <i>For applications where the transmitter and receiver will be mounted less than 3 m (9.9 ft.) apart, please select the SR version above.</i> 20 mm—0.3 to 12 m (1 to 39 ft.). <i>For applications where the transmitter and receiver will be mounted less than 7 m (23 ft.) apart, please select the SR version above.</i> 30 mm—0.3 to 12 m (1 to 39 ft.). <i>For applications where the transmitter and receiver will be mounted less than 7 m (23 ft.) apart, please select the SR version above.</i>
MSF47	Range based on minimum object resolution of the system. Heavy-duty flexible system 14 mm—0.3 to 3 m (1 to 10 ft.). 20 mm or 30 mm—0.3 to 7 m (1 to 23 ft.).

② Information required. Represents the minimum object resolution of the light curtain in millimeters. For the MSF 4700, it is possible to order different object resolutions for each pair of segments. Designators are described below.

Designator	Minimum Object Resolution
12*	12 mm (0.47 in.)
14	14 mm (0.55 in.)
20	20 mm (0.79 in.)
30	30 mm (1.18 in.)

*Not available on MSF4700

③ Information required. Represents coverage heights of the light curtain in millimeters. Coverage

heights available are a function of minimum object resolution. Designators are described below and divided into two sections, those for 12 mm resolutions, those for 14, 20 & 30 mm resolutions.

MSF4700 Information: The MSF4700 series must have a minimum of two segments: one first and one end. It is possible to order a different object resolution for each pair of segments. Up to two middle segments can be added. The total protected height of a system cannot exceed 256 beams or 3450 mm (135.8 in.). Combine the designators given here to complete fields ② and ③ in the model sequence.

12 mm Minimum Object Resolution Systems*

Designator	Coverage Height
100*	102 mm (4.0 in.)
200*	202 mm (8.0 in.)
300*	302 mm (11.9 in.)
400*	402 mm (15.8 in.)
500*	502 mm (19.8 in.)
600*	602 mm (23.7 in.)
700*	702 mm (27.6 in.)
800*	802 mm (31.6 in.)
900*	902 mm (35.5 in.)
1000*	1002 mm (39.5 in.)
1100*	1102 mm (43.4 in.)
1200*	1202 mm (47.3 in.)
1300*	1302 mm (51.3 in.)
1400*	1402 mm (55.2 in.)
1500*	1502 mm (59.1 in.)
1600*	1602 mm (63.1 in.)

*Not available on MSF4700

14 mm, 20 mm and 30 mm Minimum Object Resolution Systems

Designator	# Beams	Coverage Height
150	14	159 mm (6.3 in.)
225**	21	235 mm (9.3 in.)
300	28	309 mm (12.2 in.)
375**	35	385 mm (15.2 in.)
450	42	459 mm (18.1 in.)
525**	49	535 mm (21.1 in.)
600	56	609 mm (24.0 in.)
675**	63	685 mm (27.0 in.)
750	70	759 mm (29.9 in.)
825**	77	835 mm (32.9 in.)
900	84	909 mm (35.8 in.)
975**	91	985 mm (38.8 in.)
1050	98	1059 mm (41.9 in.)
1125**	105	1135 mm (44.9 in.)
1200	112	1209 mm (47.6 in.)
1275**	119	1285 mm (50.6 in.)
1350	126	1359 mm (53.3 in.)
1425**	133	1435 mm (56.5 in.)
1500	140	1509 mm (59.4 in.)
1575**	147	1585 mm (62.4 in.)
1650	154	1659 mm (65.3 in.)
1725**	161	1735 mm (68.3 in.)
1800	168	1809 mm (71.2 in.)

**Not available in 30 mm resolution

■ Ordering (continued)

④ Information required. Represents controller version. Designators and descriptions are given below.

Designator	Description
LCM1	DIN-mount, IP20, solid-state safety output, 24 VDC
LCM2	DIN-mount, IP20, solid-state safety output, 24 VDC, DeviceNet interface
LCM3	DIN-mount, IP20, solid-state safety output, 24 VDC, non-CE-marked, multiple stored channel select patterns
LCM100	Metal enclosure, IP65, relay safety output, 100-230 VAC
LCM200	Metal enclosure, IP65, relay safety output, 100-230 VAC, DeviceNet interface
LCM300	Metal enclosure, IP65, relay safety output, 100-230 VAC, non-CE-marked, multiple stored channel select patterns
LCM110	Metal enclosure, IP65, relay safety output, 100-230 VAC, lid-mounted reset switch
LCM210	Metal enclosure, IP65, relay safety output, 100-230 VAC, lid-mounted reset switch, DeviceNet interface
LCM310	Metal enclosure, IP65, relay safety output, 100-230 VAC, lid-mounted reset switch, non-CE mark, multiple stored channel select patterns
LCM120	Metal enclosure, IP65, solid-state safety output, 24 VDC
LCM220	Metal enclosure, IP65, solid-state safety output, 24 VDC, DeviceNet interface
LCM320	Metal enclosure, IP65, solid-state safety output, 24 VDC, non-CE-marked, multiple stored channel select patterns
LCM130	Metal enclosure, IP65, solid-state safety output, 24 VDC, lid-mounted reset switch
LCM230	Metal enclosure, IP65, solid-state safety output, 24 VDC, lid-mounted reset switch, DeviceNet interface
LCM330	Metal enclosure, IP65, solid-state safety output, 24 VDC, lid-mounted reset switch, non-CE mark, multiple stored channel select patterns
LCM140	Metal enclosure, IP65, relay safety output, 24 VDC
LCM240	Metal enclosure, IP65, relay safety output, 24 VDC, DeviceNet interface
LCM340	Metal enclosure, IP65, relay safety output, 24 VDC, non-CE-marked, multiple stored channel select patterns
LCM150	Metal enclosure, IP65, relay safety output, 24 VDC, lid-mounted reset switch
LCM250	Metal enclosure, IP65, relay safety output, 24 VDC, lid-mounted reset switch, DeviceNet interface
LCM350	Metal enclosure, IP65, relay safety output, 24 VDC, lid-mounted reset switch, non-CE mark, multiple stored channel select patterns

Note: For more configurations with quick-disconnect connectors refer to the LCM controller section.

⑤ Information required. Represents transmitter (X) and receiver (R) cable lengths. Designators and descriptions are given below.

Designator	Description
3	3 m (10 ft.)
10	10 m (33 ft.)
30	30 m (99 ft.)

⑥ Information required for MSF4700 only. Represents transmitter and receiver interconnect cable lengths. The MSF4700 Series segments feature an in-line connector cable design. A flexible 150 mm (6 in.) cable is always supplied between each segment. Length of interconnect cables given below are in addition to this standard cable. The maximum cumulative system length, including the cables is 15 m (49 ft.) for the transmitter and 15 m (49 ft.) for the receiver. The transmitter and receiver interconnect cable lengths do not need to match.

Combine the designators listed below to complete both fields numbered ⑥ in the example.

The combination for a three-segment system might look like 030. This means that the system uses only the standard 150 mm (6 in.) cables between two of the segments and a 3 m (10 ft.) interconnect cable between the other segments.

Designator	Interconnect Cable
(Blank)	Standard 150 mm (6 in.)
003	0.3 m (12 in.)
005	0.5 m (20 in.)
010	1 m (3.3 ft.)
020	2 m (6.6 ft.)
030	3 m (10 ft.)
050	5 m (16 ft.)
100	10 m (33 ft.)

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For in-depth information on
safety standards and use.

⑦ Information optional. Indicate if you would like an Omron STI RM Series resource module.

Designator	Description
RM1	Include RM-1 resource module, force-guided relay output
RM3	Include RM-3 resource module, mute module
RM4	Include RM-4 resource module, allow for wiring up to four MC4700 systems
RMX	Include RM-X resource module
(Blank)	No RM series resource module



For information on Resource Modules, see page D138



For information on safety light curtain accessories, see page D184

Safety Standards and Precautions

All models of the MiniSafe meet ANSI/RIA R15.06-1999, ANSI B11.19-2003. When used with mechanical power presses, OSHA industrial safety standards apply, as stated in 1910.217(c). For other applications, the machine guarding requirements found in section 1910.212 apply. The MiniSafe meets ANSI control reliability requirements for point-of-operation presence sensing devices. All controllers have CSA-CUS acceptance and are designed to meet UL508.

MiniSafe systems employing LCM-1 controllers (except those with the ability to store multiple channel select patterns) have been EC type examined to the requirements of category 4, EN 954-1 (type 4, IEC 61496).

The MiniSafe should only be used on machinery that can consistently and immediately stop anywhere in its cycle or stroke. Never use a MiniSafe on a full revolution clutched power press or machine. If the light curtain does not protect all access to the point of operation, the unprotected access must be guarded by other appropriate devices such as mechanical guards.

The purchaser, installer and employer have the responsibility to meet all local, state and federal government laws, rules, codes or regulations relating to the proper use, installation, operation and maintenance of this control and the guarded machine. See the Installation and Operation Manual for additional information.

All application examples described are for illustration purposes only. Actual installations will differ from those indicated.

D

safety light curtains

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