

UMA Safety Mat

User Manual



Original instructions

Introduction

Thank you for purchasing the UMA Safety Mat.

This is the instruction Manual describing the use of the UMA Safety Mat.

Always take into account the following points when using the UMA Safety Mat

Make sure the UMA mat is handled by a "Responsible Person" who is well aware of and familiar with the machine to be installed.

The term "Responsible Person" used in this Instruction Manual means the person qualified, authorized and responsible to secure "safety" in each process of the design, installation, operation, maintenance services and disposition of the machine.

It is assumed that the UMA mat will be used properly according to the installation environment, performance and function of the machine. A responsible Person should conduct a risk assessment of the machine and determine the suitability of this product before installation. Read this Manual thoroughly and understand its contents.

Legislation and Standards

1. When used with an MC3 Safety Mat Controller the UMA Series Safety Mats comprise a system of Category 3 according to EN ISO 13849-1 which has been EC type examined to the requirements of EN ISO 13856-1.
2. (1) This product is a pressure-sensitive protective device in accordance with EN ISO 13856-1.
(2) This product complies with the following legislation and standards:

1) EU Legislation Machinery Directive 2006/42/EC
 EMC Directive 2014/30/EU
 RoHS Directive 2011/65/EC

2) European & International EN ISO 13856-1:2013
Standards EN 12978:2003+A1:2009
 EN ISO 13849-1:2015

3) North American Standards: ANSI/RIA 15.06-2012
 ANSI B11.19-2010
 ANSI/UL 508
 OSHA 1910.21(b)
 CSA Z432-04
 CSA-C22.2 No. 14

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Product specifications and accessories may be changed at any time based on improvements and other reasons. It is our practice to change part numbers when published ratings or features are changed, or when significant construction changes are made. However, some specifications of the Product may be changed without any notice. When in doubt, special part numbers may be assigned to fix or establish key specifications for your application. Please consult with your Omron representative at any time to confirm actual specifications of purchased Product.

Errors and Omissions.

Information presented by Omron Companies has been checked and is believed to be accurate; however, no responsibility is assumed for clerical, typographical or proofreading errors or omissions.

Safety Precautions

This manual uses of symbols and alerts to identify the level of risk associated with certain uses or misuses of the product. Failure to follow all precautions and alerts may result in an unsafe use or operation. Thoroughly read this manual and understand all installation procedures, operation check procedures and maintenance procedures before using the safety mat system. To use with safety controllers, refer to the controller's user manual.

The following are the symbols and alerts used for Warnings:



WARNING

Indicates a potentially hazardous situation which, if not avoided, will result in minor or moderate injury, or may result in serious injury or death. Additionally there may be significant property damage.

The symbols below are combined with alert statements used to differentiate between mandatory and prohibited actions.

	Indicates prohibited actions.
	Indicates mandatory actions.

Before installing and using the Safety Mat System, carefully read the Safety Precautions attached to the product.

WARNING

Serious injury may occur due to loss of required safety functions. **DO NOT** install the safety mat so that its operation may turn on the guarded equipment in a hazardous state. Only install the safety mat so that its operation turns the guarded equipment off in a hazardous state.



Serious injury may occur due to loss of required safety functions. **DO NOT** use a safety mat to detect children as it does not support child detection.



The operator has to be heavier than 35 kg (77 lb) in order for the safety mat to sense the person. Otherwise the safety mat may not activate and seriously injury can occur.



Do not use, on the safety mat, high heels or walking aids such as walking sticks or walking frames of which the contact surface with the safety mat has a diameter less than 80 mm. Otherwise the safety mat may not activate and seriously injury can occur.



Make sure to install the safety mat at the safe distance from the hazardous part of the equipment. Otherwise, the machine may not stop before a person reaches the hazardous part, resulting in serious injury.



DO NOT use the safety mat for machines that cannot be stopped by electrical control. For example, **DO NOT** use it for a pressing machine that uses full-rotation clutch. Otherwise, the machine may not stop before a person reaches the hazardous part, resulting in serious injury.



Ensure that no dead zone exists. An operator entering a dead zone where the operating machine remains active may result in serious injury.



Stacking safety mats after removal from packaging may affect the functionality of the mats. The UMA Safety Mat is durable activating device, providing it is properly handled and installed. For dependable and long life of the safety mat, follow instructions in 5-2. *Installation Procedure* carefully.



DO NOT store the safety mat where it may fall. The product may get damaged or someone will get hurt as it falls.



Employees must be instructed that the perimeter trim and molded corners are not an active sensing surface. Stepping only on the perimeter trim and molded corners will not send a stop signal to the guarded machine.



Mount mat trims properly for protection and for proper mat operation.



If the safety mat is large, DO NOT carry it horizontally or allow it to be handled by one person. The safety mat may be bent or get damaged. The handler may be injured.



DO NOT cover a safety mat. Otherwise, the safety mat may not be activated, resulting in serious injury.



Serious injury may occur due to loss of required safety functions. DO NOT drill through or make a hole in the safety mat. Doing so may corrode the inside of the safety mat, which may cause a person to go undetected.



DO NOT install the safety mat where the area is submerged in water. Water may enter the mat and prevent it from working properly.



DO NOT use the safety mat where flammable gases or explosive gases may be present. Doing so may cause combustion or explosion due to relay heating or arcing during switching.



DO NOT use the safety mat where the surrounding area has hot burning metal such as welding sparks or it will be exposed to chemicals to which mat material is not resistant. The safety mat may get damaged, which may cause a person to go undetected.



Serious injury may occur due to loss of required safety functions. DO NOT install the safety mat upside down. Doing so may cause a person to go undetected. Install the safety mat so that the surface with cones comes upside.



DO NOT drop or disassemble the safety mat. Doing so may damage the product or cause fire or electric shock, resulting in seriously injury.



Serious injury may occur due to breakdown of the safety outputs. DO NOT connect loads beyond rated value to the safety outputs.



Serious injury may occur due to breakdown of the safety outputs. Wire the safety mat properly so that supply voltages or voltages for loads DO NOT touch the safety outputs accidentally or intentionally.



Serious injury may occur due to loss of required safety functions. Operate this presence sensing safetypressure-sensitive protective device only when it is properly installed, tested and inspected in accordance with all applicable government, industry and company safety regulations.



Precautions for Safe Use

- Turn OFF the power supply before wiring. Also, do not touch any terminals (current-carrying parts) while the power is ON. Doing so may result in electric shock.
- If a connector is not properly connected to extension cable or to another product, water may enter the connector and prevent it from working properly.
- Install the safety mat on a flat surface, otherwise the mat may not work as intended.
- Do not perform wiring when there is a risk of lightning. Doing so may result in electric shock.
- Apply properly specified voltages to the safety mat inputs. Applying inappropriate voltages may cause the safety mat to fail to perform its specified function, which leads to the loss of safety functions or damages to the safety mat.
- Use a power supply of the specified voltage. Do not use power supplies with large ripples or power supplies that intermittently generate incorrect voltages.
- Do not use the safety mat for a load that exceeds the safety mat's switching capacity (contact voltage, contact current) or other contact ratings. Doing so will reduce the specified performance, causing insulation failure, contact welding, and contact failure, and the safety mat may be damaged.
- The durability of the safety mat depends greatly on the switching conditions. Confirm operation under the actual conditions in which the safety mat will be used. Make sure the number of switching operations is within the permissible range. If a safety mat is used after performance has deteriorated, it may result in insulation failure between circuits and burning of the safety mat itself.
- To prevent short-circuit or ground failure of the load, connect fuses as protection elements. Not doing so may damage or burn the load.
- When installing trims, be careful not to get injured by potential sharp edges.
- Incorrect connection to the controller will prevent the mat from working properly.
- Exceeding the maximum number of mats, the maximum mat surface area or the maximum total cable length for mat connection will prevent the mat from working properly.
- Do not allow wheeled vehicle such as forklifts to be starting, braking, and turning while on the safety mat. Doing so may cause damage to the surface of the mat and cause to loose traction.

Precautions for Correct Use

Use the UMA Series Safety Mat in combination with the MC3 Safety Mat Controller.

■ Handle with care

1. Do not drop the safety mat to the ground or expose to excessive vibration or mechanical shock. The safety mat may be damaged and may not function properly.
2. Do not apply constant loads to the same area of the safety mat for a long period of time. It may damage the safety mat.
3. Do not use the safety mat submerged in water or in locations subject to high pressure water jets or continual submersion.
4. Store the safety mat in a vertical (standing) position prior to installation so that loads are not applied to the safety mat.
5. Bending radii of cables must be equal to or higher than specified minimum values.

■ Solvents

Exposure of the safety mat to solvents such as alcohol, thinner, trichloroethane, organic solvents, hydrochloric acid or gasoline should be avoided. Such solvents can make markings on the safety mat illegible and cause deterioration of parts.

■ Storage and use conditions of the Safety Mat

Do not store and install in the conditions stated below.

1. In direct sunlight
2. At ambient temperatures out of the range of -10 to 55°C (14 to 131°F).
3. At air pressure out of the range of 86 to 106 kPa
4. In corrosive or combustible gases
5. With excessive vibration or mechanical shocks
6. Under splashing of oil, chemicals

■ Mounting of the Safety Mat

1. Use dedicated trims to secure the perimeter of the safety mat for installation.
2. Only install the safety mat on a smooth, flat surface free of debris, protrusions and holes. This could result in damage or unspecified operation of the mat.
3. Do not use the cables to lift or move the safety mat.

■ Disposal

Dispose of the safety mat in accordance with the relevant rules and regulations of the country or area where the safety mat is used.

■ Others

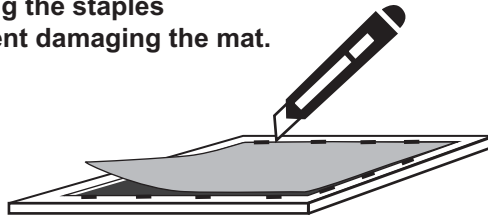
This is a Class A product (Product in industrial setting). Use of the product outside of an industrial setting may cause radio disturbance. In such case, take appropriate measures.

Unpacking the UMA Mat

The UMA mat is secured in a wooden frame with cardboard stapled on top and bottom. To remove the mat from package, you have two options:

- Remove the staples from the top cardboard, or
- Use a utility knife to cut the cardboard along the inside of the staples and remove the cardboard. Make sure to cut the cardboard no more than 10 mm inside the staples. Cutting more than 10 mm inside of the staples may damage the mat.

**To open,
cut along the staples
to prevent damaging the mat.**



 Keep hands and fingers away from blade.

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Chapter 1 System Overview

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1-1. Description

The UMA Safety Mats are used to monitor an entire hazardous area. It offers flexibility, quick access and may frequently be the most economic choice.

The UMA Safety Mats are ideally suited to harsh environments where devices such as laser scanners and light curtains can false trip due to contaminants in the environment. Safety mats when used as a start-up prevention device offer additional worker protection offering continual detection in hazardous areas.

The safety mat must be of sufficient size to detect entry by an operator or others into a hazardous area. UMA Safety Mats are available in a variety of standard sizes. Knowing the distance from the hazardous area of the machine that must be covered with safety mats is critical to a safe installation.

Refer to 5-1. *Safety Distance Calculation* for more details.

1-1-1. How the System Works

There are two types of UMA Safety Mat, UM□□A-□-□-1 and UM□□A-□-□-2. UM□□A-□-□-1 comes with a short 4-wire quick disconnect cable at a corner of the safety mat. (This mat is referred to as "1-cable mat".) UM□□A-□-□-2 comes with two short 2-wire quick disconnect cables at two corners of the safety mat. (This mat is referred to as "2-cable mat".)

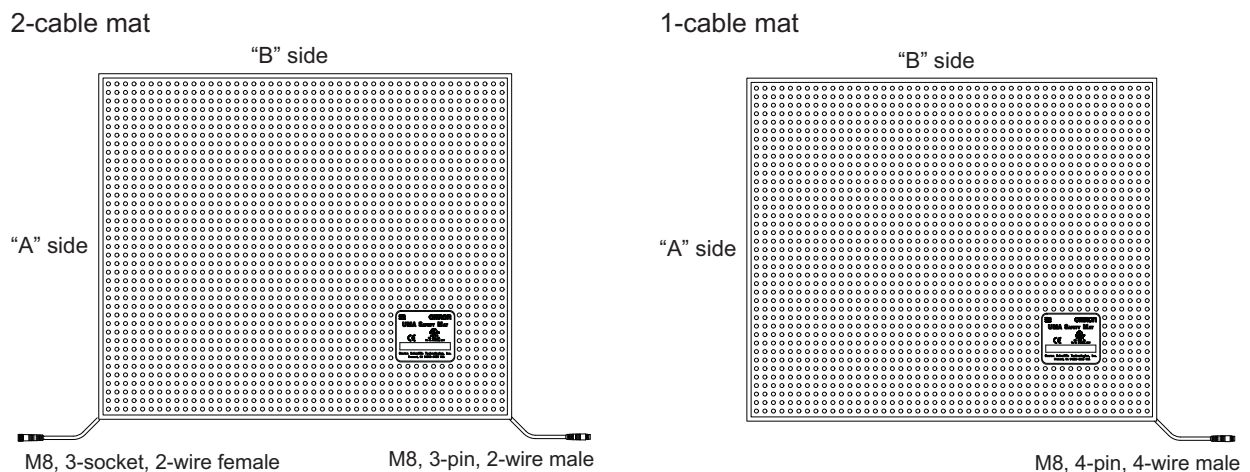


Fig. 1-1 2-cable and 1-cable Mat Examples

For more details in 2-cable and 1-cable mat configurations, please refer to 2-2. *Mat Dimensions*.

The use of the UMA Safety Mat with a MC3 Safety Mat Controller, extension cables and trims can construct a safety mat system.

(The use with NX Series Safety Control Unit is also possible. Refer to its user manual for details.)

Trims are used to provide mechanical protection for the mat cables and to secure the mat to the floor so that they cannot be easily relocated and therefore become ineffective.

Users need to be aware that not all perimeter trim is the same.

Refer to 4-1-2. *Trim Selection* for more details.

1-2. Theory of Operation

When sufficient pressure is applied to the mat active sensing area, the two conductive plates inside the mat touch causing the safety output relays in the controller to de-energize and a stop signal is sent to the guarded machine.

If a wire should break, or separate from a plate, or become disconnected from the controller the Safety Outputs in the controller will de-energize and a stop signal will be sent.

1-3. Application Examples

Presence sensing safety mats are used to monitor an entire hazardous area. They offer flexibility, quick access and may frequently be the most economic choice. Other options for perimeter guarding include interlocked barrier guards and safety light curtains. However, personnel can become trapped inside a barrier guard and safety light curtains only monitor the perimeter, not the hazardous area inside. Additionally, mats can also simplify routine tasks such as machine setup, maintenance and repair. Applications can be found throughout industry and typically include the following areas:

- Welding Robots
- Assembly Machinery
- Material Handling
- Packaging Machinery
- Punches
- Presses
- Robotic Work Cells

■ Machine Shutdown / Start Up Prevention

The safety mat is used to both shutdown the machine and prevent it from starting up while activated.

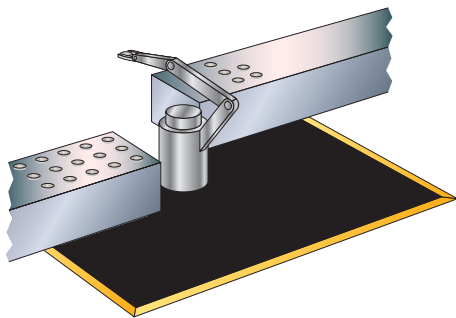


Fig. 1-2 Machine Shutdown / Start Up Prevention Example

■ Machine Start Up Prevention

The light curtain turns off the machine and the safety mat prevents it from starting up while activated.

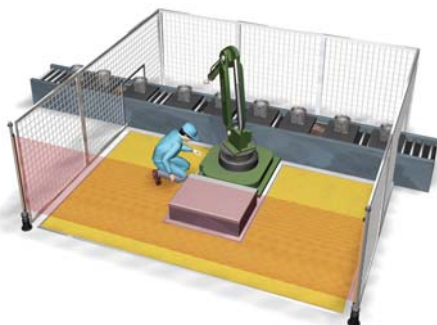
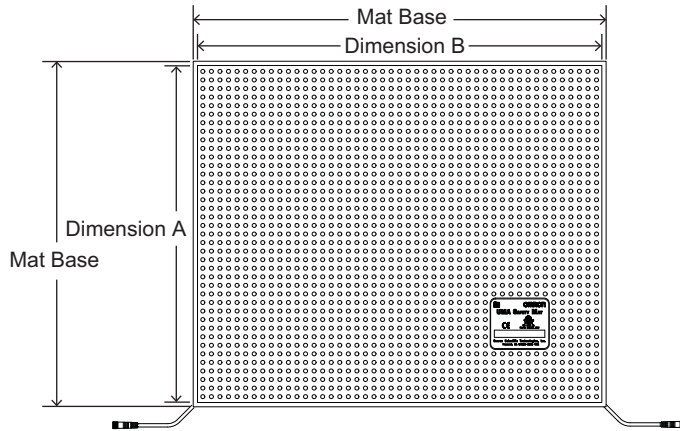


Fig. 1-3 Machine Start Up Prevention Example

1-4. Nomenclature

UM□□A-□-□-□
 1 2 3 4 5

1. Measurement unit
 None: Inch
 M: mm
2. Color
 None: Black
 Y: Yellow
3. Safety Mat Dimension A
4. Safety Mat Dimension B
5. Number of Cables
 1: 1 cable (4-wire type)
 2: 2 cables (2-wire type)



* Refer to 2-2. *Mat Dimensions* for the dimensions of the mat base.

1-5. List of Models

1-cable mat

Dimension		Black	Yellow
A (mm)	B (mm)	Model	Model
300	300	UMMA-0300-0300-1	UMMYA-0300-0300-1
400	400	UMMA-0400-0400-1	UMMYA-0400-0400-1
500	250	UMMA-0500-0250-1	UMMYA-0500-0250-1
500	400	UMMA-0500-0400-1	UMMYA-0500-0400-1
500	500	UMMA-0500-0500-1	UMMYA-0500-0500-1
500	1500	UMMA-0500-1500-1	UMMYA-0500-1500-1
600	400	UMMA-0600-0400-1	UMMYA-0600-0400-1
750	250	UMMA-0750-0250-1	UMMYA-0750-0250-1
750	500	UMMA-0750-0500-1	UMMYA-0750-0500-1
750	750	UMMA-0750-0750-1	UMMYA-0750-0750-1
750	1500	UMMA-0750-1500-1	UMMYA-0750-1500-1
1000	500	UMMA-1000-0500-1	UMMYA-1000-0500-1
1000	750	UMMA-1000-0750-1	UMMYA-1000-0750-1
1000	1000	UMMA-1000-1000-1	UMMYA-1000-1000-1
1000	1250	UMMA-1000-1250-1	UMMYA-1000-1250-1
1000	1500	UMMA-1000-1500-1	UMMYA-1000-1500-1

2-cable mat

Dimension		Black	Yellow
A (mm)	B (mm)	Model	Model
300	300	UMMA-0300-0300-2	UMMYA-0300-0300-2
400	400	UMMA-0400-0400-2	UMMYA-0400-0400-2
500	250	UMMA-0500-0250-2	UMMYA-0500-0250-2
500	400	UMMA-0500-0400-2	UMMYA-0500-0400-2
500	500	UMMA-0500-0500-2	UMMYA-0500-0500-2
500	1500	UMMA-0500-1500-2	UMMYA-0500-1500-2
600	400	UMMA-0600-0400-2	UMMYA-0600-0400-2
750	250	UMMA-0750-0250-2	UMMYA-0750-0250-2
750	500	UMMA-0750-0500-2	UMMYA-0750-0500-2
750	750	UMMA-0750-0750-2	UMMYA-0750-0750-2
750	1500	UMMA-0750-1500-2	UMMYA-0750-1500-2
1000	500	UMMA-1000-0500-2	UMMYA-1000-0500-2
1000	750	UMMA-1000-0750-2	UMMYA-1000-0750-2
1000	1000	UMMA-1000-1000-2	UMMYA-1000-1000-2
1000	1250	UMMA-1000-1250-2	UMMYA-1000-1250-2
1000	1500	UMMA-1000-1500-2	UMMYA-1000-1500-2

For inch-sized or other sized UMA Safety Mats, please contact your sales representative.

Chapter 2 Specifications

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2-1. Specifications

Table2-1 Specifications

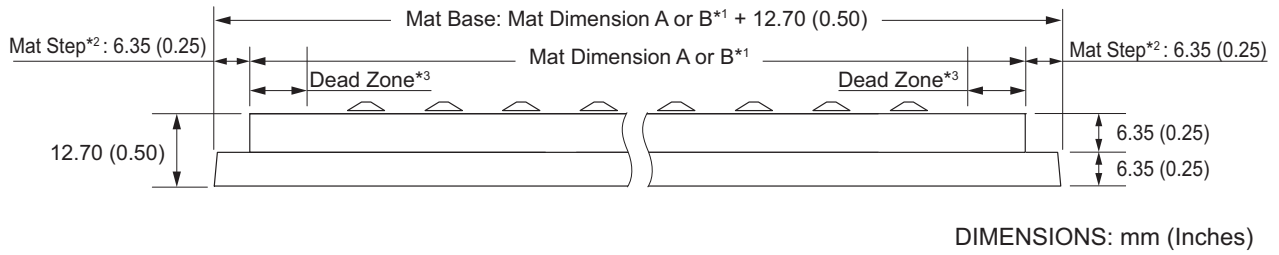
Detection Method	Pressure sensitive
Mat Type	Normally open SPST, four-wire (1-cable type) or two-wire (2-cable type) available
Mat Electrical Rating	20.4 V to 28.8 V
Activation Force	300 N (67 lbf) min. to 80 mm (3.14 in.) dia. test piece
Maximum Load	2,000 N (450 lb) to 80 mm (3.14 in.) dia. test piece 1,862 kPa (270 lbs/in. ²) (rolling load (stationary))
Response Time	50 ms max.
Mechanical Durability	1 x 10 ⁶ operations min.
Mat Exit Cable	Model No. ending '-1': 1 exit cable, M8 4-pin cable, 4 conductors, 22 AWG, male Model No. ending '-2': 2 exit cables, M8 3-pin cable, 2 conductors, 22 AWG, 1 male and 1 female
Ambient operating temperature	-10 to 55°C (14 to 131°F) (with no icing or condensation)
Ambient storage temperature	-10 to 55°C (14 to 131°F) (with no icing or condensation)
Ambient operating humidity	0 to 95% RH
Degree of protection	IP65
Material (Mat cover)	Polyurethane
Weight	Approx. 25 kg/m ²

Table2-2 Conformity

Conforming to Standards	Refer to <i>Legislation and Standards</i> for details.
Performance Level (PL)/ Safety Category *	PL d, Category 3 (EN ISO 13849-1:2015)
PFHd *	4.8×10 ⁻⁸

* Applicable to integrated systems of UMA Safety Mats and MC3 Safety Mat Controller.

2-2. Mat Dimensions



- *1. Refer to 1-4. *Nomenclature* for more information.
- *2. "Step" portion of mat (inactive) is used to "seat/place/hold" trim.
- *3. The mat has the following inactive (non-sensing) area:
 - 10 mm (20 mm at corners) with a test piece of 80 mm diameter
 - 15 mm (30 mm at corners) with a test piece of 11 mm diameter

Fig. 2-1 Mat dimensions (side view)

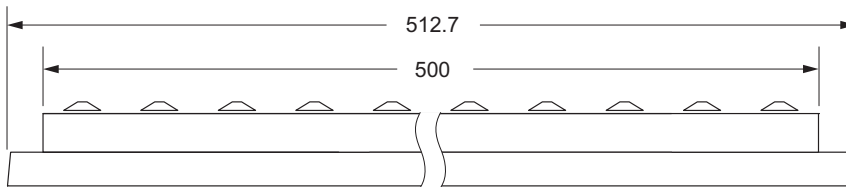


Fig. 2-2 Example dimensions (UMMA-0500-0500-□)

■ UM□□A-□-□-1 (1-cable mat)

The UM□□A-□-□-1 mat comes with a short 4-conductor quick disconnect cables with M8 4-pin connector at a corner of the safety mat.

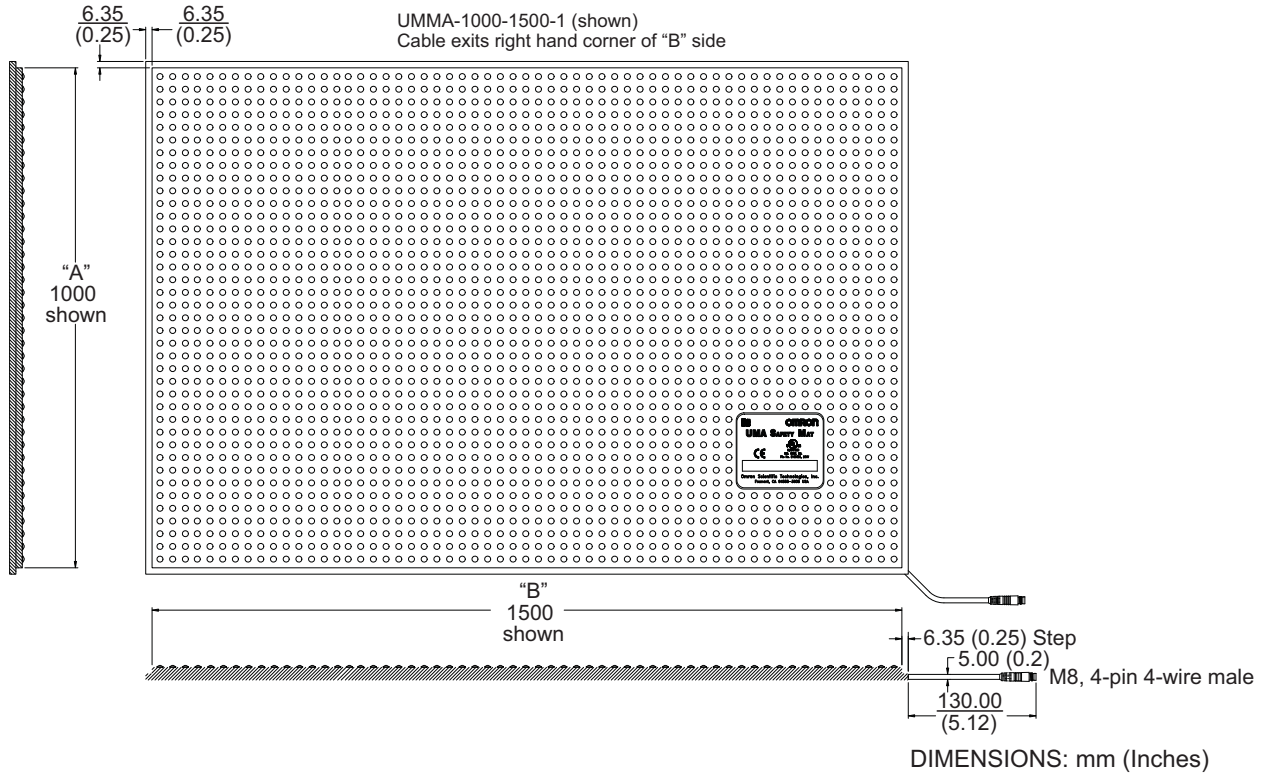


Fig. 2-3 1-cable mat dimensions

■ UM□□A-□-□-2 (2-cable mat)

The UM□□A-□-□-2 mat comes with two short 2-conductor quick disconnect cables with M8 3-pin connector at two corners of the safety mat.

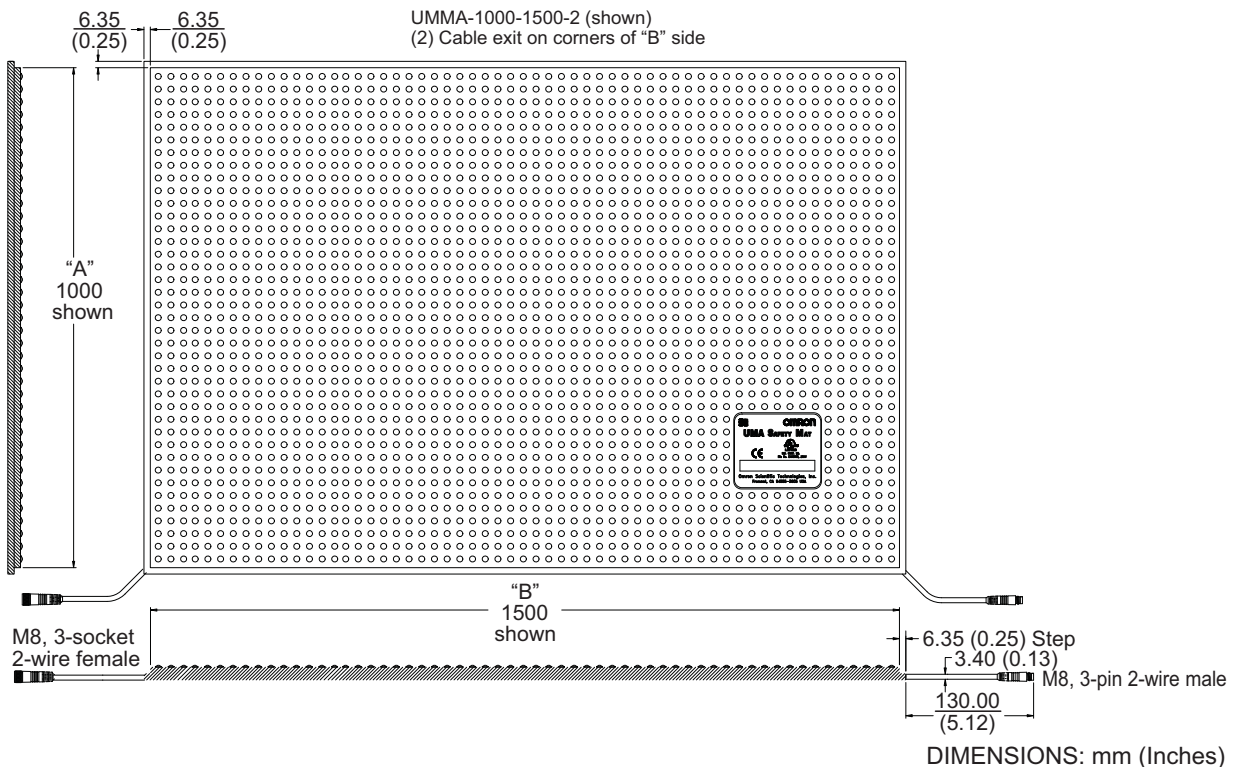


Fig. 2-4 2-cable mat dimensions

2-3. Limitations for Using Controllers

Controller	Maximum number of mats connected in series	Maximum safety mat surface area	Maximum total cable length
MC3	12	10 m ²	100 m

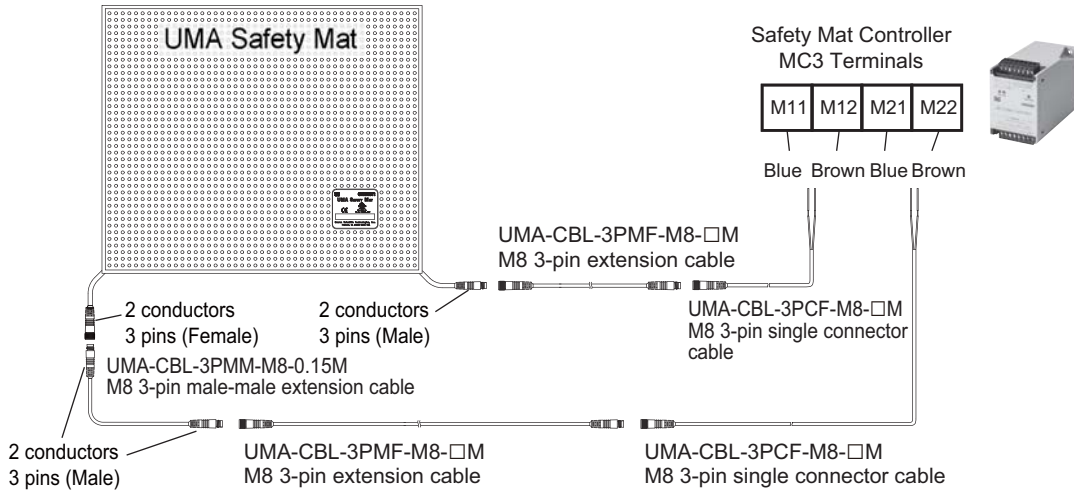
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3-1. Connection Example

3-1-1. 2-Cable Mat

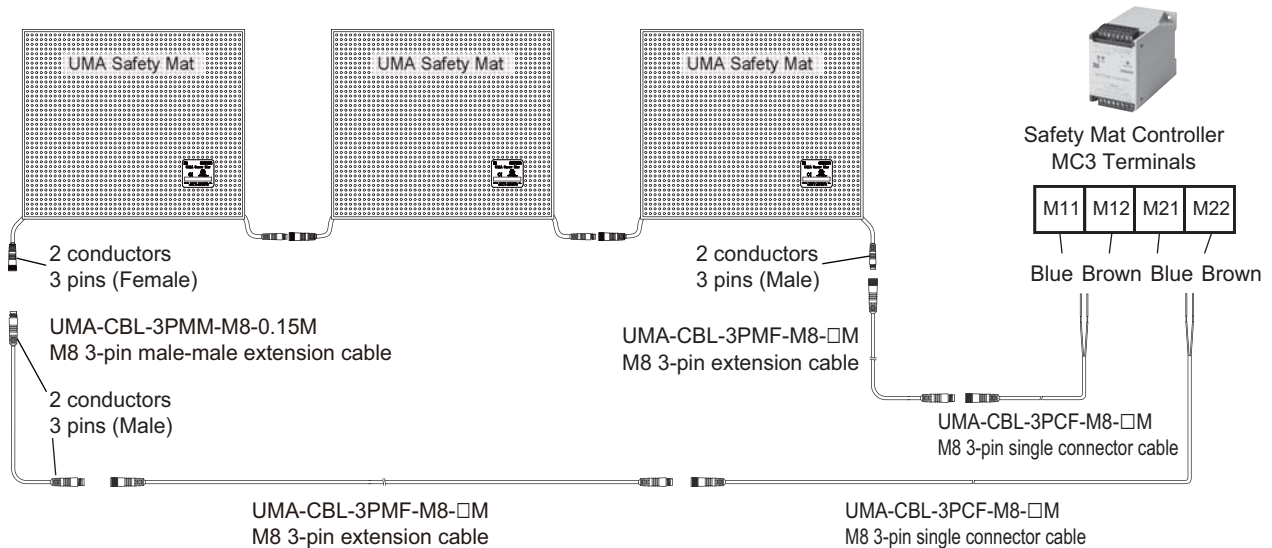
3-1-1-1. Single 2-Cable Mat (UM□□A-□-□-2)



Refer to *Chapter 6 Cables* for more information on the extension cables.
 Refer to *Mat Controller MC3 Series Installation and Operating Manual* for connection with the MC3.

Fig. 3-1 Single 2-Cable Mat to MC3

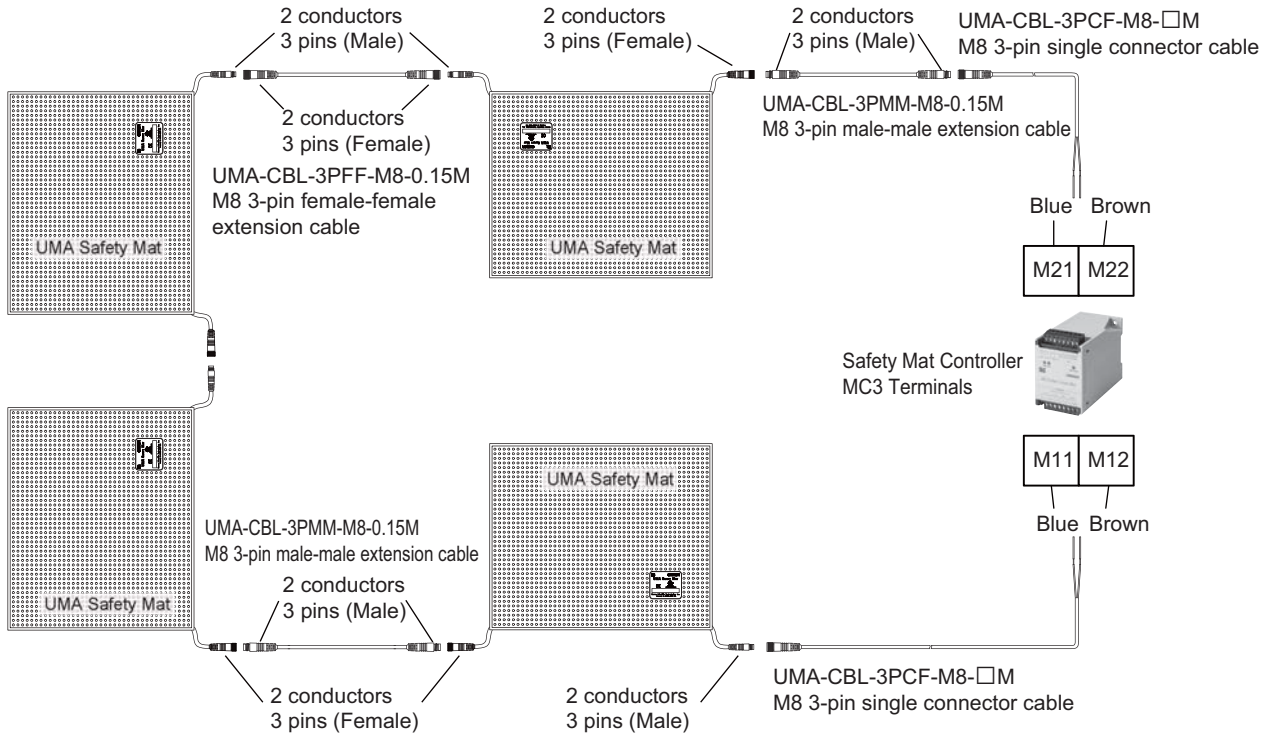
3-1-1-2. Multiple 2-Cable Mats in Series (UM□□A-□-□-2)



Refer to *Chapter 6 Cables* for more information on the extension cables.
 Refer to *Mat Controller MC3 Series Installation and Operating Manual* for connection with the MC3.

Fig. 3-2 Multiple 2-Cable Mats in Series to MC3

3-1-1-3. Multiple 2-Cable Mats of Different Orientations in Series (UM□□A-□-□-2)

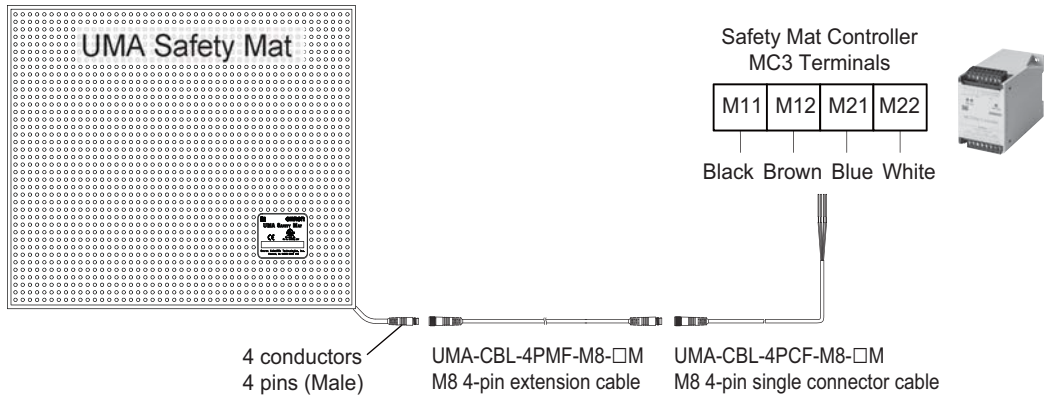


Refer to *Chapter 6 Cables* for more information on the extension cables.
 Refer to *Mat Controller MC3 Series Installation and Operating Manual* for connection with the MC3.

Fig. 3-3 Multiple 2-Cable Mats of Different Orientations in Series to MC3

3-1-2. 1-Cable Mat

3-1-2-1. Single 1-Cable Mat (UM□□A-□-□-1)

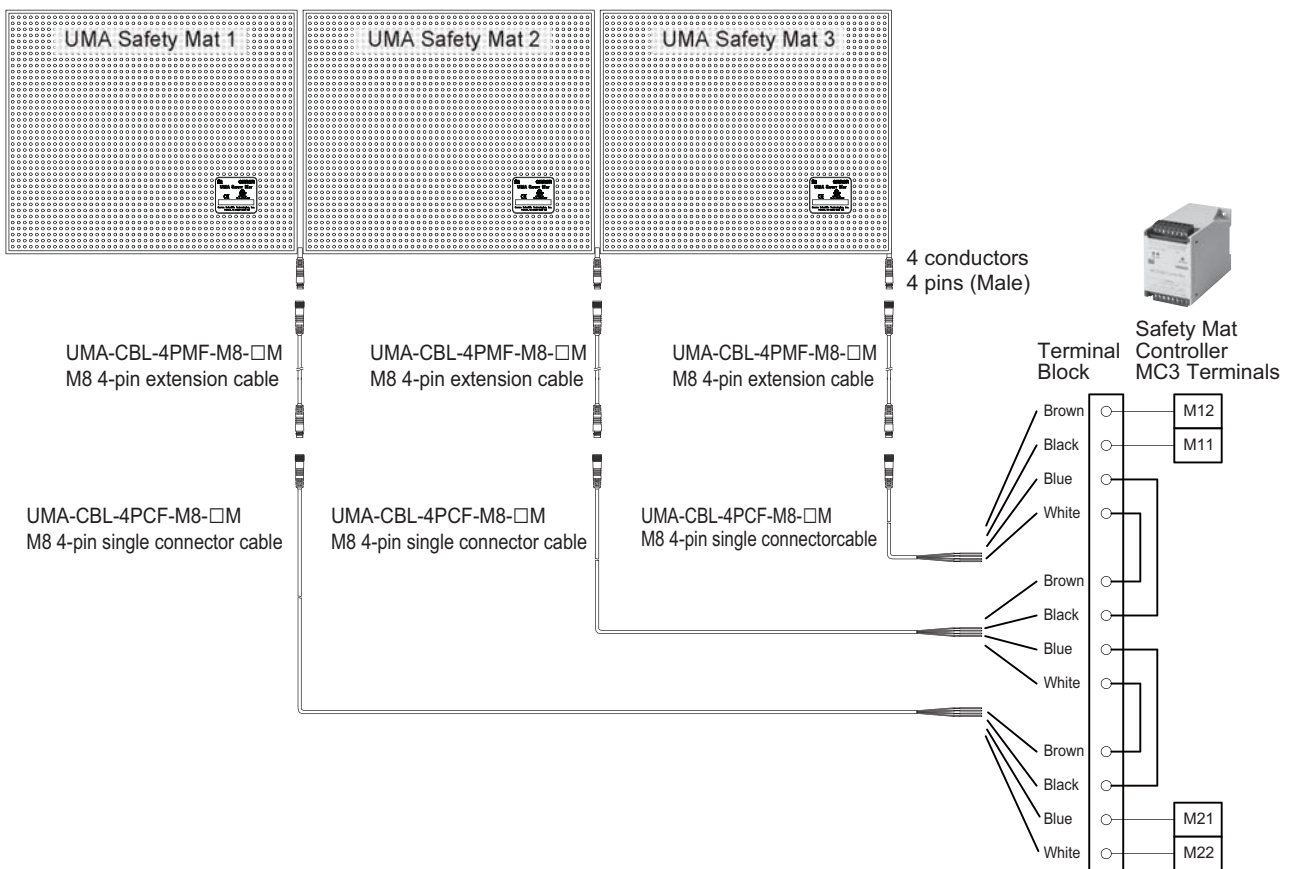


Refer to *Chapter 6 Cables* for more information on the extension cables.

Refer to *Mat Controller MC3 Series Installation and Operating Manual* for connection with the MC3.

Fig. 3-4 Single 1-Cable Mat to MC3

3-1-2-2. Multiple 1-Cable Mats in Series (UM□□A-□-□-1)



Refer to *Chapter 6 Cables* for more information on the extension cables.

Refer to *Mat Controller MC3 Series Installation and Operating Manual* for connection with the MC3.

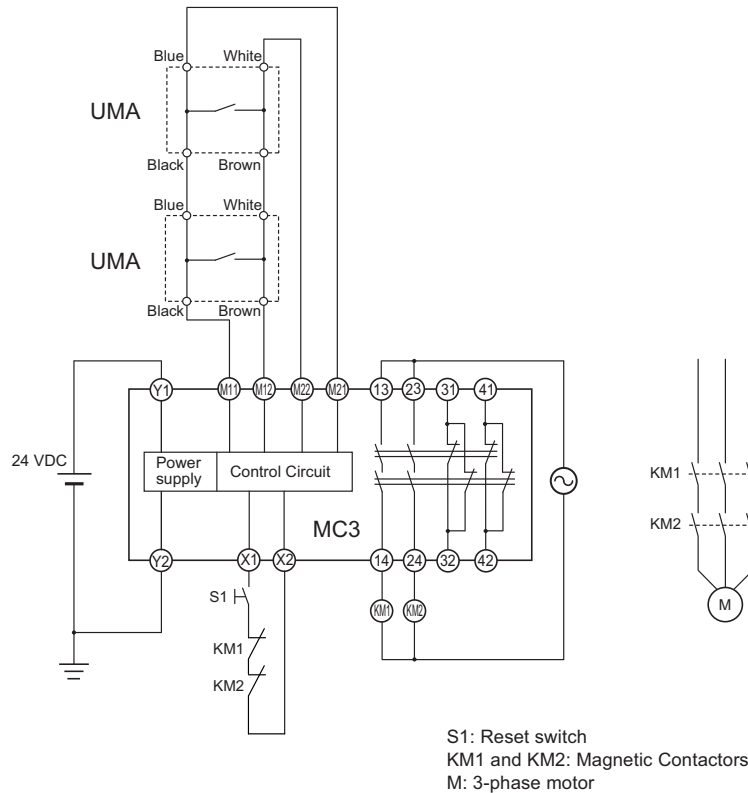
Fig. 3-5 Multiple 1-Cable Mats in Series to MC3

3-2. Application Examples

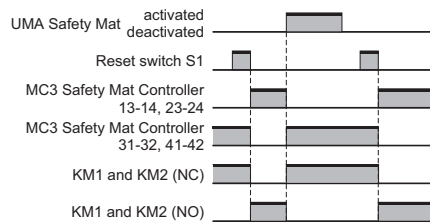
3-2-1. UMA (1-Cable Mats) with MC3 (Manual Reset Mode)

■ Application Overview

- The power supply to the motor M is turned OFF when a person steps on the mat.
- The power supply to the motor M is kept OFF until the reset switch S1 is pressed after a person steps out of the mat and the guard is closed.



Timing Chart



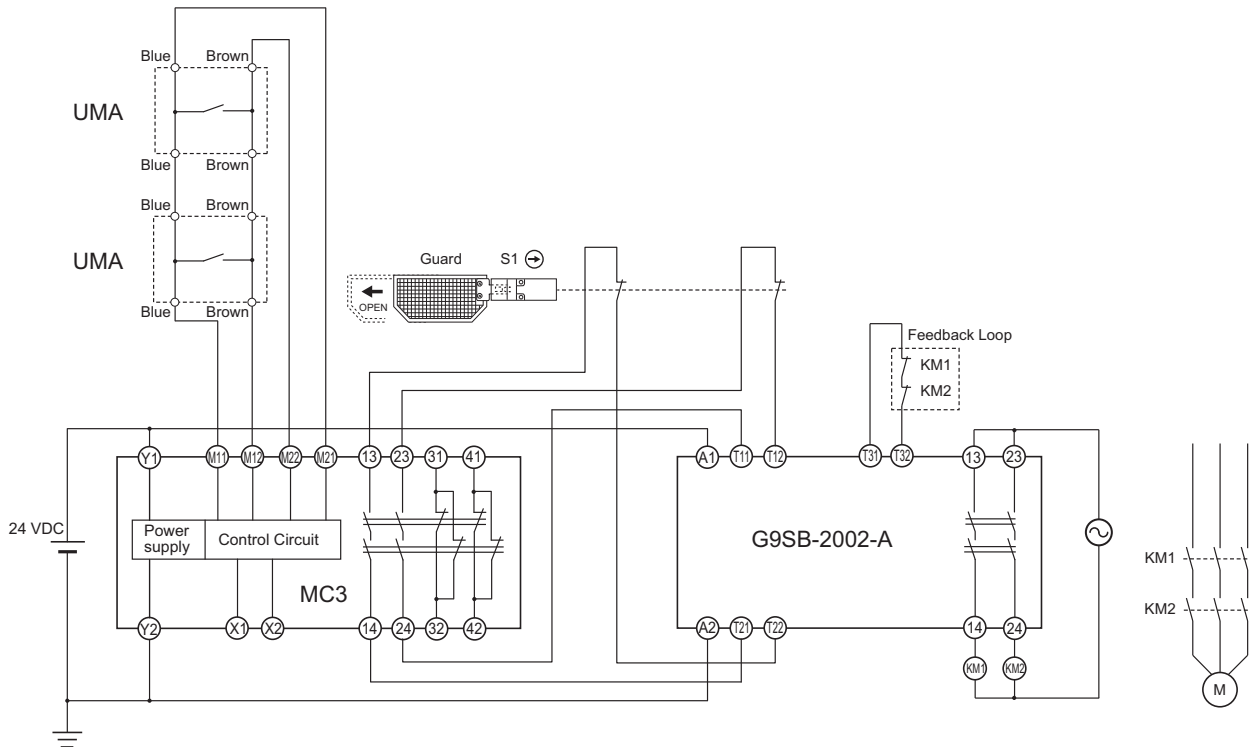
Note. Remove the three yellow jumpers from the MC3 to use Manual Reset Mode. Refer to *Mat Controller MC3 Series Installation and Operating Manual* for the location of the jumpers.

3-2-2. UMA (2-Cable Mats) with MC3 (Automatic Reset Mode)

Application Overview

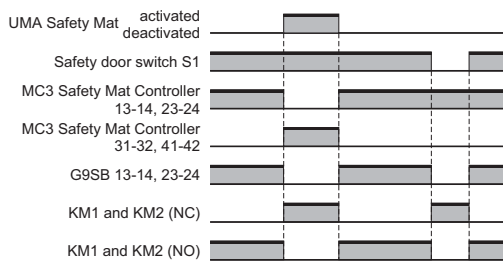
- The power supply to the motor M is turned OFF when a person steps on the mat.
- The power supply to the motor M is turned OFF when the S1 detects that the guard is opened.
- The power supply to the motor M is kept OFF until a person steps out of the mat and the guard is closed.

(Other safety relay units or safety controllers than the G9SB can also be used for this application.)



S1: Safety door switch
 KM1 and KM2: Magnetic Contactors
 M: 3-phase motor

Timing Chart



Note. Attach the three yellow jumpers to the MC3 to use Automatic Reset Mode. Refer to *Mat Controller MC3 Series Installation and Operating Manual* for the location of the jumpers.

Chapter 4 Mounting Trims

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4-1. Safety Mat Mounting Trim

4-1-1. Considerations

Only authorized individuals may relocate the safety mat in order to prevent inadvertent movement. These requirements include, but are not limited to:

- Secured edging;
- Secured trim;
- Fasteners;
- Recesses;
- Size and weight of large mats

Several types of perimeter trim are available as described later in this document. Users need to be aware that not all perimeter trim is the same. Two of the most optimum types of trim include two-part perimeter ramp trim and two-part joining trim.

- Two-part perimeter ramp trim holds mat in place and simplifies installation by providing an aluminum base with channels for running cables, and a snap-on PVC cover.
- Two-part joining trim is used to create an active area between two adjacent mats.

WARNING

Employees must be instructed that the perimeter trim is not an active sensing surface. Stepping only on the perimeter trim will not send a stop signal to the guarded machine.



Mount mat trims properly for protection and for proper mat operation.



Perimeter trim is used to provide mechanical protection for the mat cables and to fasten the mat(s) in place as required by ISO 13856.

ISO 13856-1:2013, Section 4.17 states, in part, “**Where there is a danger that a person can trip on the outside edge(s) of a sensor or sensor covering, a suitable ramp shall be provided. The slope of the ramp shall not exceed 20 degrees from the horizontal.**” Typically Omron trim is sloped at 19 degrees.

4-1-2. Trim Selection

The following pages show the various versions of the perimeter trim and joining trim that are currently available from Omron, and show the typical installation dimensional details. The following pages show details of the available Omron Trim Assemblies.

Items shown include:

Table 4-1 Trims list

Name	Model	Length	Description
Ramp Trim with Yellow PVC Cover	UMRT4	1.22 m (48 in.)	Used for perimeter of safety mat. Composed of two parts, an aluminum base and a PVC cover. Possible to install cables inside.
	UMRT8	2.44 m (96 in.)	
Joining Trim	UMJS4	1.22 m (48 in.)	Used to join multiple safety mats. Serves to create an active joint between safety mats. Composed of two parts, an aluminum base and a PVC cover. Possible to install cables inside except M8 connector portion.
	UMJS8	2.44 m (96 in.)	
Aluminum Ramp Trim	UMAL	2.44 m (96 in.)	Used for perimeter of safety mat. This is a single part aluminum trim. Available for areas where the two part ramp trim may not be suitable. Possible to install cables inside.
Molded Outside Corner	UMOC	-	Used for the outside corners of perimeter trim. This is a single part PVC trim. Designed to mate with two part PVC trim.
Molded Inside Corner	UMIC	-	Used for the inside corners of perimeter trim. This is a single part PVC trim. Designed to mate with two part PVC trim.

Note 1. The Ramp Trim with Yellow PVC Covers, Joining Trims or Aluminum Ramp Trims must be cut to fit the length of the safety mats to be used.

If cables are to be routed in the wireway of the trim or exit the trim, the trim must be cut or notched for cable access. Refer to *Chapter 5 Installation* for more information on cutting or notching the trim.

Note 2. The Ramp Trims with Yellow PVC Cover, Aluminum Ramp Trims and Molded Corners must be anchored to the floor to secure the safety mats. It is also necessary to drill holes in the trims for the anchors.

Refer to *Chapter 5 Installation* for more information on drilling holes in the trims and molded corners and anchoring to the floor.

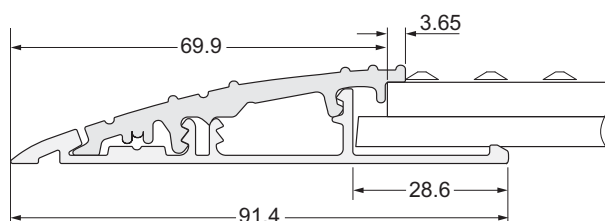
Note 3. Screws (No.8-32 x 1.25") and anchors (12 each) are included with Ramp Trim with Yellow PVC Cover (UMRT4 and UMRT8) and Aluminum Ramp Trim (UMAL).

4-1-2-1. Two-Part Ramp Trim with Yellow PVC Cover (UMRT□)

- Ramp trim, aluminum base & PVC cover.
- +69.9 mm (2.75 in.) to mat layout dimensions. Refer to *Fig. 4-6* for explanations.

This trim simplifies routing of cables and replacement of damaged mats. The trim provides a convenient wiring channel for up to 4 mat cables. Wires can be easily installed in the base and the cover installed after the system has been checked for proper operation. This is the most commonly used trim. The trims must be cut to fit the length of the safety mats to be used. The corner of this trim must be cut to be mitered if UM□C Molded Corners are not used.

Refer to *5-2-5-1. Securing the UMA Safety Mat with Two-Part Ramp Trim with Yellow PVC Cover (UMRT□)* for the dimensions of the mitered corners.



DIMENSIONS: mm

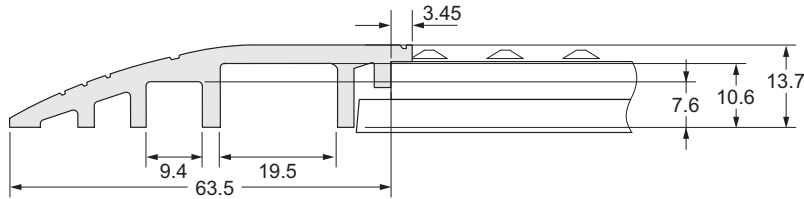
Fig. 4-1 UMRT□

4-1-2-2. Aluminum Ramp Trim (UMAL)

- Ramp trim, one-part aluminium.
- +63.5 mm (2.50 in.) to mat layout dimensions. Refer to *Fig. 4-6* for explanations.

This single part aluminum ramp trim is available for areas where the two part ramp trim may not be suitable. The trim is used where additional mechanical protection is required for the mat wiring. When using this trim it is very important to take care to ensure that the mat wiring is not damaged when the trim is fastened to the floor. The trims must be cut to fit the length of the safety mats to be used. The corner of this trim must be cut to be mitered.

Refer to 5-2-5-3. *Securing the UMA Safety Mat with Aluminum Ramp Trim (UMAL)* for the dimensions of the mitered corners.



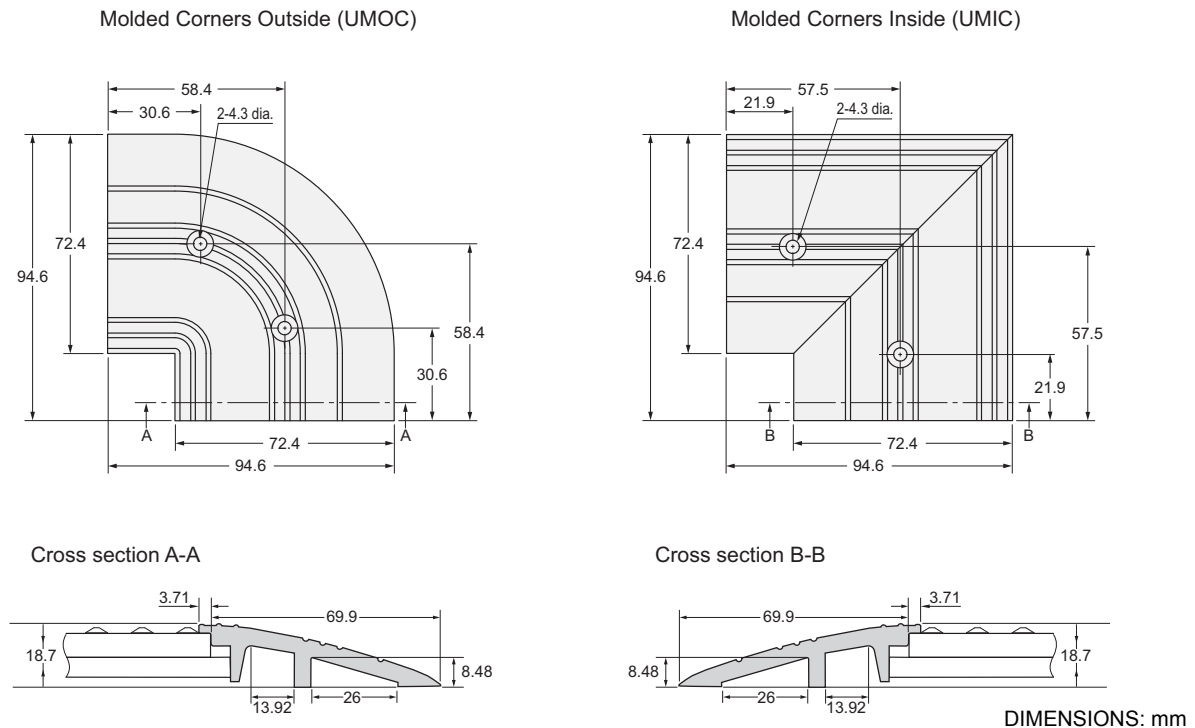
DIMENSIONS: mm

Fig. 4-2 UMAL

4-1-2-3. Molded Corners (UM□C)

- Perimeter ramp trim, PVC cover with molded corners.
- +69.9 mm (2.75 in.) to mat layout dimensions.

This molded corner eliminates the need to miter the corners of perimeter trim. The molded corner is designed to mate with Omron two part PVC trim. The molded corner provides a convenient wiring channel for up to 4 mat cables and the molded corners make field cutting of trim easier. Care must be taken where wires are routed around the molded corners as these corners are fastened over the wiring.



DIMENSIONS: mm

Fig. 4-3 UM□C

4-1-2-4. Two Part Active Joining Trim (UMJS□)

When multiple UMA Safety Mats are required to cover an area, Active Joining Trim is required. Active Joining Trim is comprised of two parts, the Active Joining Trim Base and the Joining Trim Cover. Active Joining Trim is cut to be installed under and between two or more adjacent safety mats. It serves the dual purpose of creating an active joint between mats and as a wireway for mat cables (except M8 connector portion). Active Joining Trim works by transferring the weight of an object or personnel beyond the inactive area along the edge of each mat to the active area of either one or both mats comprising the joint.

The drawing below details this joining trim.

Joining trim for layouts with more than one mat.
 Gap between mats for two-part joining trim is 35.8 mm. The overall size of the mat will be longer than mats' nominal dimensions.

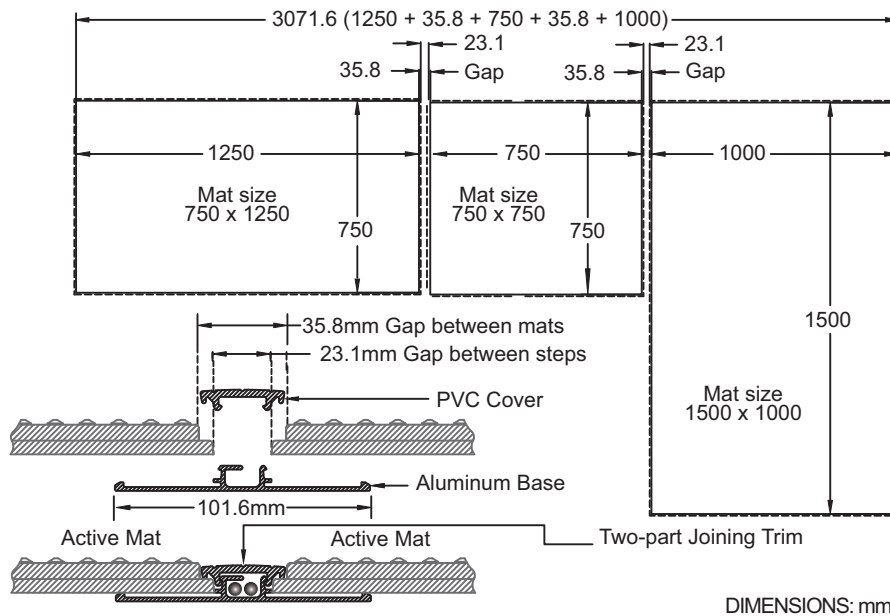
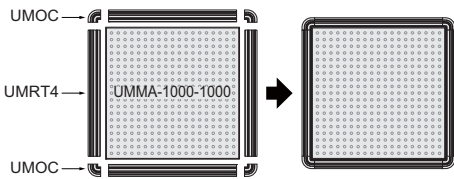


Fig. 4-4 Two Part Active Joining Trim

See also 5-2-5-4. *Two Part Active Joining Trim (UMJS□)* for wireway for mat cables in the adjacent part between the joining trim and another trim.

4-1-3. Typical Mat Trim Combination and Example Calculations

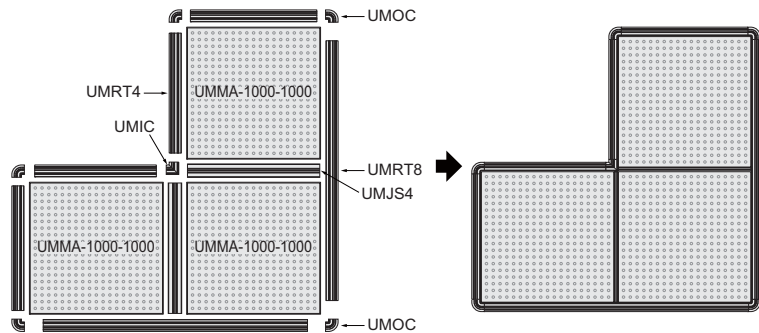
Example 1: Using a Single Safety Mat



In this example, the perimeter of the safety mat is about 4 m and the following trims and corners are used:

- UMMA-1000-1000 Safety Mat : 1
- UMRT4 Ramp Trim with Yellow PVC Cover (1.22 m) : 4
- UMOC Molded Outside Corner : 4

Example 2: Using three Safety Mats

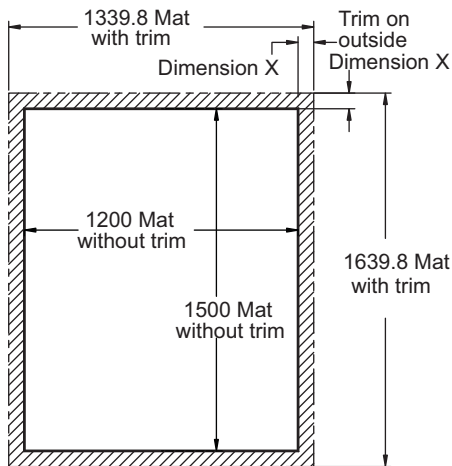


In this example, the perimeter of the safety mats is about 8 m, the joint between the safety mats is 2-m long, and the following trims and corners are used:

- UMMA-1000-1000 Safety Mat : 3
- UMRT4 Ramp Trim with Yellow PVC Cover (1.22 m) : 4
- UMRT8 Ramp Trim with Yellow PVC Cover (2.44 m) : 2
- UMJS4 Joining Trim (1.22 m) : 2
- UMOC Molded Outside Corner : 5
- UMIC Molded Inside Corner : 1

Fig. 4-5 Typical Mat Trim Combination

The below example shows the nominal mat dimensions of 1500 mm x 1200 mm. The trim is ADDED to layout perimeter (+69.9 mm) on all sides. Outside dimensions including mat and trims become 1639.8 mm x 1339.8 mm.



Model	Dimension X (mm)
UMRT□	69.9
UMOC	
UMIC	
UMAL	63.5

DIMENSIONS: mm

Fig. 4-6 Example Calculation

Chapter 5 Installation

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5-1. Safety Distance Calculation

The first and by far the most important consideration is the calculation of the safety distance. There is a minimum mat size that should be placed between a worker and a hazardous motion. Many users will "eyeball" the application, look at the area where a machine operator would stand and say, "that looks like it needs a 24-inch wide mat." It may not be enough.

Operators must be aware that the perimeter trim and/or molded corners are not active sensing surfaces. Stepping only on the perimeter trim and/or molded corners will not send a stop signal to the guarded machine. They are used to hold mats in place and to simplify installation by providing channels for running cables. Therefore they must not be included as an active sensing surface in safety distance calculation.

According to EN ISO 13855, the minimum distance, S , in millimeters, from the detection zone to the hazard zone shall not be less than that calculated using the following equation:

$$S = (K \times T) + C$$

where

S = minimum safety distance (mm);

K = speed constant (mm/s);

T = overall stopping time of the system (s);

C = depth penetration factor (mm).

5-1-1. General Mounting of Safety Mat on the Floor

With safety mat, the safety distance must take into account the operator's pace and stride. The minimum distance for safety mat assumes the approach speed to the hazard zone will be at walking speed, that is,

$$K = 1600 \text{ mm/s}$$

The overall system stopping time comprises at least two phases.

$$T = t_1 + t_2$$

where

T = overall stopping time of the system (s)

t_1 = maximum time between the occurrence of the actuation of the safety mat and the output signal achieving the OFF-state;

t_2 = stopping time, which is the maximum time required to terminate the hazardous machine function after the output signal from the safety mat achieves the OFF-state. The response time of the control system of the machine shall be included.

The Depth Penetration Factor is represented by the symbol C . It is the minimum travel towards the hazard before detection by the safety mat. Assuming the operator is walking and the safety mat is mounted on the floor. The operator's first step onto the mat is a depth penetration factor of 1200 mm, that is,

$$C = 1200 \text{ mm}$$

The minimum distance, S , in millimeters, from the hazard zone to the outermost edge of the detection zone of the safety mat, shall be calculated as:

$$S = (1600 \times T) + 1200 \text{ mm}$$

5-1-1-1. General Mounting Example

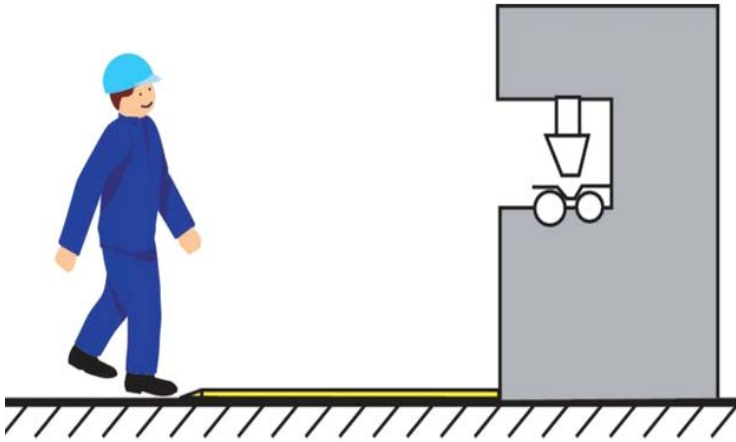


Fig. 5-1 General Mounting Example

A worker is guarded by a safety mat mounted on the floor.

The response time of the safety mat controller (MC3 in this example) is 30 ms (t_1) and the stopping time of the machine system is 300 ms (t_2).

The minimum distance is given by:

$$S = (1600 \times T) + 1200$$

$$S = (1600 \times 0.33) + 1200$$

$$S = 528 + 1200$$

$$S = 1728 \text{ mm}$$

5-1-2. Step Mounting

If the safety mat is mounted on a step or raised platform, the minimum distance, S , from the detection zone to the hazard zone may be calculated as follows, where h is the height of the step in millimeters (mm).

$$S = (1600 \times T) + (1200 - 0.4h) \text{ mm}$$

5-1-2-1. Step Mounting Example

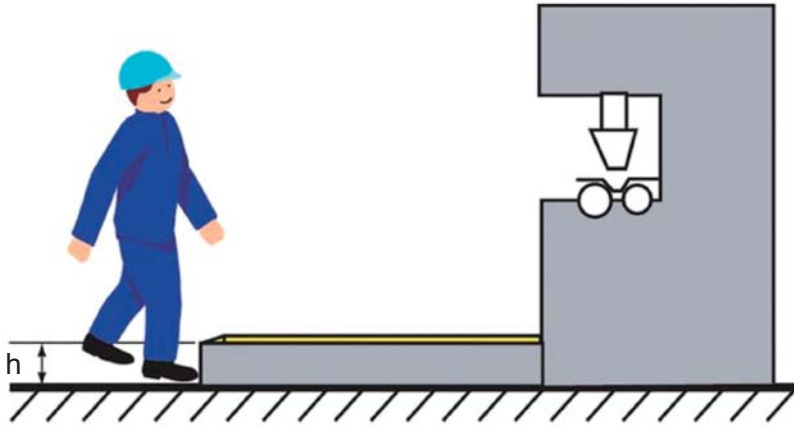


Fig. 5-2 Step Mounting Example

A worker is guarded by a safety mat mounted at 150 mm (h) high platform.

The response time of the safety mat controller (MC3 in this example) is 30 ms (t_1) and the stopping time of the machine system is 300 ms (t_2).

The minimum distance is given by:

$$\begin{aligned} S &= (1600 \times T) + (1200 - 0.4h) \\ S &= (1600 \times 0.33) + (1200 - 60) \\ S &= 528 + 1140 \\ S &= 1668 \text{ mm} \end{aligned}$$

5-2. Installation Procedure

⚠ WARNING

Stacking safety mats after removal from packaging may affect the functionality of the mats. The UMA Safety Mat is a durable activating device, providing it is properly handled and installed. For dependable and long life of the safety mat, follow these instructions carefully.



If the safety mat is large, DO NOT carry it horizontally or allow it to be handled by one person. The safety mat may be bent or get damaged. The handler may be injured.



DO NOT cover a safety mat. Otherwise, the safety mat may not be activated, resulting in serious injury.



Serious injury may occur due to loss of required safety functions. DO NOT drill through or make a hole in the safety mat. Doing so may cause a person to go undetected.



5-2-1. Surface Preparation

The surface on which the safety mat(s) will be placed should be flat, smooth and free of debris. Any debris left under the mat may, in time, work its way through the polyurethane housing and eventually contact the electrode assembly. This may affect the mechanical switching of the electrode assembly and will provide a path for moisture to enter the mat. These conditions may lead to a mat failure.

5-2-2. Lifting and Carrying the UMA Safety Mat

Tilt the mat to a vertical position on the side without the mat cable(s). Hold the vertical edge of the mat while lifting and carrying the mat. See below. Carrying the mat in a vertical position will prevent the mat from bending across its width or length, which could damage the mat by causing a bend or kink in the electrode assembly. A small bow along the length of the mat may be allowed. Assistance may be required to lift, carry and install the larger safety mats. The weight of these mats varies from 2.5 kg (5.5 lb) to over 60 kg (132 lb). The large size and flexibility of these mats can be awkward for one person to carry.

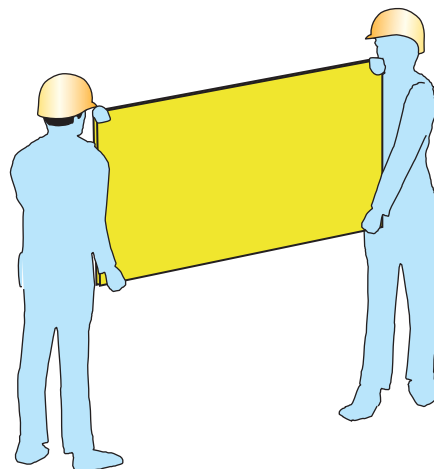


Fig. 5-3 Carrying the Mat

5-2-3. Mounting Information

The mounting surface has to be absolutely even, clean and dry.

Position the mat correctly. Mats may not be folded or bent. Safety mats may not be modified in any way. Cutouts or shortening are not possible.

Please note that mat trim is required to fix the mat to the floor. The total space required for a mat must include both the mat and the selected trim.

5-2-4. Care of the UMA Safety Mat Cables

After the mat is in place, use care in routing the mat cables to prevent damage to the insulation or damage to the internal wires. Make sure that the cable wireways are free of burrs and sharp edges. If cables are to exit the trim, make sure that all notches or cutouts are large enough to allow the wiring to exit the trim without causing damage to the cables.

Bending radii of cables must be equal to or higher than the following minimum values:

- Mat cables (2-cable mats) and UMA-CBL-3P□□-M8-□M: R34 mm
- Mat cables (1-cable mats) and UMA-CBL-4P□□-M8-□M: R50 mm

5-2-5. Securing the UMA Safety Mat to the Floor

A safety mat must be fixed in position to prevent its removal or relocation. A relocated mat may not be in position to detect the operator, or other personnel, before they reach the hazard. A safety mat must not, of itself, create a hazard. Use appropriate trim to prevent tripping.

1. Arrange the mat(s), cables, and trim system into the desired position. Check that all gaps are closed and all components of the sensing area are snug and properly oriented.
2. User should drill mounting holes in aluminum base plate. User determines hole locations. Recommended spacing should be approximately 610 mm between holes and 130 mm from each end of the trim.
3. Utilize the drilled holes in perimeter trim as a template to mark drill points on the mounting surface/floor. Never drill through the safety mat! Any holes in the mat will destroy the seal, impair the reliable operation of the mat and void the warranty.
4. After marking drill points, remove perimeter trim and drill holes into mounting surface (use a 3/16 inch or 5 mm bit). Check hole alignment of the trim and floor, and then insert the supplied plastic anchors into the mounting holes.
5. Position the mats, install the joining trim base between the mats and place the PVC cover on the joining trim base. Square the mats. For two-part trims, slide the trim base under the mats. When the mats and trim are correctly positioned and the holes are aligned, fasten the perimeter trim to the floor using the supplied Phillips head screws.
6. After the mats and trim are securely anchored to the floor and the wires have been routed, a rugged cover of the trim is snapped into place. Corners can either be mitered or be our exclusive molded corners. When you using Corners, check hole alignment and fasten the Corners to the floor.

5-2-5-1. Securing the UMA Safety Mat with Two-Part Ramp Trim with Yellow PVC Cover (UMRT□)

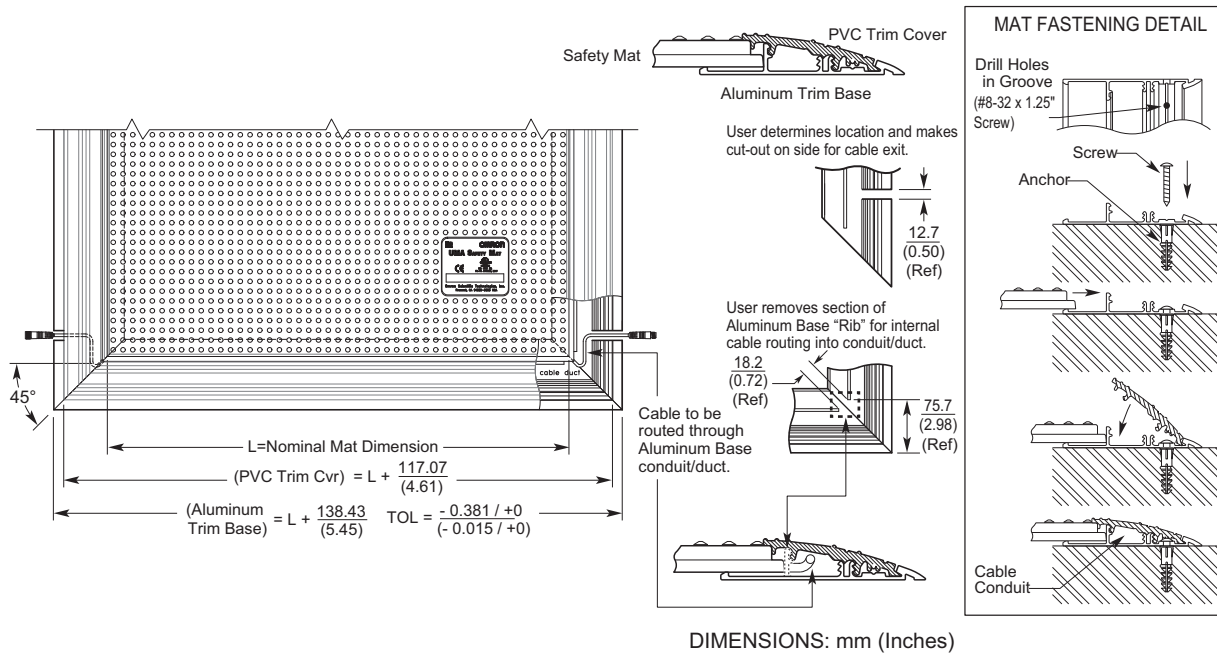


Fig. 5-4 Installation Information for UMRT□

5-2-5-2. Securing the UMA Safety Mat with Two-Part Ramp Trim with Yellow PVC Cover (UMRT□) and Molded Outside Corner (UMOC)

Care must be taken where wires are routed around the molded corners as these corners are fastened over the wiring.

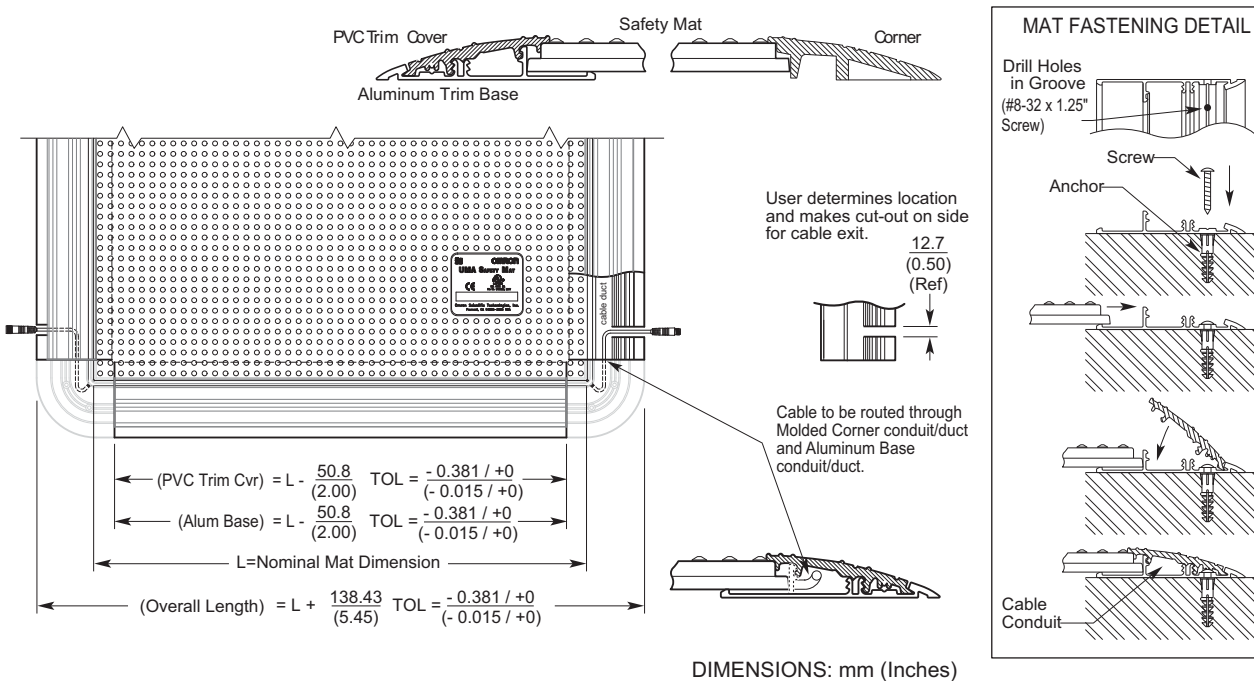


Fig. 5-5 Installation Information for UMRT□ and UMOC

5-2-5-3. Securing the UMA Safety Mat with Aluminum Ramp Trim (UMAL)

When using this trim it is very important to take care to ensure that the mat wiring is not damaged when the trim is fastened to the floor.

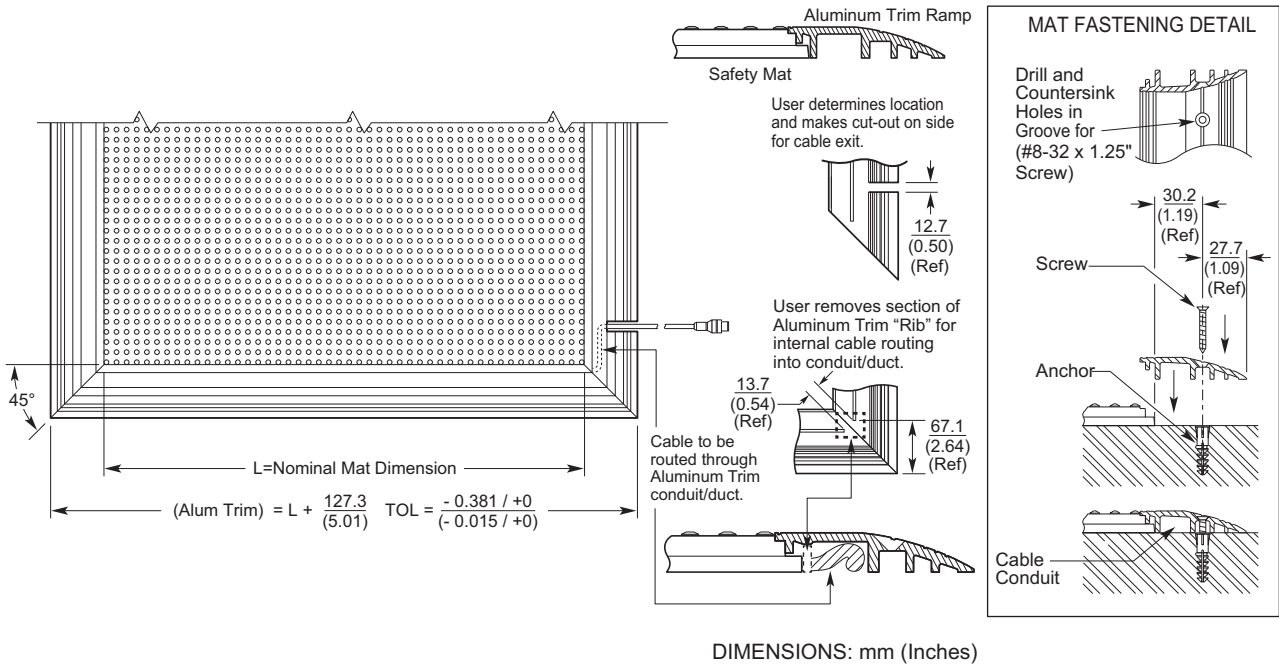


Fig. 5-6 Installation Information for UMAL

5-2-5-4. Two Part Active Joining Trim (UMJS□)



Fig. 5-7 Picture of Active Joining Trim Cutout where Joining Trim enters Ramp Trim



Fig. 5-8 Picture of Active Joining Trim Cutout where Joining Trim enters Ramp Trim

Note. M8 connector portion cannot be installed under the Active Joining Trim.

5-2-6. Functional Test

The safety function of the safety mat must be tested by qualified personnel after installation. Refer to 7-1. *Test and Maintenance* for the details.

5-3. Installation Example

1. Additional fixed guards are installed to prevent access to the danger zone of the machinery.
2. The fixed guard is arranged and designed in such a way that there is no access to the danger zone between the fixed guard and the safety mats. The fixed guard permits access to the danger zone through the sensors only.
3. A sloping cover plate prevents the operator standing at the side of the effective sensing field and in the danger zone.
4. Safety mats are properly installed.
5. The dead zones of the safety mats are located in such a way that the protective function will not be impaired.
6. The tripping hazard at the sensor edge is reduced by a ramp at the point of access. The ramp may also protect connecting cables.
7. Cable wireway is located outside the fixed guard. This prevents its misuse as an access to the hazard zone.
8. Reset button is located in a well protected location giving full visibility of the protected area.

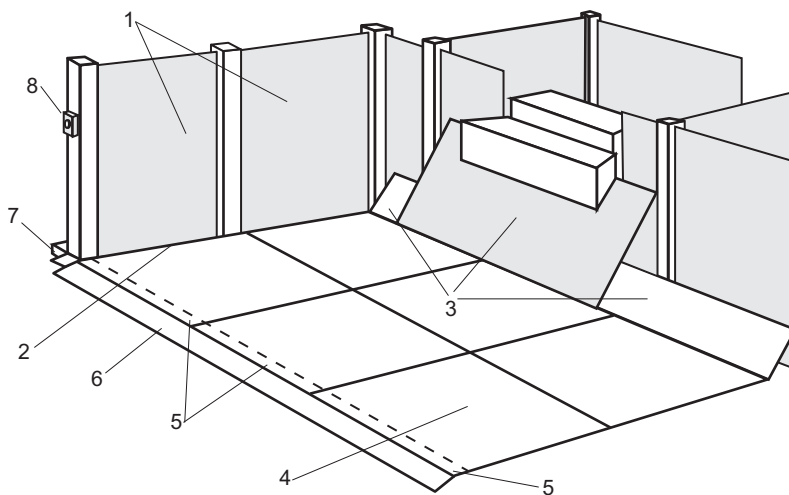


Fig. 5-9 Good Mat Installation Example

Chapter 6 Cables

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6-1. Using with 2-Cable Mats

6-1-1. Cable

6-1-1-1. Single Connector Cable (M8, 3-socket)

Model: UMA-CBL-3PCF-M8-□M

Single connector cable to connect a 2-cable UMA Safety Mat to a MC3 Safety Mat Controller.

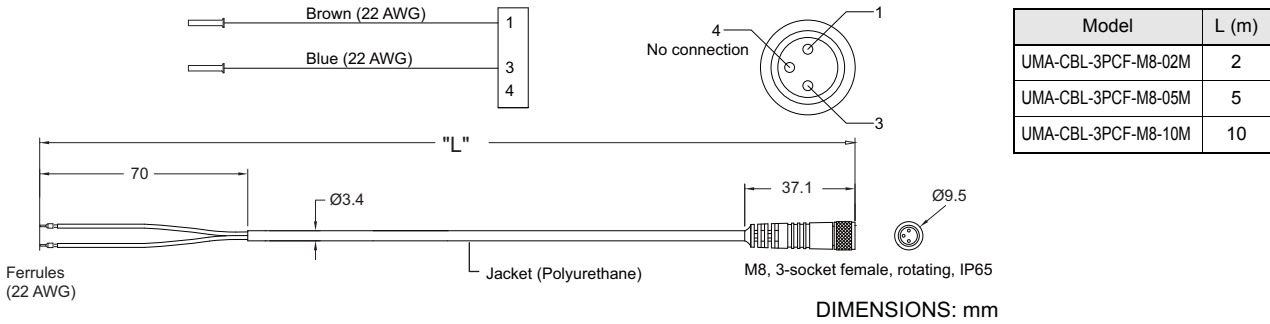


Fig. 6-1 UMA-CBL-3PCF-M8-□M

6-1-1-2. Male-Female Extension Cable (M8, 3-pin)

Model: UMA-CBL-3PMF-M8-□M

Extension cable to connect a 2-cable UMA Safety Mat to a UMA-CBL-3PCF-M8-□M Single Connector Cable or connect multiple 2-cable UMA Safety Mats in series.

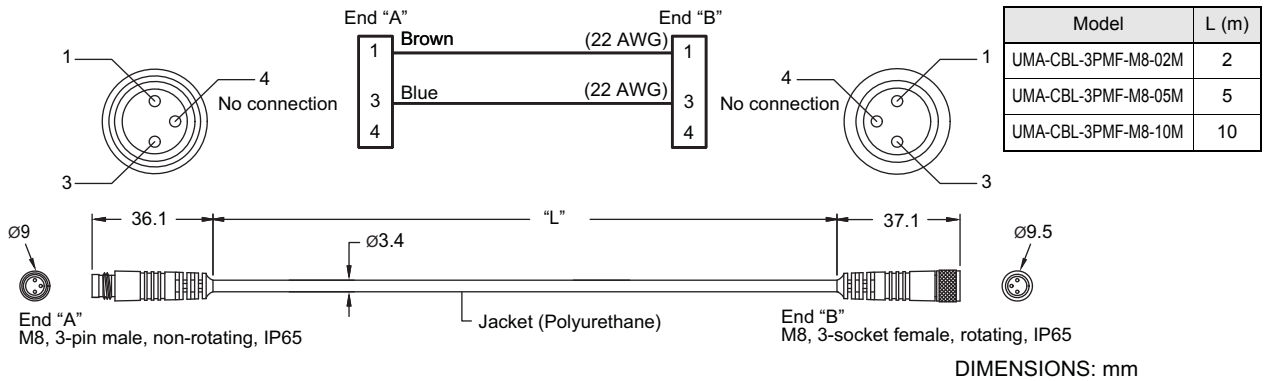


Fig. 6-2 UMA-CBL-3PMF-M8-□M

6-1-1-3. Male-Male Extension Cable (M8, 3-pin)

Model: UMA-CBL-3PMM-M8-0.15M

Used to connect the connector sockets of 2-cable UMA Safety Mats together.

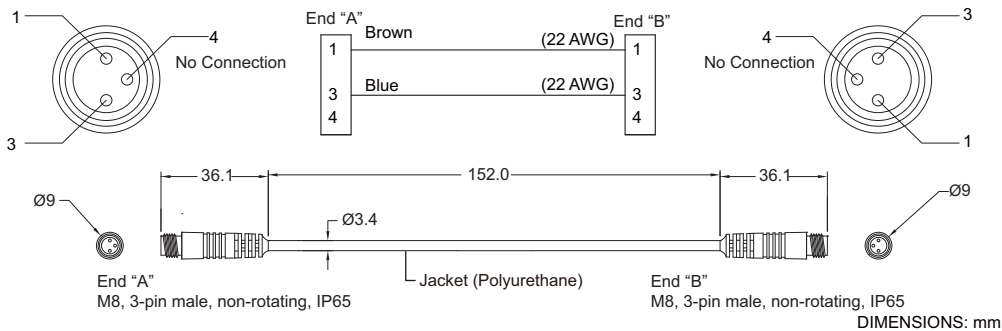


Fig. 6-3 UMA-CBL-3PMM-M8-0.15M

6-1-1-4. Female-Female Extension Cable (M8, 3-pin)

Model: UMA-CBL-3PFF-M8-0.15M

Used to connect the connector plugs of 2-cable UMA Safety Mats together.

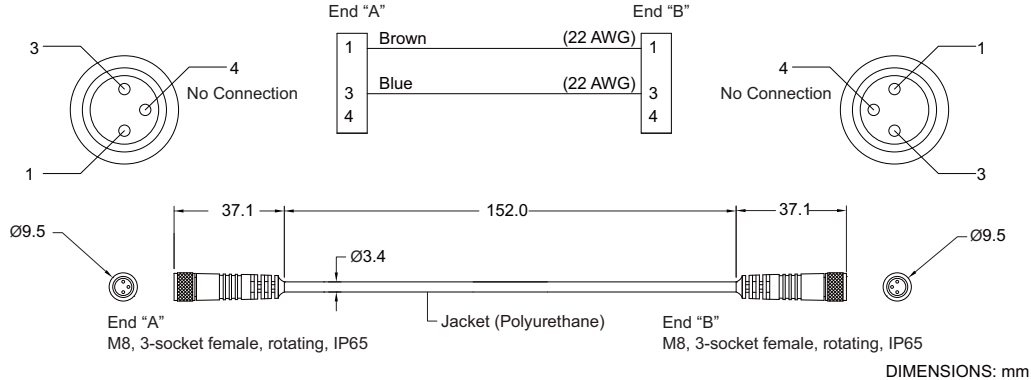


Fig. 6-4 UMA-CBL-3PFF-M8-0.15M

6-2. Using with 1-Cable Mats

6-2-1. Cable

6-2-1-1. Single Connector Cable (M8, 4-socket)

Model: UMA-CBL-4PCF-M8-□M

Single connector cable to connect a 1-cable UMA Safety Mat to a MC3 Safety Mat Controller.

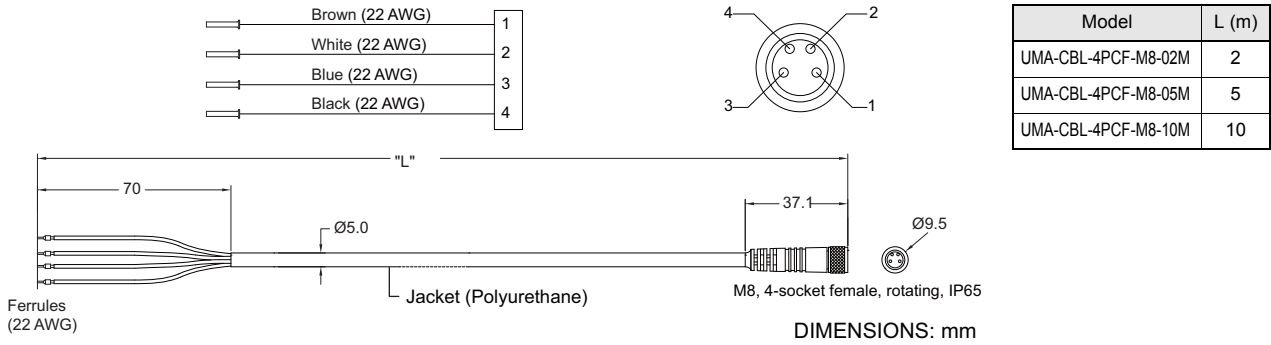


Fig. 6-5 UMA-CBL-4PCF-M8-□M

6-2-1-2. Male-Female Extension Cable (M8, 4-pin)

Model: UMA-CBL-4PMF-M8-□M

Extension cable to connect a 1-cable UMA Safety Mat to a UMA-CBL-4PCF-M8-□M Single Connector Cable.

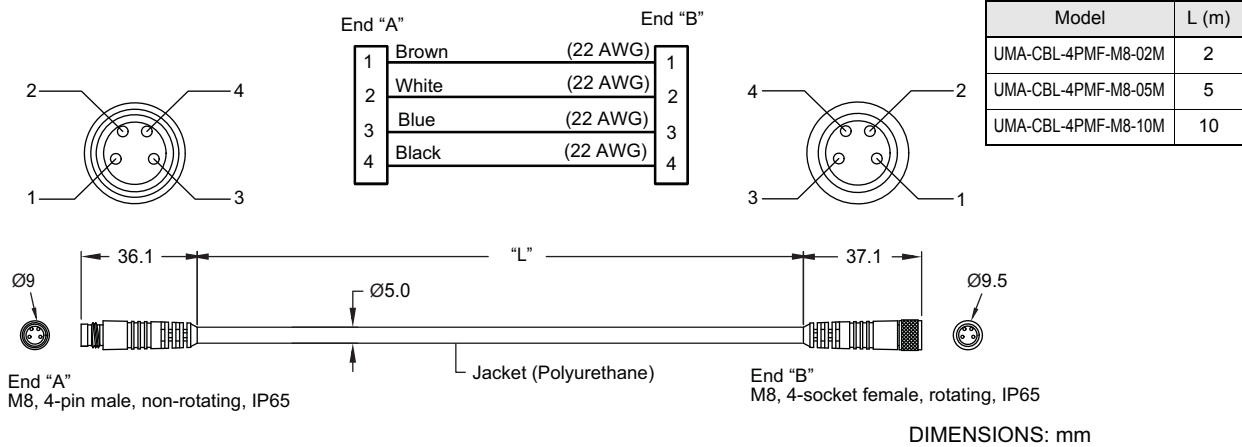


Fig. 6-6 UMA-CBL-4PMF-M8-□M

Chapter 7 Appendix

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7-1. Test and Maintenance

WARNING

Serious injury may occur due to loss of required safety functions. Operate this pressure-sensitive protective device only when it is properly installed, tested and inspected in accordance with all applicable government, industry and company safety regulations.

The following test procedure must be performed by qualified personnel at installation and after any maintenance, adjustment or modification to the UMA Safety Mat. Additionally, the test procedure must be performed at periodic intervals depending upon use. The machine installer must specify the interval according to national legislative requirements. Omron recommends a maximum interval of 6 months. Testing must be documented in a way that allows it to be traced at any time. Testing ensures that the UMA Safety Mat works properly to stop the machine. The requirements of the system and machine manufacturer are to be taken into account and observed. Familiarity with this installation and operating manual is required before proceeding.

7-1-1. Visual Inspection

Check the following steps to properly inspect the mat.

1. Check the safety mat is secured to the floor with the recommended mounting trims in position and not removed or relocated.
2. Check the cable for damages.
3. Check for proper cable connections.
4. Check the surface of the mat for cuts or opening that exposes the electrode.
5. Check the surface of the mat for dirt build-up that can reduce the traction on the mat. Sweep the mat regularly.

Damaged or defective components of the safety mat system should be immediately replaced.

7-1-2. Functional Test

Check the following conditions of the safety mat.

- After verifying the conditions in 7-1-1. *Visual Inspection*, step onto the safety mat in several places to check whether the output relays of the safety-monitoring device are disabled and stop the hazardous movement of the machine.

Damaged or defective components of the safety mat system should be immediately replaced.

7-2. Accessories

Control Unit

Model No.	Description
MC3	Safety Mat Controller

Trims

Model No.	Description	Weight *
UMRT4	Bulk two-part ramp trim with yellow PVC cover 1.22 m (48 in.) length	1.5 kg (3.3 lb.)
UMRT8	Bulk two-part ramp trim with yellow PVC cover 2.44 m (96 in.) length	3.0 kg (6.6 lb.)
UMJS4	Bulk two-part active joining trim 1.22 m (48 in.) length	1.4 kg (3.0 lb.)
UMJS8	Bulk two-part active joining trim 2.44 m (96 in.) length	2.7 kg (6.0 lb.)
UMAL	Bulk aluminum ramp trim 2.44 m (96 in.)	2.9 kg (6.5 lb.)
UMOC	Molded outside corner	
UMIC	Molded inside corner	

*Net weight

Cables for 1-cable mats

Model No.	Description	Length	Application
UMA-CBL-4PCF-M8-02M	M8, 4-pin female single connector cable	2 m (78.7 in.)	To be used to connect a 1-cable UMA Safety Mat to a MC3 Safety Mat Controller.
UMA-CBL-4PCF-M8-05M		5 m (196.9 in.)	
UMA-CBL-4PCF-M8-10M		10 m (393.7 in.)	
UMA-CBL-4PMF-M8-02M	M8, 4-pin male to female extension cable	2 m (78.7 in.)	To be used to connect a 1-cable UMA Safety Mat to a MC3 Safety Mat Controller.
UMA-CBL-4PMF-M8-05M		5 m (196.9 in.)	
UMA-CBL-4PMF-M8-10M		10 m (393.7 in.)	

Cables for 2-cable mats

Model No.	Description	Length	Application
UMA-CBL-3PCF-M8-02M	M8, 3-pin female single connector cable	2 m (78.7 in.)	To be used to connect a 2-cable UMA Safety Mat to a MC3 Safety Mat Controller.
UMA-CBL-3PCF-M8-05M		5 m (196.9 in.)	
UMA-CBL-3PCF-M8-10M		10 m (393.7 in.)	
UMA-CBL-3PMF-M8-02M	M8, 3-pin male to female extension cable	2 m (78.7 in.)	To be used to connect a 2-cable UMA Safety Mat to a MC3 Safety Mat Controller or connect multiple 2-cable UMA Safety Mats in series.
UMA-CBL-3PMF-M8-05M		5 m (196.9 in.)	
UMA-CBL-3PMF-M8-10M		10 m (393.7 in.)	
UMA-CBL-3PMM-M8-0.15M	M8, 3-pin male to male extension cable	0.15 m (5.9 in.)	To be used to connect the connector sockets of 2-cable UMA Safety Mats together.
UMA-CBL-3PFF-M8-0.15M	M8, 3-pin female to female extension cable	0.15 m (5.9 in.)	To be used to connect the connector plugs of 2-cable UMA Safety Mats together.

7-3. Declaration of Conformity

No. DECL-000134 Rev. A

EU DECLARATION OF CONFORMITY

1. **Product Models/Products:**
Safety Mats, UMA Series, Model(s) UMA, UMMA, UMMYA, UMYA used in conjunction with Safety Mat Controller Model MC3
2. **Name and address of the manufacturer:**
OMRON Scientific Technologies Incorporated
6550 Dumbarton Circle, Fremont, CA 94555-3605, U.S.A
3. **This Declaration of Conformity is issued under the sole responsibility of the manufacturer.**
4. **Objects of the declaration:**
Pressure Sensitive Protective Devices to detect the presence of persons – consisting of a Safety Mat Controller in conjunction with pressure sensitive safety mats. Not suitable for the detection of children
5. **The objects of the declaration described above are in conformity with the relevant Union harmonization legislation:**
Machinery Directive 2006/42/EC, 2014/30/EU EMC Directive, RoHS Directive 2011/65/EU
6. **References to the relevant harmonized standards used or references to the other technical specifications in relation to which conformity is declared:**
Machinery Directive: EN ISO 13856-1:2013, EN 12978:2003+A1:2009, EN ISO 13849-1:2015
7. **Name, address, and identification number of Notified Body, Number of EC Type Examination**
Machinery Directive:
Notified body: TÜV NORD CERT GmbH, Certification Body Machinery
Address: Langemarckstr. 20, 45141 Essen
Notified Body identification No.:0044
EC Type Examination Certificate Number: 44 205 15174901 (issued 2016/11/22, currently in process of revision)

Signed and on behalf of: OMRON Scientific Technologies Incorporated

Place of issue: Fremont, CA, 94555, USA **Date of issue:** _____

Signature: _____

Name: Martin D. Krikorian

Function: Quality Director, OMRON Scientific Technologies Incorporated

Name and address of contact in EU

OMRON Europe B.V.

Quality & Environment Department

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7-4. Revision History

A manual revision code appears as a suffix to the manual number at the bottom of the front and back covers of this manual.

Z375-E1-02



Revision No.

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02	March 2017	Minor correction

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