

### Sensor with an Adjustable Sensing Distance of 0.3 to 3 m Under Stable Operation without Background Interference

- Ensures a stable operating range with minimal side-lobe areas.
- Built-in unstable operation check function allows easy adjustment to a proper mounting direction.
- Mono-block construction with a sensor, power supply, and terminals ensures easy wiring.
- Incorporates synchronous selector and reference pulse I/O terminals ideal for parallel-operation use without mutual interference.

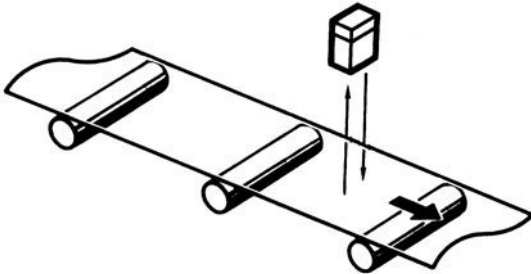


### Ordering Information

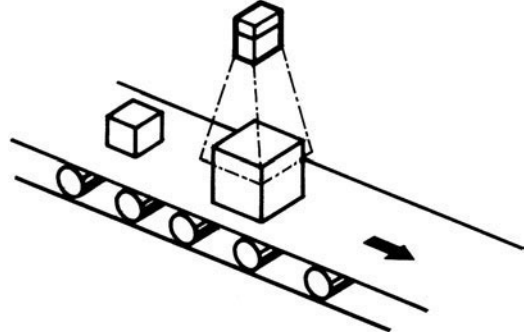
Sensing method		Reflective
Model	for AC	E4A-3K
	for DC	E4A-3K DC12-24

### Application Examples

Detection of cellophane, glass, and photosensitive paper



Detection of objects on conveyors or discrimination of object heights



# Specifications

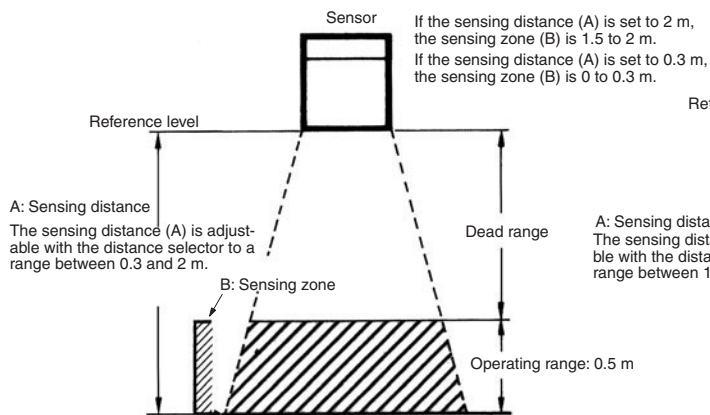
## ■ Ratings/Characteristics

<b>Supply voltage</b>	100, 110, 200, and 220 VAC $\pm$ 10% at 50/60 Hz (see note)
<b>Power consumption</b>	Approx. 2.5 VA
<b>Sensing distance</b>	Adjustable between 0.3 and 3 m (selectable ranges of 0.3 and 2 m or 1.3 and 3 m)
<b>Standard sensing object</b>	100-mm dia., 1.5-m-long metal or plastic round pipe
<b>Minimum sensing object</b>	50 x 50 mm flat plate
<b>Ultrasonic oscillation frequency</b>	Approx. 40 kHz
<b>Directional angle</b>	Half-value angle: 25°
<b>Response time</b>	Operate time: 0.25 s; release time: 0.5 s
<b>Control output</b>	Contact output: SPDT 3 A at 220 VAC, cos dia.=1 or 3 A at 24 VDC, cos dia.=1
<b>Ambient temperature</b>	Operating: -20°C to 55°C (with no icing)
<b>Ambient humidity</b>	Operating: 45% to 85%
<b>Insulation resistance</b>	20 M $\Omega$ min. (at 500 VDC)
<b>Dielectric strength</b>	1,500 VAC, 50/60 Hz for 1 min
<b>Vibration resistance</b>	Destruction: 10 to 25 Hz, 1.5-mm double amplitude for 2 hrs each in X, Y, and Z directions
<b>Shock resistance</b>	Destruction: 500 m/s <sup>2</sup> (approx. 50G) 3 times each in $\pm$ X, $\pm$ Y, and $\pm$ Z directions
<b>Life expectancy (output relay)</b>	<b>Mechanical</b> 20,000,000 operations min. <b>Electrical</b> 100,000 operations min.
<b>Enclosure rating</b>	IEC IP60
<b>Weight</b>	Approx. 500 g without Mounting Bracket Approx. 600 g with Mounting Bracket

**Note:** Models operating at 12 to 24 VDC are available. Specify the supply voltage when ordering.

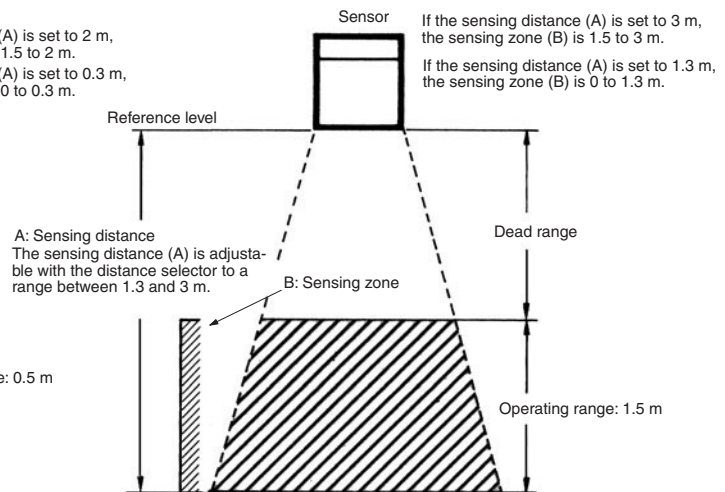
## ■ Operating and Dead Ranges

### 1. Distance Selector Set to a Range Between 0.3 and 2 m



The distance from the reference level to the operating range (detection zone).

### 2. Distance Selector Set to a Range Between 1.3 and 3 m



The distance from the reference level to the operating range (detection zone).

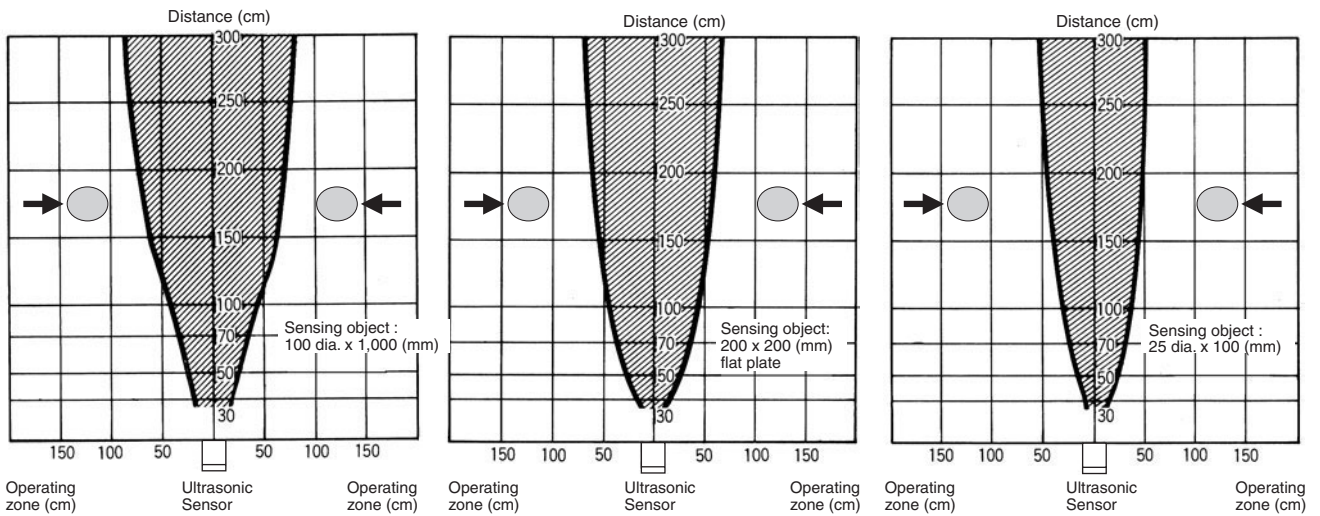
An object may be detected due to multiple reflection if the object is in the dead range, in which case however, the detection of the object will not be stable. Therefore, do not attempt to use the E4A-3K to detect an object in the dead range by making use of multiple reflection.

**Note:** Multiple reflection is a phenomenon caused by an ultrasonic beam reflected several times repeatedly between the sensing object and the Sensor or nearby objects such as the ceiling.

# Engineering Data

## ■ Operating Zone (Typical Examples)

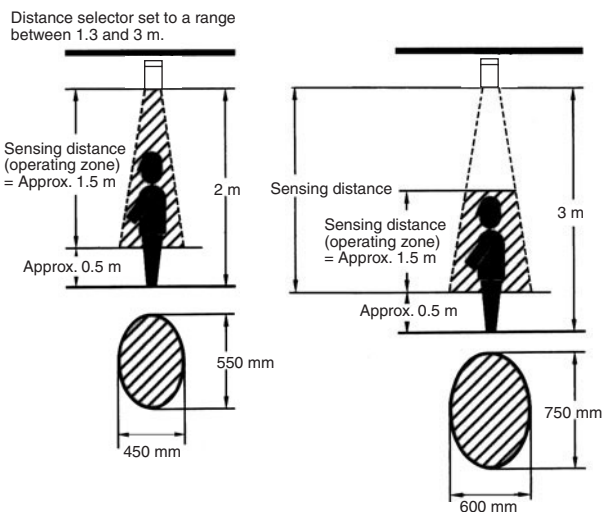
The operating zone is the sensing range of the E4A-3K at the sensing distance with the sensing object moved vertically towards the ultrasonic beam. The operating zone varies with the sensing distance and sensing object.



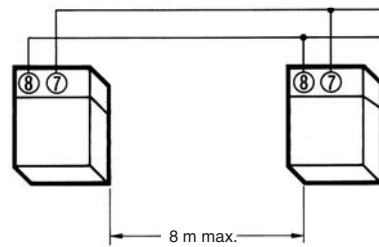
### Reference

- Each of the following illustrations indicates the operating zone with the E4A-3K mounted to the ceiling for the purpose of detecting the human body. In either case, make sure that the lower limit of the sensing range is approximately 0.5 m above the floor so that the floor will not be detected.

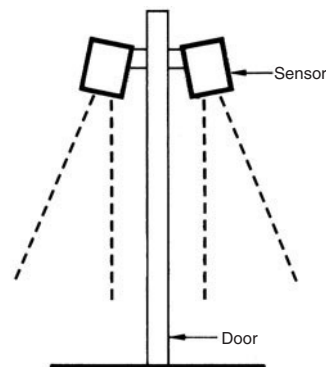
### Typical Example



- If more than one Unit is used within a maximum distance of 8 m, be sure to wire the Units so that the Units will be in synchronous operation. Refer to *External Connections* for details.



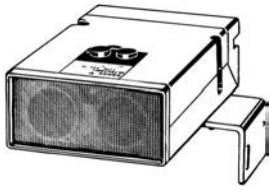
- If there is a door between two Units located for different operating zones as shown in the following illustration, be sure to wire the Units so that the Units will be in synchronous operation.



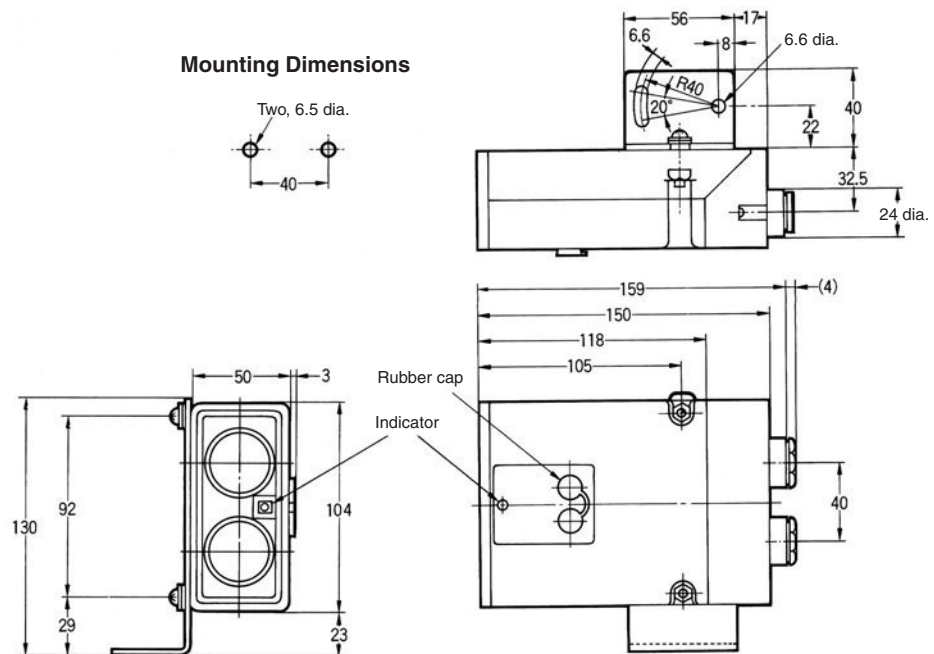
# Dimensions

**Note:** All units are in millimeters unless otherwise indicated.

## E4A-3K



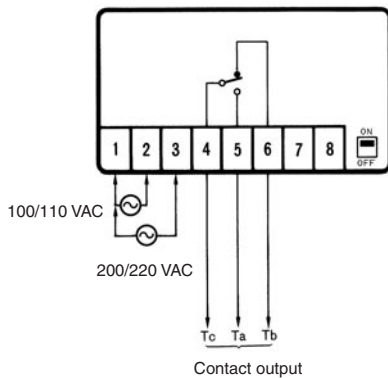
### Mounting Dimensions



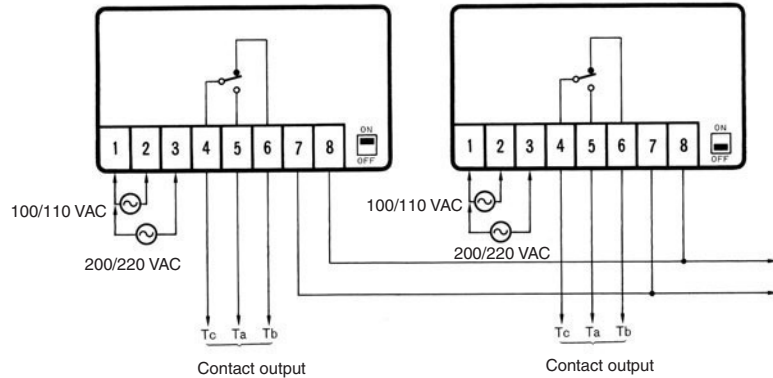
# Installation

## External Connections

### Example of Connections of the E4A-3K in Asynchronous Operation



### Example of Connections of the E4A-3K in Synchronous Operation



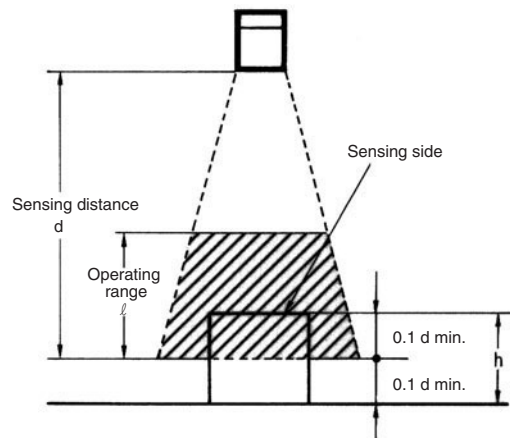
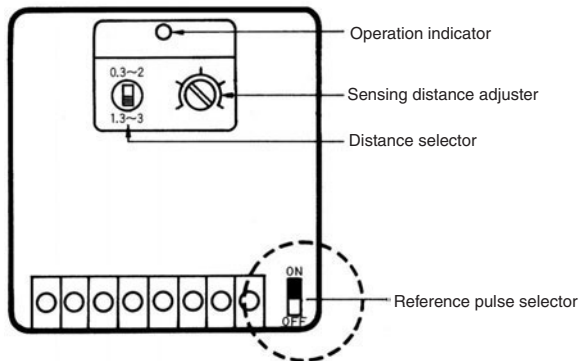
- Note:**
1. If the synchronous operation of the E4A-3K is not required, set the reference pulse selector to ON. Keep terminals 7 and 8 open.
  2. Use a cable with an external diameter of 10 mm max. for wiring.

- Note:**
1. If the synchronous operation of the E4A-3K is required, set the reference pulse selector of only one Unit to ON. Then connect terminal 7 of all the Units together and do the same for terminal 8.
  2. A maximum of 50 Units can be connected in synchronous operation.
  3. Do not wire the lines for synchronous operation use (i.e., wires connecting to terminals 7 and 8) alongside power lines in the same conduit.
  4. Use a shielded cable with an external diameter of 10 mm max. for wiring.
  5. Make sure that all the Units in synchronous operation are turned on, otherwise none of the Units will operate.

# Adjustments

## Reference Pulse Selector Position

If more than one Unit is used at one location, the Units will need to be in synchronous operation to prevent mutual interference. In that case, set the reference pulse selector of only one Unit to ON. Set the reference pulse selector of each Unit to OFF if the Units are in asynchronous operation. Refer to *External Connections* for details.



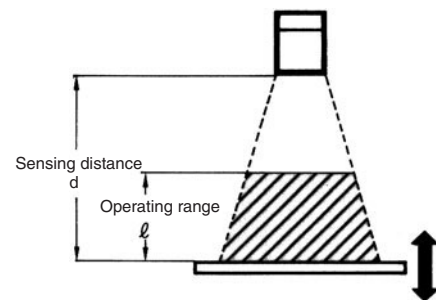
From the above, the minimum height ( $h$ ) of the sensing object is expressed by  $0.2d$ . If the sensing object is comparatively low in height or if the E4A-3K is used for the delicate height discrimination of objects, it will be necessary to set the sensing distance to a small value.

- If the sensing object is moving parallel to the ultrasonic beam for level or height detection, the sensing distance will be the distance required for the sensing object to move.

## Sensing Distance Adjustments

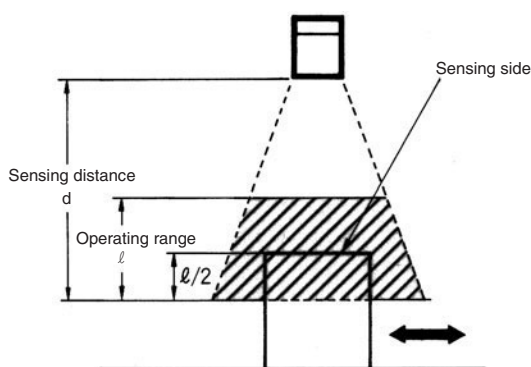
Before adjusting the sensing distance, remove the rubber cap from the top of the E4A-3K. Be sure to put on the rubber cap after the sensing distance is adjusted.

1. Apply a flat-blade screwdriver to the groove of the distance selector to set the distance selector to either a range between 0.3 and 2 m or a range between 1.3 and 3 m according to the desired sensing distance and operating range.
2. To set the sensing distance, first locate a flat plate as a sensing object that is approximately 20-by-20 cm at the desired sensing distance. Then gradually turn the sensing distance adjuster clockwise (i.e., in the direction increasing the sensing distance) until the relay operates. The operation indicator will be lit when the relay operates.



## Standard Sensing Distance Settings

- If the sensing object is moving vertically towards the ultrasonic beam (i.e., the E4A-3K is in normal sensing operation), set the sensing distance so that the sensing side of the object passes through the center of the operating range as shown in the following illustration.

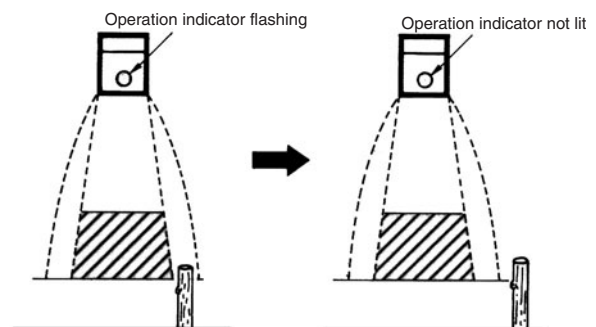


If there is an object, such as a floor, wall, or conveyor, located behind the sensing object, make sure that the distance between the set sensing distance ( $d$ ) and the background object is  $0.1d$  min. Furthermore, make sure that the set sensing distance ( $d$ ) is at least  $0.1d$  closer to the Sensor from the maximum limit of the operating range as shown in the following illustration.

## Operation Check

After adjusting the sensing distance, check that the E4A-3K operates properly by locating the sensing object within the operating range. Then remove the sensing object and check that the operation indicator is not lit. The operation indicator may be still be lit or flashing after the sensing object is removed. In that case, the E4A-3K may be malfunctioning due to beam reflection from objects outside the operating range or affected by ambient wind or temperature, in which case, eliminate the cause or change the mounting position or direction of the Sensor.

If the mounting position or direction of the Sensor is changed, be sure to check the sensing distance and the operation of the E4A-3K.



# Precautions

## ■ Correct Use

### Sensor Mounting Angle

If the E4A-3K is in level control or distance control of sensing objects, the stability of signal detection will depend on the sensing surface condition of the objects. Considering the repose angle of the objects, mount the E4A-3K so that the ultrasonic beam and the sensing surface of each object meet at right angles to each other.

### Surrounding Objects

Make sure that the Sensor is free from surrounding objects that reflect the ultrasonic beam diffusion, otherwise the Sensor may malfunction. In particular, pay the utmost attention so that no side lobe of the ultrasonic beam will be reflected by such objects.

### Mounting

Securely mount the E4A-3K by using the nuts provided with the E4A-3K or the mounting holes of the E4A-3K. Refer to *Dimensions* for details.

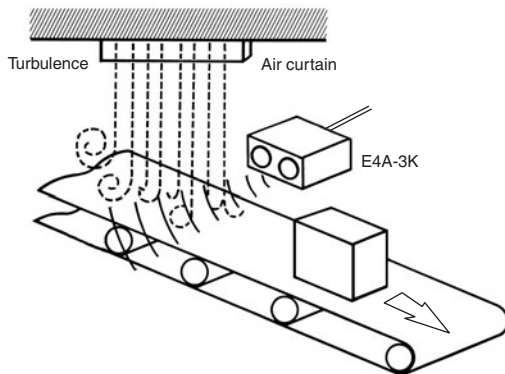
Do not strike the Sensor with any hammer or other object, otherwise the E4A-3K will no longer be water-resistant.

If the E4A-3K is not mounted securely, the E4A-3K may be damaged by vibration or may not detect sensing objects accurately due to a possible change in the mounting position.

### Environmental Conditions

Do not use the E4A-3K at a temperature exceeding the rated range or outdoors, otherwise the reliability and life of the E4A-3K will decrease.

The Ultrasonic Reflective Sensor utilizes the air as a beam transmission media. Do not use the E4A-3K in places with radical convection or extreme local temperature changes. For example, if there is a hot air curtain that causes turbulence within the sensing area, the E4A-3K may malfunction.



The jetting sound of air nozzles includes noise of a wide frequency range, which will affect the operation of the E4A-3K. Do not use an air nozzle near the E4A-3K.

The sensing distance of the E4A-3K will decrease if there is any water drops on the surface of the emitter or receiver.

The reflective model may not detect any objects if there is any object absorbing sound, such as powder and cotton, on the surface of the emitter or receiver.

**ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.**

To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

# Terms and Conditions of Sale

1. **Offer; Acceptance.** These terms and conditions (these "**Terms**") are deemed part of all quotes, agreements, purchase orders, acknowledgments, price lists, catalogs, manuals, brochures and other documents, whether electronic or in writing, relating to the sale of products or services (collectively, the "**Products**") by Omron Electronics LLC and its subsidiary companies ("**Omron**"). Omron objects to any terms or conditions proposed in Buyer's purchase order or other documents which are inconsistent with, or in addition to, these Terms.
2. **Prices; Payment Terms.** All prices stated are current, subject to change without notice by Omron. Omron reserves the right to increase or decrease prices on any unshipped portions of outstanding orders. Payments for Products are due net 30 days unless otherwise stated in the invoice.
3. **Discounts.** Cash discounts, if any, will apply only on the net amount of invoices sent to Buyer after deducting transportation charges, taxes and duties, and will be allowed only if (i) the invoice is paid according to Omron's payment terms and (ii) Buyer has no past due amounts.
4. **Interest.** Omron, at its option, may charge Buyer 1-1/2% interest per month or the maximum legal rate, whichever is less, on any balance not paid within the stated terms.
5. **Orders.** Omron will accept no order less than \$200 net billing.
6. **Governmental Approvals.** Buyer shall be responsible for, and shall bear all costs involved in, obtaining any government approvals required for the importation or sale of the Products.
7. **Taxes.** All taxes, duties and other governmental charges (other than general real property and income taxes), including any interest or penalties thereon, imposed directly or indirectly on Omron or required to be collected directly or indirectly by Omron for the manufacture, production, sale, delivery, importation, consumption or use of the Products sold hereunder (including customs duties and sales, excise, use, turnover and license taxes) shall be charged to and remitted by Buyer to Omron.
8. **Financial.** If the financial position of Buyer at any time becomes unsatisfactory to Omron, Omron reserves the right to stop shipments or require satisfactory security or payment in advance. If Buyer fails to make payment or otherwise comply with these Terms or any related agreement, Omron may (without liability and in addition to other remedies) cancel any unshipped portion of Products sold hereunder and stop any Products in transit until Buyer pays all amounts, including amounts payable hereunder, whether or not then due, which are owing to it by Buyer. Buyer shall in any event remain liable for all unpaid accounts.
9. **Cancellation; Etc.** Orders are not subject to rescheduling or cancellation unless Buyer indemnifies Omron against all related costs or expenses.
10. **Force Majeure.** Omron shall not be liable for any delay or failure in delivery resulting from causes beyond its control, including earthquakes, fires, floods, strikes or other labor disputes, shortage of labor or materials, accidents to machinery, acts of sabotage, riots, delay in or lack of transportation or the requirements of any government authority.
11. **Shipping; Delivery.** Unless otherwise expressly agreed in writing by Omron:
  - a. Shipments shall be by a carrier selected by Omron; Omron will not drop ship except in "break down" situations.
  - b. Such carrier shall act as the agent of Buyer and delivery to such carrier shall constitute delivery to Buyer;
  - c. All sales and shipments of Products shall be FOB shipping point (unless otherwise stated in writing by Omron), at which point title and risk of loss shall pass from Omron to Buyer; provided that Omron shall retain a security interest in the Products until the full purchase price is paid;
  - d. Delivery and shipping dates are estimates only; and
  - e. Omron will package Products as it deems proper for protection against normal handling and extra charges apply to special conditions.
12. **Claims.** Any claim by Buyer against Omron for shortage or damage to the Products occurring before delivery to the carrier must be presented in writing to Omron within 30 days of receipt of shipment and include the original transportation bill signed by the carrier noting that the carrier received the Products from Omron in the condition claimed.
13. **Warranties.** (a) **Exclusive Warranty.** Omron's exclusive warranty is that the Products will be free from defects in materials and workmanship for a period of twelve months from the date of sale by Omron (or such other period expressed in writing by Omron). Omron disclaims all other warranties, express or implied. (b) **Limitations.** OMRON MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, ABOUT NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OF THE PRODUCTS. BUYER ACKNOWLEDGES THAT IT ALONE HAS DETERMINED THAT THE PRODUCTS WILL SUITABLY MEET THE REQUIREMENTS OF THEIR INTENDED USE. Omron further disclaims all warranties and responsibility of any type for claims or expenses based on infringement by the Products or otherwise of any intellectual property right. (c) **Buyer Remedy.** Omron's sole obligation hereunder shall be, at Omron's election, to (i) replace (in the form originally shipped with Buyer responsible for labor charges for removal or replacement thereof) the non-complying Product, (ii) repair the non-complying Product, or (iii) repay or credit Buyer an amount equal to the purchase price of the non-complying Product; provided that in no event shall Omron be responsible for warranty, repair, indemnity or any other claims or expenses 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. Return of any Products by Buyer must be approved in writing by Omron before shipment. Omron Companies shall not be liable for the suitability or unsuitability or the results from the use of Products in combination with any electrical or electronic components, circuits, system assemblies or any other materials or substances or environments. Any advice, recommendations or information given orally or in writing, are not to be construed as an amendment or addition to the above warranty. See <http://www.omron247.com> or contact your Omron representative for published information.
14. **Limitation on Liability; Etc.** OMRON COMPANIES SHALL NOT BE LIABLE FOR SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITS OR PRODUCTION OR COMMERCIAL LOSS IN ANY WAY CONNECTED WITH THE PRODUCTS, WHETHER SUCH CLAIM IS BASED IN CONTRACT, WARRANTY, NEGLIGENCE OR STRICT LIABILITY. Further, in no event shall liability of Omron Companies exceed the individual price of the Product on which liability is asserted.
15. **Indemnities.** Buyer shall indemnify and hold harmless Omron Companies and their employees from and against all liabilities, losses, claims, costs and expenses (including attorney's fees and expenses) related to any claim, investigation, litigation or proceeding (whether or not Omron is a party) which arises or is alleged to arise from Buyer's acts or omissions under these Terms or in any way with respect to the Products. Without limiting the foregoing, Buyer (at its own expense) shall indemnify and hold harmless Omron and defend or settle any action brought against such Companies to the extent based on a claim that any Product made to Buyer specifications infringed intellectual property rights of another party.
16. **Property; Confidentiality.** Any intellectual property in the Products is the exclusive property of Omron Companies and Buyer shall not attempt to duplicate it in any way without the written permission of Omron. Notwithstanding any charges to Buyer for engineering or tooling, all engineering and tooling shall remain the exclusive property of Omron. All information and materials supplied by Omron to Buyer relating to the Products are confidential and proprietary, and Buyer shall limit distribution thereof to its trusted employees and strictly prevent disclosure to any third party.
17. **Export Controls.** Buyer shall comply with all applicable laws, regulations and licenses regarding (i) export of products or information; (ii) sale of products to "forbidden" or other proscribed persons; and (iii) disclosure to non-citizens of regulated technology or information.
18. **Miscellaneous.** (a) **Waiver.** No failure or delay by Omron in exercising any right and no course of dealing between Buyer and Omron shall operate as a waiver of rights by Omron. (b) **Assignment.** Buyer may not assign its rights hereunder without Omron's written consent. (c) **Law.** These Terms are governed by the law of the jurisdiction of the home office of the Omron company from which Buyer is purchasing the Products (without regard to conflict of law principles). (d) **Amendment.** These Terms constitute the entire agreement between Buyer and Omron relating to the Products, and no provision may be changed or waived unless in writing signed by the parties. (e) **Severability.** If any provision hereof is rendered ineffective or invalid, such provision shall not invalidate any other provision. (f) **Setoff.** Buyer shall have no right to set off any amounts against the amount owing in respect of this invoice. (g) **Definitions.** As used herein, "including" means "including without limitation"; and "Omron Companies" (or similar words) mean Omron Corporation and any direct or indirect subsidiary or affiliate thereof.

## Certain Precautions on Specifications and Use

1. **Suitability of Use.** Omron Companies shall not be responsible for conformity with any standards, codes or regulations which apply to the combination of the Product in the Buyer's application or use of the Product. At Buyer's request, Omron will provide applicable third party certification documents identifying ratings and limitations of use which apply to the Product. This information by itself is not sufficient for a complete determination of the suitability of the Product in combination with the end product, machine, system, or other application or use. Buyer shall be solely responsible for determining appropriateness of the particular Product with respect to Buyer's application, product or system. Buyer shall take application responsibility in all cases but the following is a non-exhaustive list of applications for which particular attention must be given: (i) Outdoor use, uses involving potential chemical contamination or electrical interference, or conditions or uses not described in this document. (ii) Use in consumer products or any use in significant quantities. (iii) 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. (iv) Systems, machines and equipment that could present a risk to life or property. Please know and observe all prohibitions of use applicable to this Product. NEVER USE THE PRODUCT FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY OR IN LARGE QUANTITIES WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON'S PRODUCT IS PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.
2. **Programmable Products.** Omron Companies shall not be responsible for the user's programming of a programmable Product, or any consequence thereof.
3. **Performance Data.** Data presented in Omron Company websites, catalogs and other materials 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 user must correlate it to actual application requirements. Actual performance is subject to the Omron's Warranty and Limitations of Liability.
4. **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 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's representative at any time to confirm actual specifications of purchased Product.
5. **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.

**OMRON AUTOMATION AND SAFETY • THE AMERICAS HEADQUARTERS** • Chicago, IL USA • 847.843.7900 • 800.556.6766 • [www.omron247.com](http://www.omron247.com)

**OMRON CANADA, INC. • HEAD OFFICE**

Toronto, ON, Canada • 416.286.6465 • 866.986.6766 • [www.omron247.com](http://www.omron247.com)

**OMRON ELECTRONICS DE MEXICO • HEAD OFFICE**

México DF • 52.55.59.01.43.00 • 01-800-226-6766 • [mela@omron.com](mailto:mela@omron.com)

**OMRON ELECTRONICS DE MEXICO • SALES OFFICE**

Apodaca, N.L. • 52.81.11.56.99.20 • 01-800-226-6766 • [mela@omron.com](mailto:mela@omron.com)

**OMRON ELETRÔNICA DO BRASIL LTDA • HEAD OFFICE**

São Paulo, SP, Brasil • 55.11.2101.6300 • [www.omron.com.br](http://www.omron.com.br)

**OMRON ARGENTINA • SALES OFFICE**

Cono Sur • 54.11.4783.5300

**OMRON CHILE • SALES OFFICE**

Santiago • 56.9.9917.3920

**OTHER OMRON LATIN AMERICA SALES**

54.11.4783.5300

**OMRON EUROPE B.V.** • Wegalaan 67-69, NL-2132 JD, Hoofddorp, The Netherlands. • +31 (0) 23 568 13 00 • [www.industrial.omron.eu](http://www.industrial.omron.eu)

*Authorized Distributor:*

**Automation Control Systems**

- Machine Automation Controllers (MAC) • Programmable Controllers (PLC)
- Operator interfaces (HMI) • Distributed I/O • Software

**Drives & Motion Controls**

- Servo & AC Drives • Motion Controllers & Encoders

**Temperature & Process Controllers**

- Single and Multi-loop Controllers

**Sensors & Vision**

- Proximity Sensors • Photoelectric Sensors • Fiber-Optic Sensors
- Amplified Photomicrosensors • Measurement Sensors
- Ultrasonic Sensors • Vision Sensors

**Industrial Components**

- RFID/Code Readers • Relays • Pushbuttons & Indicators
- Limit and Basic Switches • Timers • Counters • Metering Devices
- Power Supplies

**Safety**

- Laser Scanners • Safety Mats • Edges and Bumpers • Programmable Safety Controllers • Light Curtains • Safety Relays • Safety Interlock Switches