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safety light curtains



■ Description

Designed for use in explosive environments, an MS4600-EP system consists of a transmitter and receiver of equal height housed in an explosion-proof enclosure. Since the control reliable circuitry is contained in the receiver and transmitter, no separate control box is required.

The MS4600-EP comes with a complete feature set. Individual Beam Indicators are included to simplify alignment.

Two solid-state safety outputs provide 500 mA of current at 24 VDC.

The ability to select Automatic Start and Start/Restart Interlock modes means that the MS4600-EP can be configured for either point-of-operation or perimeter guarding.

Exact Channel Select allows the MS4600-EP detection zone to have permanently blocked beams. This is valuable if tooling or other machine parts must permanently obstruct a portion of the zone.

Floating Blanking is useful when process material or parts must transit through the detection zone. Floating Blanking allows up to two beams to be blocked anywhere in the zone.

Machine primary control element monitoring is required for control reliable safety. MPCE monitoring is built into the MS4600-EP rather than being required externally.

Explosion Proof

MiniSafe® MS4600-EP

- 14 mm (0.55 in.), 19 mm (0.75 in.) or 30 mm (1.18 in.) resolution
- 13.5 m (45 ft.) range
- Protected heights from 263 to 1219 mm (10.4 to 48 in.)
- Simple “two-box” design — no separate control box required
- No cable required between transmitter and receiver
- Two PNP safety outputs designed to directly switch machine primary control elements
- Individual Beam Indicators
- Available with one NPN or one PNP auxiliary output
- Exact Channel Select
- Floating Blanking
- Choice of operating modes
- MPCE monitoring

Options

- DeviceNet™ Interface
- Machine Test Signal (MTS)
- Auxiliary Outputs Alarm/Follow Mode

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

DeviceNet Option

This optional interface allows an MS4600-EP system to communicate non-safety related data across this popular fieldbus. As the de facto standard for fieldbus communications, DeviceNet is widely employed in the automotive, semiconductor and other industries.

Monitoring of a DeviceNet equipped light curtain provides the process control system with the following non-safety information: manufacturer; product name; operating mode; detection zone status; solid-state safety output status; signal strength; number of beams installed; number of beams selected; MPCE monitoring enabled/disabled; floating blanking active/inactive; exact channel select active/inactive; blanking pattern for exact channel select; receiver diagnostic codes; error codes and descriptions.

DeviceNet and the MiniSafe MS4600-EP provide a powerful automation solution.

MTS Option

Machine Test Signal (MTS) is an optional feature on the MS4600-EP series light curtain. MTS allows the machine control system to check for the proper operation of the light curtain safety outputs by simulating a beam blocked state on the transmitter.

Alarm/Follow Mode Option

The non-safety output can be configured (at the time of sale) to have either “alarm” or “follow” functionality. “Alarm” mode means that the non-safety outputs will be de-energized if the system is behaving normally and energized if the system is in a faulted/interlocked state and will remain this way until the condition is cleared. “Follow” mode mimics the status of the solid-state safety outputs, meaning they will be active when the system is in the machine run state and inactive when the system is in the machine stopped state.

Enclosure

- Integral cast mounting feet
- Ground-lug package
- Sandblasted natural finish
- Certifications:
 - Europe: ATEX Directive 94/9/EC Certificate Number DEMKO 04 ATEX 0322237U
 - North America: Class I, II & III, Div. 1 & 2
 - Canada: UL (FTRV7); Canadian Electrical Code: Class I, Groups C and D; Class II, Groups E, F & G (Ref. C22.2 No. 30-1991 and C22.2 No. 25-1966)
 - U.S.: UL (FTRV), NFPA 70/NEC: Class I, Groups C & D; Class II, Groups E, F & G; Class II Groups F & G Division II only

Applications

Industries such as chemicals, agriculture, waste water, printing, distilling, pharmaceuticals, and cosmetics have hazardous process locations.

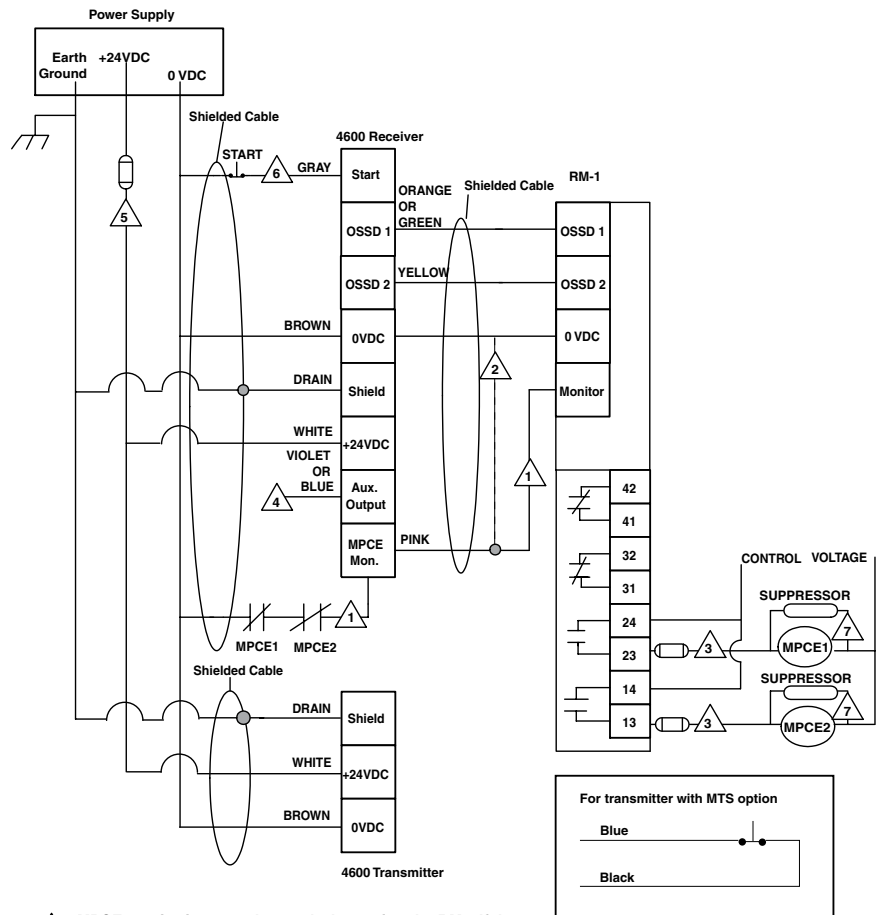


■ Using Solid-state Outputs

Extreme versatility is a feature of the solid-state outputs from the MiniSafe MS4600-EP. These outputs can be connected to an Omron STI RM-series relay module, a safety monitoring and control device, or in many cases, directly to the primary control element of the guarded machine.

Connecting Via an RM-1 Module

The Omron STI RM-1 module provides force-guided relay outputs for machine control. OSSD (safety) outputs 1 and 2 are connected to the RM-1 and provide the power necessary to energize its relays.

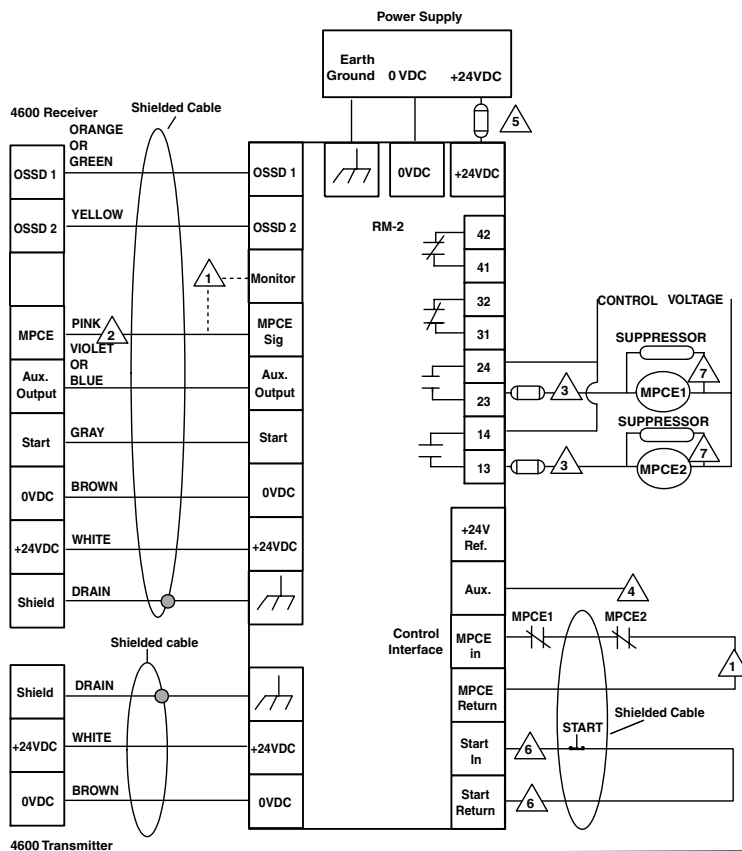


- ⚠️ 1 MPCE monitoring must be used when using the RM1. If the RM1 is the Final Switching Device connect the Pink wire to the MONITOR terminal of the RM1. If force-guided control relays are used as Final Switching Devices they must be monitored, connect the Pink wire though N/C contacts to 0 VDC. (Do not connect both.)
- ⚠️ 2 For testing prior to installation, the user may select MPCE OFF(default factory setting). In this case the MPCE line (pink wire) must be connected to the system 0VDC line.
- ⚠️ 3 User supplied over current protection, 6 A max.
- ⚠️ 4 Auxiliary Output connect to PLC (optional)
- ⚠️ 5 User-supplied fuse.
- ⚠️ 6 If remote start is not used, connect the start line (grey wire) to 0VDC.
- ⚠️ 7 Verify that the final switching devices are properly suppressed.

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Connecting Via an RM-2 Module

The Omron STI RM-2 module provides force-guided relay outputs for machine control as well as a convenient location to terminate all outputs and inputs from the MS4600.



4600 Transmitter

① MPCE monitoring must be used when using the RM2. If the RM2 is the Final Switching Device connect the Pink wire to the MONITOR terminal of the RM2. If force-guided control relays are used as Final Switching Devices connect the Pink wire to the MPCE Sig. terminal. Then connect a set of N.C. contacts from MPCE1 and MPCE2 to the MPCE in and MPCE return terminals. (Do not connect both.)

② For testing prior to installation, the user may select MPCE OFF (default factory setting). In this case the MPCE line (pink wire) must be connected to the system 0 VDC line.

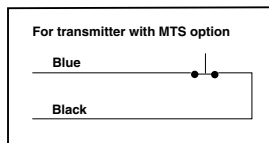
③ User-supplied over current protection, 6 A max.

④ Auxiliary output-connect to PLC (optional).

⑤ User-supplied fuse.

⑥ If remote start is not used, install a jumper across the Start connections at the Control Interface terminals.

⑦ Verify that the final switching devices are properly suppressed.

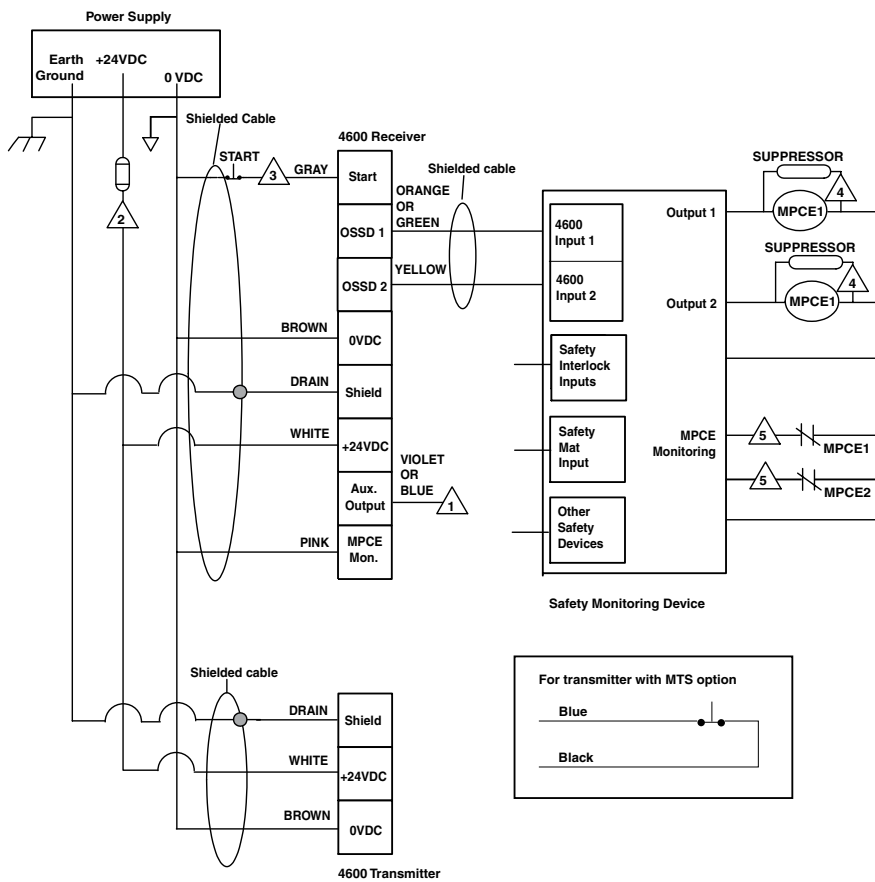


■ Using Solid-state Outputs (continued)

Connecting to a Safety Monitoring Device

The wiring from the MS4600 to the machine control circuit must be control reliable. Safety devices, such as the MS4600-EP should not depend on a PLC to stop a guarded machine. However, safety related monitoring devices are now available. Note that all safety inputs are directed to the monitoring device which also performs the MPCE monitoring function.

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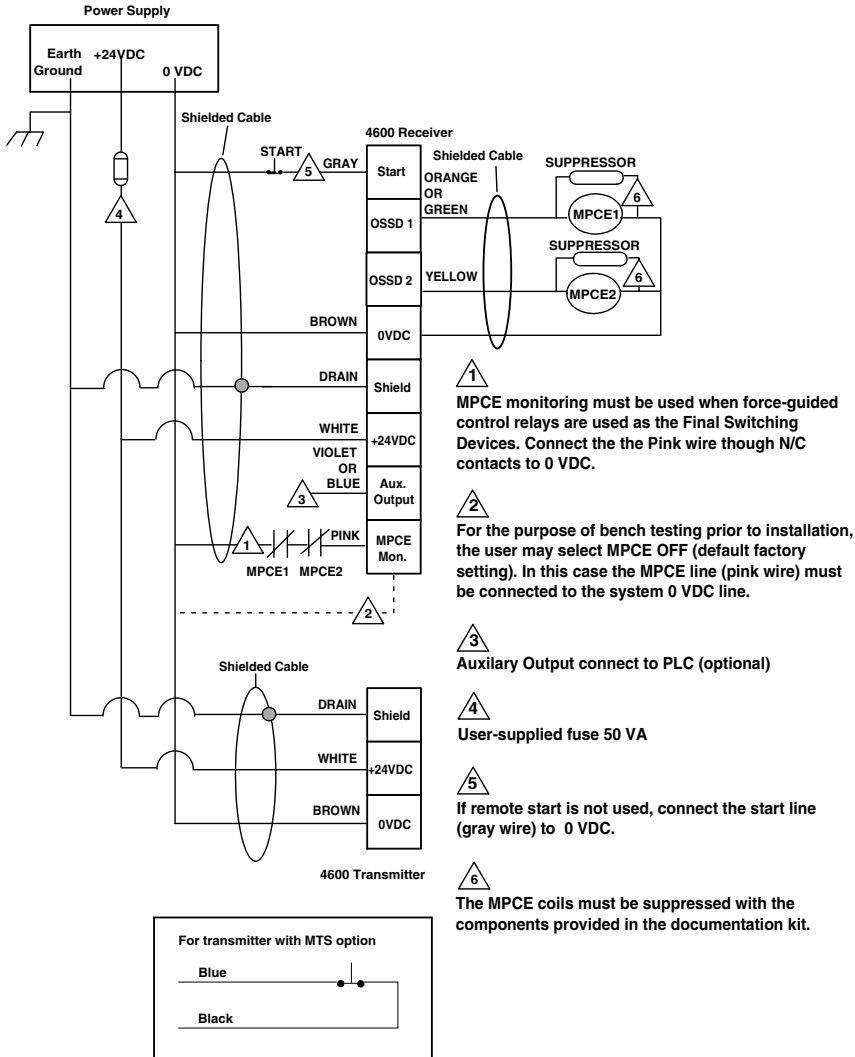


- ⚠️ 1 Auxiliary Output connect to PLC (optional)
- ⚠️ 2 User-supplied fuse.
- ⚠️ 3 If remote start is not used, connect the start line (grey wire) to 0VDC.
- ⚠️ 4 Verify that the final switching devices are properly suppressed.
- ⚠️ 5 The Safety Monitoring Device must monitor the MPCE's Normally Closed Contacts.

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Connecting Via Two Force-Guided Relays

FGR series relays provides force-guided outputs for machine control.



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■ Specifications for Transmitter and Receiver

Performance	
Protected Height:	350 to 1219 mm (13.8 to 48.0 in.)
Operating Range:	0.3 to 13.5 m (1 to 45 ft.) for 19 mm and 30 mm resolutions (Not available for 14 mm resolution)
Resolution:	14 mm (0.55 in.), 19 mm (0.75 in.) or 30 mm (1.18 in.). Use of Exact Channel Select and/or Floating Blanking may increase this value.
Response Time (varies by protected height):	see tables at right
Input Voltage (V_{in}):	24 VDC \pm 20%
Input Power:	14 watts (without load on the outputs)
Safety Output Ratings:	Two PNP outputs sourcing 500 mA max @ V_{in} (see note 1). Short circuit protected.
Auxiliary (Non-Safety) Output Ratings:	One NPN output sinking 100 mA max @ V_{in} or one PNP output sourcing 100 mA @ V_{in} (see notes 1 and 2)
Power Supply:	24 VDC \pm 20%. The rating depends on the current requirements of the loads attached to the outputs (see note 3). The power supply must meet the requirements of IEC 60204-1 and 61496-1. Omron STI part number 42992 or equivalent.
MPCE Monitoring Circuit:	50 mA steady state @ 24 VDC
Start/Restart Input Circuit:	20 mA @ 24 VDC
Effective Aperture Angle:	$\pm 2.5^\circ$ maximum, transmitter and receiver at operating range greater than 3 m (9.8 ft.).
Light Source:	GaAlAs Light Emitting Diode, 850 nm
Indicator – Transmitter:	power applied; Receiver: machine run, machine stop, interlock/fault; channel select/floating blanking, individual beam
Mechanical	
Enclosure:	Cast aluminum, 357-T6 Al alloy
Cable Length:	Optional cables are available in 10, 15, 30 and 50 m lengths
Cable Connections – Receiver:	8-pin; Transmitter: 3-pin standard, 5-pin with MTS
Environmental	
Protection Rating:	IP66; NEMA 3, 4, 4X, 7, 9 12
Operating Temperature:	0 to 55°C (32 to 131°F)
Relative Humidity:	95% maximum, non-condensing
Vibration:	Tested in accordance with UL991 vibration specifications, Section 20, at 5 G peak vibration level, frequency range 5-60 Hz in 3 axes
Shock:	Tested to withstand shock resulting from a 3 ft. lb. impact detailed in UL991, Section 21
MS4600 Conformity/Approvals	
Conforms to:	ANSI/RIA R15.06-1999, ANSI B11.19-2003, OSHA 1910.217(c), OSHA 1910.212
Other Approvals:	The MS4600 system has been EC type examined to the requirements of IEC 61496-1, -2 for a Type 4 ESPE. TUV Registration No: BB991007101. UL1998
Enclosure Certification	
Europe:	ATEX Directive 94/9/EC, Certificate Number DEMKO 04 ATEX 0322237U
North America:	Class I, II & III, Div. 1 & 2
Canada:	UL (FTRV7); Canadian Electrical Code: Class I, Groups C and D; Class II, Groups E, F & G (Ref. C22.2 No. 30-1991 and C22.2 No. 25-1966). UL listed.
U.S.:	UL (FTRV), NFPA 70/NEC: Class I, Groups C & D; Class II, Groups E, F & G; Class II Groups F & G Division II only. UL listed

Response Times for Systems With 14 mm and 20 mm Resolutions

Protected Height (mm/in.)	Response Time (seconds)
263/10.4	<0.020
350/13.8	<0.020

Response Times for Systems With 30 mm Resolutions

Protected Height (in./mm)	Response Time (seconds)
350/13.8	<0.020
524/20.6	<0.020
872/34.3	<0.020
1220/48.0	<0.025

Specifications are subject to change without notice.

Note 1: Voltage available at the outputs is equal to $V_{in} - 2.0$ VDC.

Note 2: Total current required by the two solid-state outputs and the aux. output should not exceed 1.1 A.

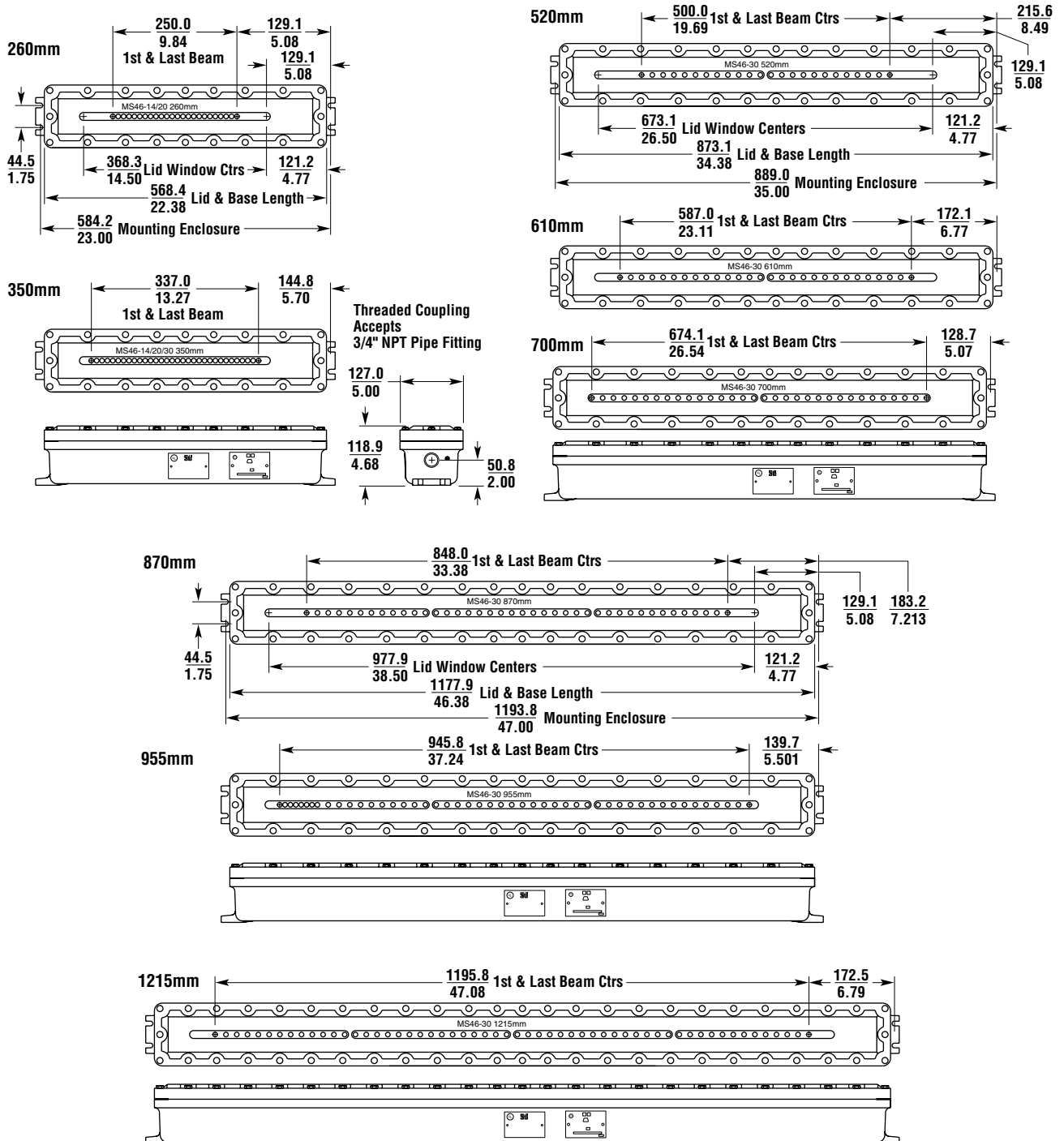
Note 3: Total system current requirement is the sum of the transmitter 285 mA and receiver 1.4 A max. (Receiver 300 mA + OSSD1 load + OSSD2 load + Aux. output load)



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



■ Dimensions—mm/in.



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Installation Notes

Because explosion-proof housings offer a smaller range of adjustment than standard Omron STI mounting brackets, the installation and alignment of transmitters and receivers is a process requiring attention to detail. The mounting lugs of the enclosures each have two adjustment screws which, when the enclosure is mounted against a hard, flat surface, allow a small amount of rotational adjustment.

Transmitter, Receiver and DeviceNet Cable Warning

Transmitter, receiver and DeviceNet cables supplied for use with MS4600-EP model light curtains are not explosion-proof. It is the responsibility of the purchaser, installer and employer to enclose these cables in appropriate explosion-proof conduit to ensure the integrity of the system.

Hybrid Systems

An application may exist where it is not necessary for the entire light curtain system to be in the hazardous area. In this case, hybrid systems which combine both explosion-proof and standard components are available. Contact Omron STI for details.

*When ordering a hybrid system, specify which component is to be explosion-proof (transmitter or receiver) by adding "EP" after the "X" or "R" in Step 4 of ordering.

EXAMPLE:

MS46EP-20-520-10X-15REP-FN-M-RV-D-RM1

Safety Standards and Precautions

All models of the Explosion-Proof MS4600-EP meet ANSI/RIA R15.06-1999 and 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 MS4600-EP series meets ANSI control reliability requirements for point-of-operation presence sensing devices.

MS4600 systems have been EC type examined to the requirements of IEC 61496-1, -2 for a Type 4 ESPE.

The MS4600-EP should only be used on machinery that can consistently and immediately stop anywhere in its cycle or stroke. Never use a MS4600-EP 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.

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