


EE-SX91

Meeting Customer Needs with Compact Sensors that Mount with M3 Screws

- Both light-ON and dark-ON outputs provided.
- A compact size and choice of five models for a wide range of applications.
- Compact NPN and PNP output models.
- Mount using M3 or M2 screws.
- Indicator is visible in many directions for installation in any location.
- Maximum load current of 100 mA.
- Models with connectors simplify wiring and maintenance.
- Flexible robot cables are standard on all models.



 Be sure to read *Safety Precautions* on page 6.

Features

A Compact Size and Choice of Five Models for a Wide Range of Applications

Select any of five models to minimize the space required.



Compact NPN and PNP Output Models

Both NPN and PNP output models are available for use according to system requirements.

Maximum Load Current of 100 mA

Output control of up to 100 mA is supported for either NPN or PNP outputs.

Models with Connectors Simplify Wiring and Maintenance

Using models with connectors allows wiring to be used as it is, with no need to replace anything but sensors.



Flexible Robot Cables: Standard on All Models

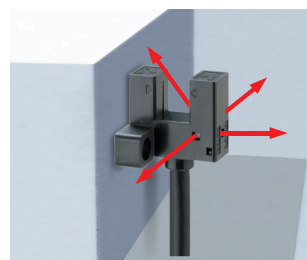
Robot Cables are effective for moving parts, and are provided as standard equipment with all models.

Both Light-ON and Dark-ON Outputs

Both light-ON and dark-ON outputs are provided on all models, allowing outputs to be switched by simply changing the wiring according to the application.

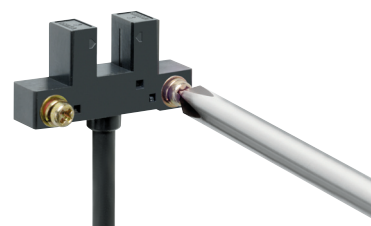
Indicator Visible from Many Directions for Installation in Any Location

The light indicator can be checked from up to four directions.



Mount Using M3 or M2 Screws

The EE-SX91 can be mounted using M3 or M2 screws, so it can easily replace an existing compact sensor mounted with M2 screws.








Ordering Information

List of Models

Models with Robot Cables

 Infrared light

Appearance	Sensing method	Sensing distance		Output configuration	Indicator mode	Connecting method (Cable length)	Model	
							NPN output	PNP output
	Through-beam type (with slot)	5 mm (slot width)	Light-ON Dark-ON (2 outputs)	Lit when light is incident	Pre-wired models (1 m)	EE-SX910-R 1M	EE-SX910P-R 1M	
					Models with connectors (0.3 m)	EE-SX910-C1J-R 0.3M	EE-SX910P-C1J-R 0.3M	
		Pre-wired models (1 m)			EE-SX911-R 1M	EE-SX911P-R 1M		
		Models with connectors (0.3 m)			EE-SX911-C1J-R 0.3M	EE-SX911P-C1J-R 0.3M		
		Pre-wired models (1 m)			EE-SX912-R 1M	EE-SX912P-R 1M		
		Models with connectors (0.3 m)			EE-SX912-C1J-R 0.3M	EE-SX912P-C1J-R 0.3M		
		Pre-wired models (1 m)			EE-SX913-R 1M	EE-SX913P-R 1M		
		Models with connectors (0.3 m)			EE-SX913-C1J-R 0.3M	EE-SX913P-C1J-R 0.3M		
		Pre-wired models (1 m)			EE-SX914-R 1M	EE-SX914P-R 1M		
		Models with connectors (0.3 m)			EE-SX914-C1J-R 0.3M	EE-SX914P-C1J-R 0.3M		

Accessories (Order Separately)

Connector with Robot Cable

Type	Cable length	Model	Remarks
Connector with Cable	2 m	EE-1016-R	Connector with lock, AWG26, 4-core Robot Cable

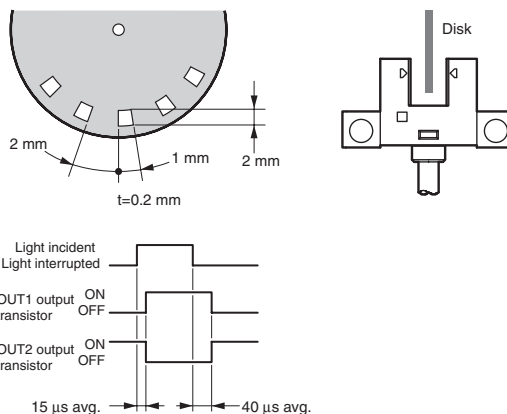
Ratings and Specifications

Item	Type		Standard	L-shaped	F-shaped	R-shaped	U-shaped
	NPN models	Pre-wired models	EE-SX910-R	EE-SX911-R	EE-SX912-R	EE-SX913-R	EE-SX914-R
		Models with connectors	EE-SX910-C1J-R	EE-SX911-C1J-R	EE-SX912-C1J-R	EE-SX913-C1J-R	EE-SX914-C1J-R
	PNP models	Pre-wired models	EE-SX910P-R	EE-SX911P-R	EE-SX912P-R	EE-SX913P-R	EE-SX914P-R
Models with connectors		EE-SX910P-C1J-R	EE-SX911P-C1J-R	EE-SX912P-C1J-R	EE-SX913P-C1J-R	EE-SX914P-C1J-R	
Sensing distance			5 mm (slot width)				
Sensing object			Opaque: 1.2 × 0.8 mm min.				
Differential distance			0.025 mm max.				
Light source			GaAs infrared LED with a peak wavelength of 940 nm				
Indicator			Light indicator (red LED)				
Supply voltage			5 to 24 VDC ±10%, ripple (p-p): 10% max.				
Current consumption			15 mA max.				
Control output			Load power supply voltage: 5 to 24 VDC Load current: 100 mA max. OFF current: 0.5 mA max. 100 mA load current with a residual voltage of 1.0 V max. 5 mA load current with a residual voltage of 0.4 V max.				
Protection circuits			Power supply reverse polarity protection; output reverse polarity protection				
Response frequency			3 kHz min. (8 kHz average) Light incident: 15 μs average; light interrupted: 40 μs average*				
Ambient illumination			1,000 lx max. with fluorescent light on the surface of the receiver				
Ambient temperature range			Operating: -25 to 55°C Storage: -30 to 80°C (with no icing or condensation)				
Ambient humidity range			Operating: 5% to 85% Storage: 5% to 95% (with no icing or condensation)				
Vibration resistance (Destruction)			10 to 2,000 Hz 0.75-mm single amplitude for 2.5 h (15-min periods, 10 cycles) each in X, Y, and Z directions				
Shock resistance (Destruction)			500 m/s ² for 3 times each in X, Y, and Z directions				
Degree of protection			IEC60529 IP50				
Connecting method			Pre-wired Models (standard cable length: 1 m), Models with Connectors (standard cable length: 0.3 m)				
Weight (packed state)	Pre-wired Models		Approx. 17 g				
	Models with Connectors		Approx. 7 g				
Materials	Case/cover		Polybutylene phthalate (PBT)				
	Emitter/receiver		Polycarbonate (PC)				

Applicable Connector

Item	Product Model	Connector with Robot Cable
	Appearance	EE-1016-R
Contact resistance	25 mΩ max. (at 10 mA DC and 20 mV max.)	
Insertion strength	20 N max.	
Surplus strength (housing holding strength)	15 N min.	
Cable length	2 m	
Ambient temperature range	-25 to 85°C	
Materials	Housing	Nylon
	Contact	Phosphor bronze

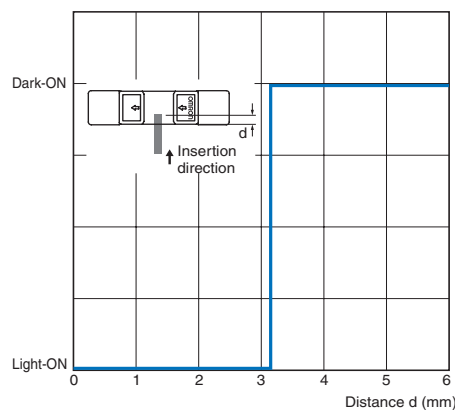
* The response frequency was measured by detecting the following rotating disk. The response times for light incidence and light interruption are shown in the timing chart.



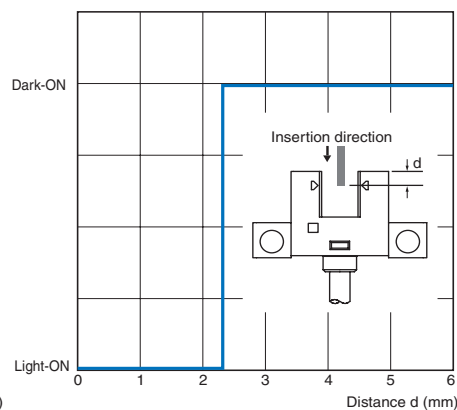
Engineering Data (Typical)

Sensing Position Characteristics

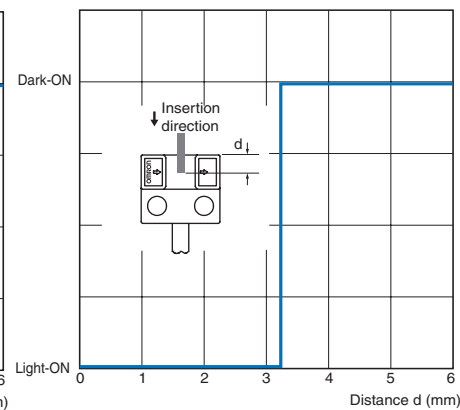
EE-SX910



EE-SX910

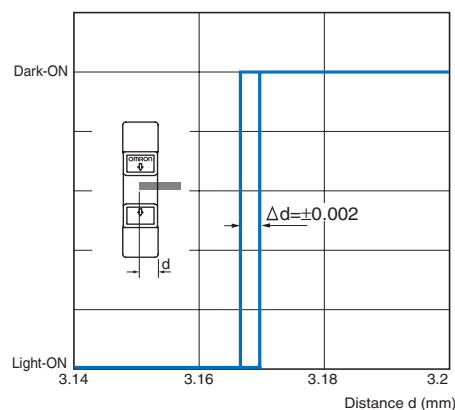


EE-SX911



Repeated Sensing Position Characteristics



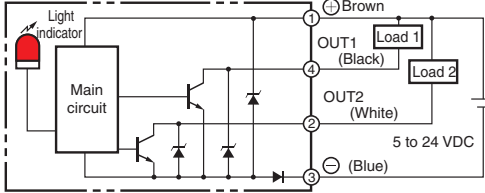
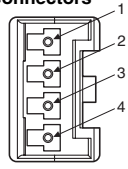






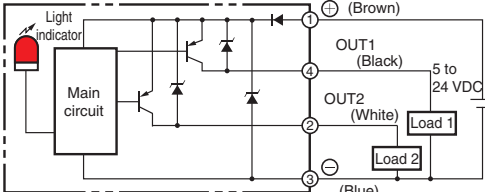
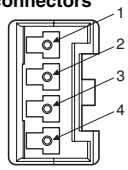




EE-SX910



V_{CC} = 24 V, No. of repetitions: 20, T_a = 25°C
(Differential distance = 0.025 mm max.)

Note: The data applies to dark status. Operation may be affected by external light interference or light coming through the sensing object.

I/O Circuit Diagrams

Output type	Model	Output transistor operation status	Timing charts	Output circuit			
NPN output	EE-SX910-R EE-SX910-C1J-R EE-SX911-R EE-SX911-C1J-R EE-SX912-R EE-SX912-C1J-R EE-SX913-R EE-SX913-C1J-R EE-SX914-R EE-SX914-C1J-R	OUT1: Light-ON OUT2: Dark-ON	<p>Light incident</p>  <p>Light interrupted</p> 	 <p>Connector pin arrangement for models with connectors</p> 			
	<p>Light indicator ON (red)</p>  <p>OFF</p> 						
	<p>Output 1 transistor</p>  <p>OFF</p> 						
	PNP output		EE-SX910P-R EE-SX910P-C1J-R EE-SX911P-R EE-SX911P-C1J-R EE-SX912P-R EE-SX912P-C1J-R EE-SX913P-R EE-SX913P-C1J-R EE-SX914P-R EE-SX914P-C1J-R		OUT1: Light-ON OUT2: Dark-ON	<p>Load 1 Operates (e.g., relay)</p>  <p>Releases</p> 	 <p>Connector pin arrangement for models with connectors</p> 
			<p>Output 2 transistor</p>  <p>OFF</p> 				
			<p>Load 2 Operates (e.g., relay)</p>  <p>Releases</p> 				

Safety Precautions

Refer to *Warranty and Limitations of Liability*.

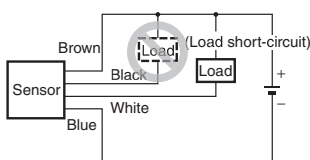
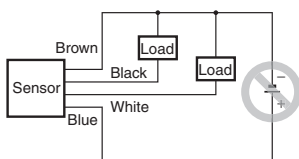
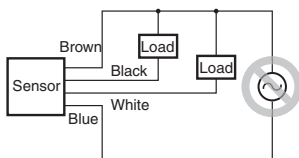
⚠ WARNING

This product is not designed or rated for ensuring safety of persons either directly or indirectly. Do not use it for such purposes.



Precautions for Safe Use

- **Power Supply Voltage**
Do not exceed the voltage range indicated in the specifications. Applying a voltage exceeding the specifications or using an AC power supply may result in rupture or burning.
- **Faulty Wiring**
Do not reverse the power supply polarity. Doing so may result in rupture or burning.
- **Do not short-circuit the load.** (Do not connect to the power supply.)
Doing so may result in rupture or burning.
- **Dispose of this product as industrial waste.**



Precautions for Correct Use

● Installation

- It is assumed that EE-SX91 Sensors will be built into a device. These Sensors use non-modulated light and are not equipped to deal with interference from an external light source. When they are used in locations subject to external light interference, such as near a window or under an incandescent light, install them to minimize the effects of external light interference.
- Mount the Sensors securely on a flat surface.
- Use M3 or M2.0 screws to secure the Photomicrosensor. (The stronger M3 screws are recommended. In addition, use flat washers and spring washers to prevent the screws from loosening.) Refer to the following table for the correct tightening torque.

Screw diameter	Tightening torque
M2.0	0.15 N·m max.
M3	0.54 N·m max.

- If the Sensor is to be used on a moving part, secure the cable connection point so that it is not directly subjected to stress.

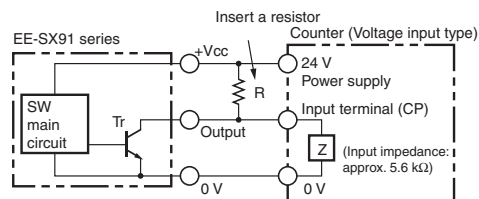
● Wiring

Unused Output Lines

Be sure to isolate output lines that are not going to be used.

Connecting to Devices with Voltage Input Specifications

A Sensor with an open-collector output can be connected to a counter with a voltage input by connecting a resistor between the power source and output. Select a resistor with reference to the following example. The resistance of the resistor is generally 4.7 kΩ and its wattage is 1/2 W for a supply voltage of 24 V and 1/4 W for 12 V.



Example: EE-SX91 Series

Load Resistance of 4.7 kΩ Connected in a Counter

Counter Specifications

Input impedance	5.6 KΩ
Voltage judged as high level (input ON)	4.5 to 30 VDC
Voltage judged as low level (input OFF)	0 to 2 VDC

The high and low levels are found using the following formulas. The input device specifications must satisfy both formulas.

High level:

$$\text{Input voltage } V_H = \frac{Z}{R+Z} V_{CC} = \frac{5.6 \text{ k}}{4.7 \text{ k}+5.6 \text{ k}} \times 24 \text{ V} = 13 \text{ V}$$

Low level:

$$\text{Load current } I_c = \frac{V_{CC}}{R} = \frac{24 \text{ V}}{4.7 \text{ k}} = 5.1 \text{ mA} \leq 100 \text{ mA}$$

Input voltage $V_L \leq 1.0 \text{ V}$ (Residual voltage for 100-mA load current)

Note: Refer to the ratings of the Sensor for the residual voltage of the load current.

● Other Precautions

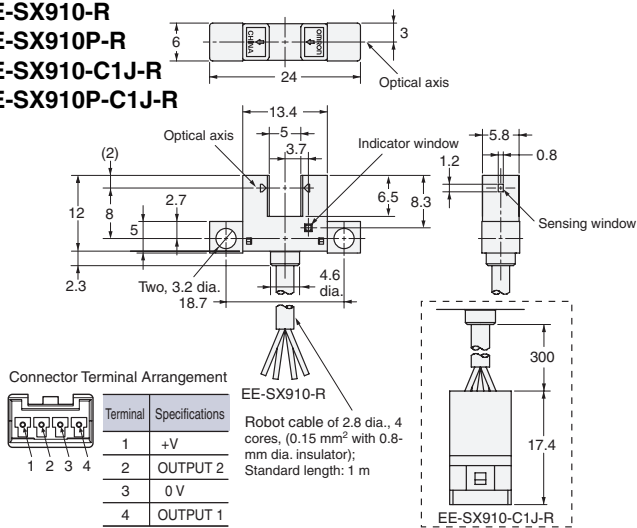
- Do not disconnect the Connector from the Sensor when power is supplied to the Sensor, or Sensor damage could result.
- Do not install the Sensor in the following places to prevent malfunction or trouble:
 1. Places exposed to dust or oil mist
 2. Places exposed to corrosive gas
 3. Places directly or indirectly exposed to water, oil, or chemicals
 4. Outdoor or places exposed to intensive light, such as direct sunlight
- Be sure to use the Sensor under the rated ambient temperature.
- The Sensor may be dissolved by exposure to organic solvents, acids, alkali, or aromatic hydrocarbons, aliphatic chloride hydrocarbons causing deterioration in characteristics. Do not expose the Sensor to such chemicals.
- Make sure the total length of the power cable connected to the product is less than 10 m.

Dimensions (Unit: mm)

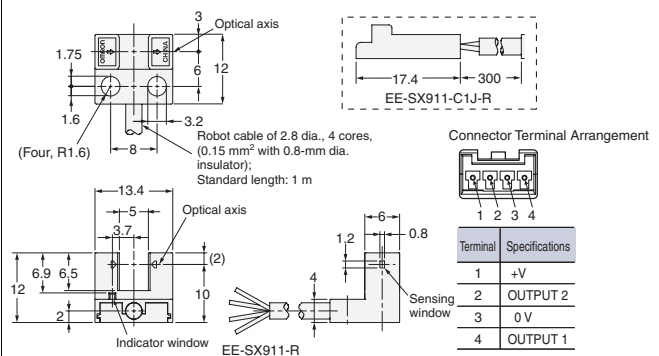
Tolerance class IT16 applies to dimensions in this datasheet unless otherwise specified.

Photomicrosensors

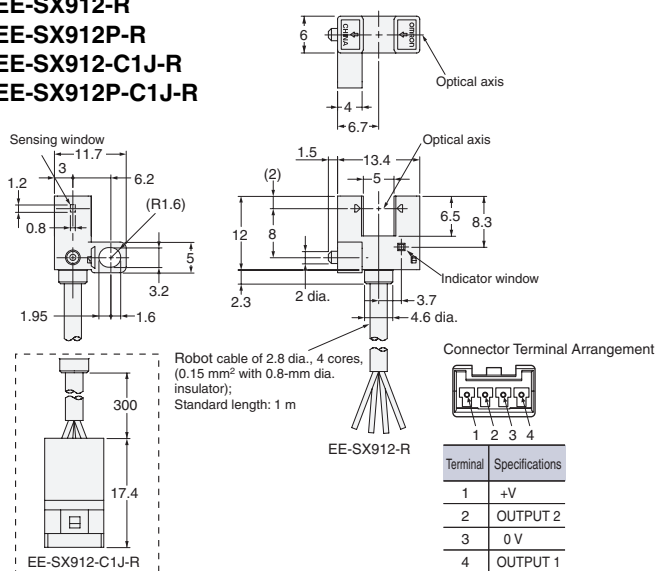
EE-SX910-R
EE-SX910P-R
EE-SX910-C1J-R
EE-SX910P-C1J-R



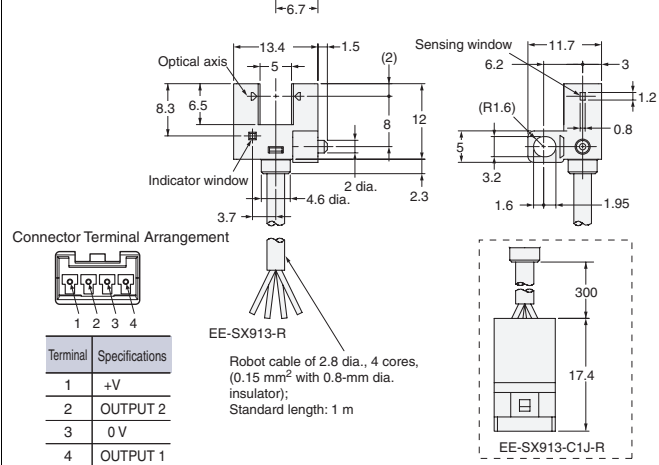
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EE-SX911-C1J-R
EE-SX911P-C1J-R



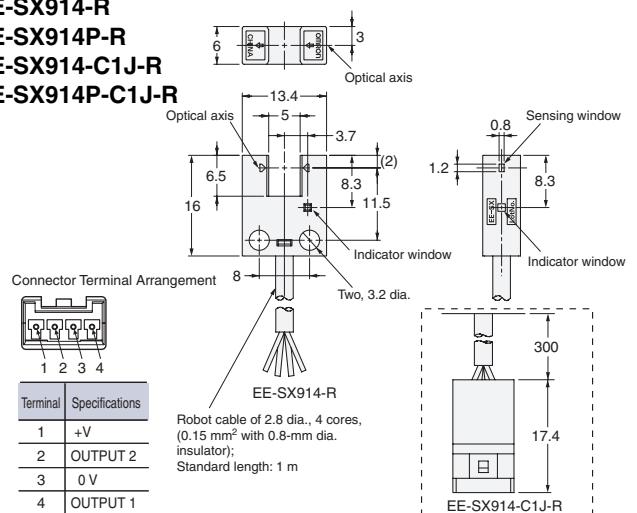
EE-SX912-R
EE-SX912P-R
EE-SX912-C1J-R
EE-SX912P-C1J-R



EE-SX913-R
EE-SX913P-R
EE-SX913-C1J-R
EE-SX913P-C1J-R



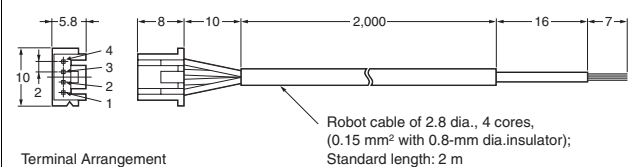
EE-SX914-R
EE-SX914P-R
EE-SX914-C1J-R
EE-SX914P-C1J-R



Accessories (Order Separately)

Connector with Robot Cable

EE-1016-R



Terminal Arrangement

①	+	Brown
②	OUTPUT 2	White
③	-	Blue
④	OUTPUT 1	Black

Read and Understand This Catalog

Please read and understand this catalog before purchasing the products. Please consult your OMRON representative if you have any questions or comments.

Warranty and Limitations of Liability

WARRANTY

OMRON's exclusive warranty is that the products are free from defects in materials and workmanship for a period of one year (or other period if specified) from date of sale by OMRON.

OMRON MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, REGARDING NON-INFRINGEMENT, MERCHANTABILITY, OR FITNESS FOR PARTICULAR PURPOSE OF THE PRODUCTS. ANY BUYER OR USER ACKNOWLEDGES THAT THE BUYER OR USER ALONE HAS DETERMINED THAT THE PRODUCTS WILL SUITABLY MEET THE REQUIREMENTS OF THEIR INTENDED USE. OMRON DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED.

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In no event shall the responsibility of OMRON for any act exceed the individual price of the product on which liability is asserted.

IN NO EVENT SHALL OMRON BE RESPONSIBLE FOR WARRANTY, REPAIR, OR OTHER CLAIMS REGARDING THE PRODUCTS UNLESS OMRON'S ANALYSIS CONFIRMS THAT THE PRODUCTS WERE PROPERLY HANDLED, STORED, INSTALLED, AND MAINTAINED AND NOT SUBJECT TO CONTAMINATION, ABUSE, MISUSE, OR INAPPROPRIATE MODIFICATION OR REPAIR.

Application Considerations

SUITABILITY FOR USE

OMRON shall not be responsible for conformity with any standards, codes, or regulations that apply to the combination of products in the customer's application or use of the products.

At the customer's request, OMRON will provide applicable third party certification documents identifying ratings and limitations of use that apply to the products. This information by itself is not sufficient for a complete determination of the suitability of the products in combination with the end product, machine, system, or other application or use.

The following are some examples of applications for which particular attention must be given. This is not intended to be an exhaustive list of all possible uses of the products, nor is it intended to imply that the uses listed may be suitable for the products:

- Outdoor use, uses involving potential chemical contamination or electrical interference, or conditions or uses not described in this catalog.
- Nuclear energy control systems, combustion systems, railroad systems, aviation systems, medical equipment, amusement machines, vehicles, safety equipment, and installations subject to separate industry or government regulations.
- Systems, machines, and equipment that could present a risk to life or property.

Please know and observe all prohibitions of use applicable to the products.

NEVER USE THE PRODUCTS FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCTS ARE PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

PROGRAMMABLE PRODUCTS

OMRON shall not be responsible for the user's programming of a programmable product, or any consequence thereof.

Disclaimers

CHANGE IN SPECIFICATIONS

Product specifications and accessories may be changed at any time based on improvements and other reasons.

It is our practice to change model numbers when published ratings or features are changed, or when significant construction changes are made. However, some specifications of the products may be changed without any notice. When in doubt, special model numbers may be assigned to fix or establish key specifications for your application on your request. Please consult with your OMRON representative at any time to confirm actual specifications of purchased products.

DIMENSIONS AND WEIGHTS

Dimensions and weights are nominal and are not to be used for manufacturing purposes, even when tolerances are shown.

PERFORMANCE DATA

Performance data given in this catalog is provided as a guide for the user in determining suitability and does not constitute a warranty. It may represent the result of OMRON's test conditions, and the users must correlate it to actual application requirements. Actual performance is subject to the OMRON Warranty and Limitations of Liability.

ERRORS AND OMISSIONS

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2008.11

In the interest of product improvement, specifications are subject to change without notice.

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