OMRON

Infrared Thermosensor
ES1B

Achieve Low-cost Measurements with an Infrared Thermosensor.

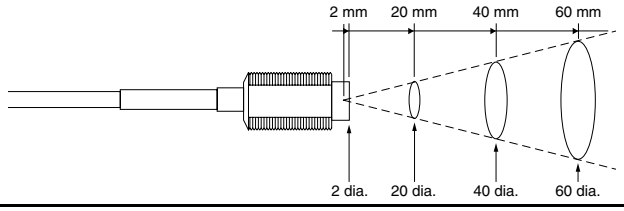
- Non-contact measurement.
- The ES1B has an electromotive output as high as that of a thermocouple, thus connecting directly to the thermocouple input terminal of the Temperature Controller is possible.
- Four temperature ranges are available to cover a wide range of temperature measurement needs, including those in the food processing, packaging, molding, and electronics industries.
- High-accuracy temperature measurement is ensured by a high-speed response of 300 ms (for a 63% response) and an indication reproducibility of ±1% PV.
- Unlike thermocouples, the Thermosensor does not deteriorate. Therefore, stable, real-time temperature control can be maintained.

NEW

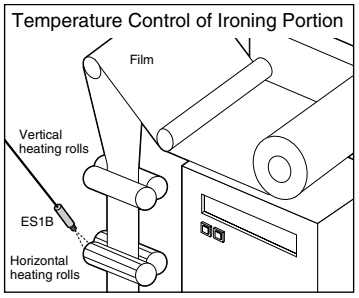
Ordering Information

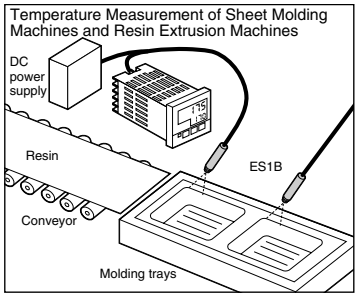
■ List of Models

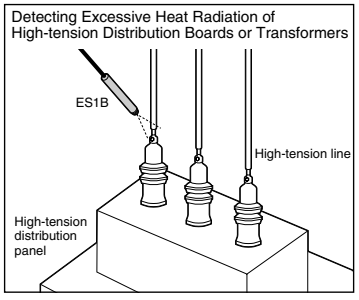
Stock Note: Shaded models are normally stocked.

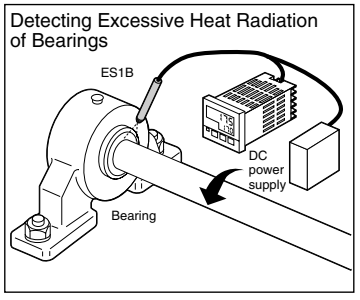
Appearance and sensing characteristic	Specification (temperature range)	Model
	10 to 70°C	ES1B 10-70C
	60 to 120°C	ES1B 60-120C
	115 to 165°C	ES1B 115-165C
	140 to 260°C	ES1B 140-260C

Application Examples









Note: 1. Either a 12 VDC or 24 VDC power supply is required for the ES1B.

2. The ES1B cannot be used with OMRON's E5ZE Multipoint Temperature Controller. (It can be used with the E5ZN, E5AR, and E5ER.)

Specifications

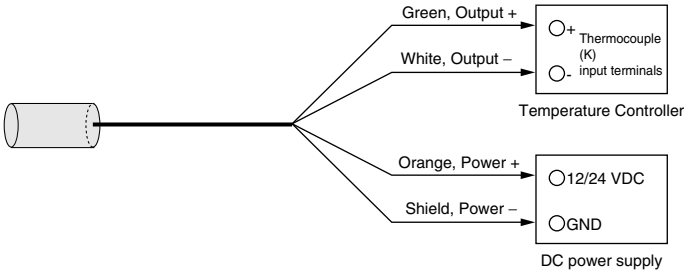
■ Ratings/Characteristics

Item		ES1B
Power supply voltage		12/24 VDC
Operating voltage range		90% to 110% of the power supply voltage
Current consumption		20 mA max.
Measuring temperature range		10 to 70°C, 60 to 120°C, 115 to 165°C, 140 to 260°C
Accuracy (See note 1.)	**±5°C (See note 2.)**	±2% PV or ±2°C, whichever is larger
	±10°C (See note 2.)	±4% PV or ±4°C, whichever is larger
	±30°C (See note 2.)	±6% PV or ±6°C, whichever is larger
	±40°C (See note 2.)	±8% PV or ±8°C, whichever is larger
Reproducibility		±1% PV or ±1°C, whichever is larger
Temperature drift		0.4°C/°C max.
Sensing distance vs. sensing diameter		1:1 typ.
Measurement wavelength		6.5 to 14.0 μm
Receiver element		Thermopile
Response speed		Approximately 300 ms at response rate of 63%
Output impedance		1 to 4 kΩ
Operating temperature		–25°C to 70°C (with no icing or condensation)
Allowable ambient humidity		35% to 85%
Vibration resistance (destruction)		98 m/s^2 for 2 hours each in X, Y, and Z directions at 10 to 55 Hz
Shock resistance (destruction)		300 m/s^2 for 3 times each in X, Y, and Z directions
Casing material		ABS resin
Degree of protection		IP65
Weight		Approx. 120 g
Cable		Compensating conductor: 3 m
		PVC-covered cable with a shield wire resisting 70°C

Note: 1. Based on characteristics of K-type thermocouple and radiation rate of 0.9.

2. The accuracy is given as the change in temperature from any reference temperature of the sensing object. For example, if the reference temperature is 50°C, the accuracy at 55°C would be ±2% PV or ±2°C, whichever is larger and the accuracy at 60°C would be ±4% PV or ±4°C, whichever is larger.

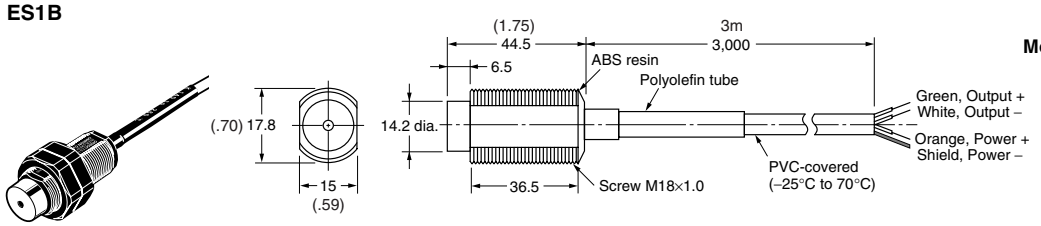
Connections



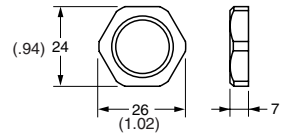
Dimensions

Note: All units are in millimeters unless otherwise indicated (inch).

ES1B



Mounting Lock Nuts (Two) (Provided)

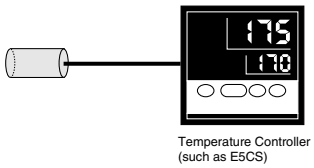


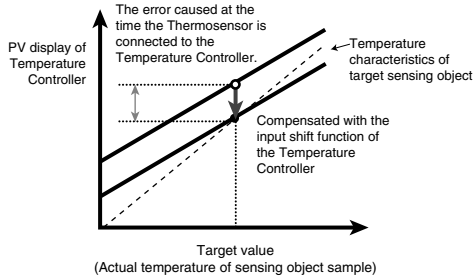
Adjustment Methods

Adjust the Thermosensor as described below before using it.

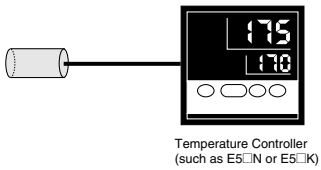
Adjust the Thermosensor according to the conditions of the sensing object and characteristics of the Temperature Controller.

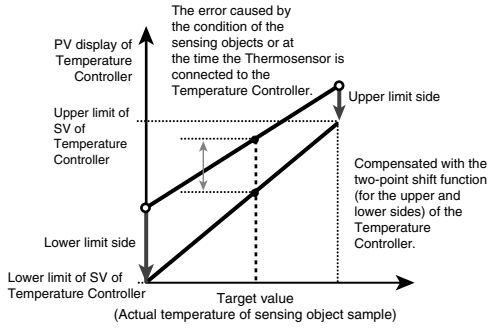
Offset Compensation for Target Value with Input Shift Function





Gain and Offset Compensation with Two-point Shift Function



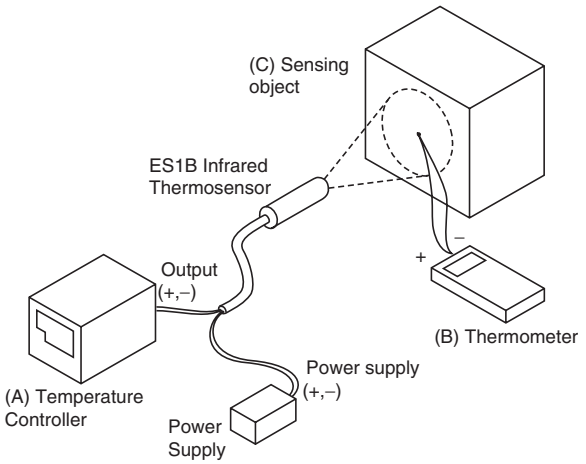


■ One-point Input Shift

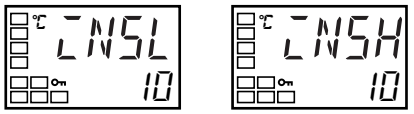
Preparations

- Set a temperature input range that is suitable for the input specifications of the Infrared Thermosensor.
- Prepare a thermometer to measure the temperature of the sensing object as shown in figure 1, below.

Configuration for Offsetting the Infrared Thermosensor Input (Figure 1)



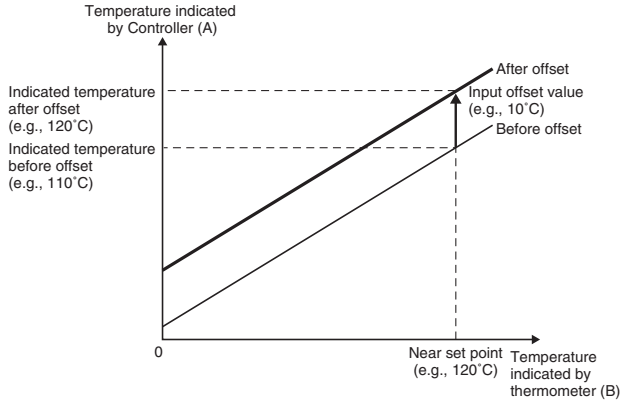
Example for the E5CN



Lower-limit temperature input | Upper-limit temperature input

1. Adjust the temperature of the sensing object (C) in the configuration shown in figure 1 to near the set point. We will assume that the temperature indicated on the thermometer is the actual temperature of the sensing object.
2. Check the temperature of the sensing object (C) and the temperature indicated on the Controller (A) and set both the upper-limit and lower-limit temperature input settings to the following value: Temperature C (sensing object) - Temperature A (Controller)
3. Check the temperature of the sensing object (C) and the temperature indicated on the Controller (A) again. If they are about the same, then the offset has been properly set.

Diagram of One-point Input Shift



■ Two-point Input Shift

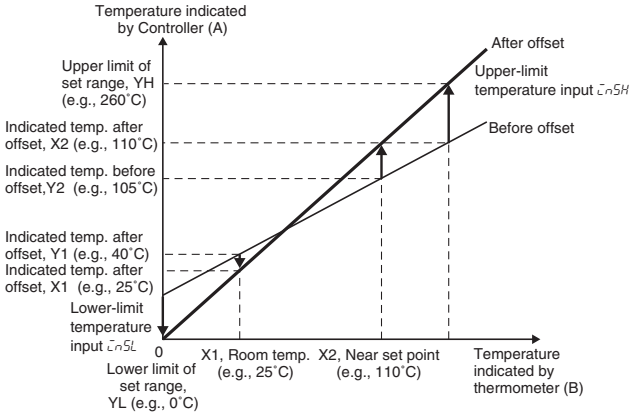
Use a two-point input shift to output more accurate display values.

Preparations

Refer to the preparations for a one-point input shift.

1. The input value is shifted at two points: near room temperature and near the set point. Check the temperature of the sensing object (C) and the temperature indicated on the Controller (A) at both near room temperature and near the set point.
2. Use the following formulas to calculate the upper-limit temperature input and lower-limit temperature input settings based on the values checked above.

Diagram of Two-point Input Shift



Lower-limit Temperature Input Setting

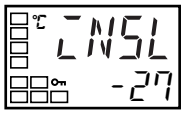
$$\text{Lower-limit temperature input} = \frac{YL-Y1}{Y2-Y1} \times \{(X2-Y2)-(X1-Y1)\}+(X1-Y1)$$

Upper-limit Temperature Input Setting

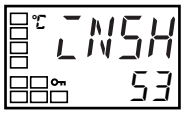
$$\text{Upper-limit temperature input} = \frac{YH-Y1}{Y2-Y1} \times \{(X2-Y2)-(X1-Y1)\}+(X1-Y1)$$

3. Set both the upper-limit and lower-limit temperature input settings and then check the temperature of the sensing object (C) and the temperature indicated on the Controller (A) both near room temperature and near the set point.
4. Although we have used two points, near room temperature and near the set point, accuracy can be increased further by using another point within the measurement temperature range other than the set value of room temperature.

Example for the E5CN



Lower-limit temperature input



Upper-limit temperature input

In this example, the ES1B is used between 140 and 260°C. Here, the set point lower limit, YL, would be 0°C and the set point upper limit, YH, would be 260°C in formulas 1 and 2. The temperatures of the sensing object are checked next.

The offset values can be calculated as shown below when the Controller display Y1 is 40°C for a room temperature X1 of 25°C and when the Controller display Y2 is 105°C for a set point temperature X2 of 110°C

Upper-limit Temperature Input Setting

$$-nSL = \frac{0-40}{105-40} \times \{(110-105)-(25-40)\}+(25-40)$$

$$= -27.3\ (°C)$$

Lower-limit Temperature Input Setting

$$-nSH = \frac{260-40}{105-40} \times \{(110-105)-(25-40)\}+(25-40)$$

$$= 52.7\ (°C)$$

Precautions

⚠ CAUTION

If this product should malfunction and cease to provide correct output, property damage may occur to the equipment or device that is connected to it. To prevent this, provide additional safety measures by also connecting the equipment or devices to a separate alarm system that will warn operators of temperature increase.

Precautions for Safe Use

1. Use the ES1B only within the ranges specified by its specifications and ratings.
2. Be sure to correctly wire the input sensor leads to the proper positive and negative terminals.
3. Do not use the product in the following locations:
   - Locations subject to icing or condensation.
   - Locations subject to excessive shocks or vibration.
   - Locations subject to dust or corrosive gases.
   - Locations subject to extreme temperature changes or direct sunlight.
   - Locations subject to water splashing or oil contact.

Precautions for Correct Use

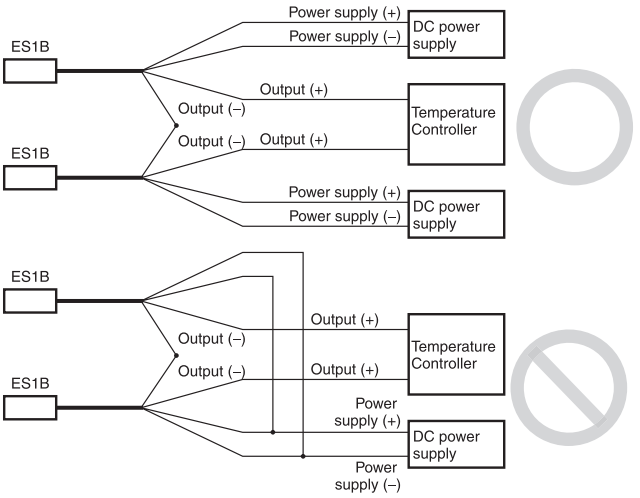
1. The thermocouple output and power supply are not isolated. Make sure that unwanted circuit paths are not formed with the equipment or device that is connected to the product.
2. To prevent inductive noise, wire the product separately from high-voltage sources and power lines carrying large currents. Also avoid parallel wiring or shared wiring paths with power lines.
3. Do not allow the filter to become soiled. Use air blow or use a thin cotton swab to clean the filter.

1. Installation

- Select a place where the emissivity is high for measuring the target. If necessary, use black spray or black tape.
- Use the supplied locknuts to fix the ES1B securely in place. Tighten to a torque of 0.5 N·m max.
- When measuring a high-temperature object, use a shield or similar protection to prevent the temperature of the ES1B from rising.

2. Connection

- Connect to the green output lead wire (+), white output lead wire (–), orange power supply lead wire (+), and shield power supply wire (–).
- To measure the temperature difference between two locations, use two isolated power supplies.



3. Adjustment

- The output impedance of the ES1B is 1 to 4 kΩ. Normally, current leaking to the ES1B from the burnout detection circuit of the temperature controller will offset the measured temperature in a range extending from several degrees to several tens of degrees. When using a controller equipped with an input shift function, use the input shift function to compensate for this offset error in the vicinity of the measuring temperature. For details on this compensation, see Input Shift Method section and the user's manual of the controller being used.
- If the length of a lead wire must be extended, use a K thermocouple compensating conductor for the output lead wires (+, –), and standard copper wire for power supply leads (+, –).
- Do not bend lead wires repeatedly.

4. Cleaning

- Do not use paint thinner or the equivalent for cleaning. Use standard grade alcohol.

Certain Terms and Conditions of Sale

1. Offer; Acceptance. These terms and conditions (these "Terms") are deemed part of all catalogs, manuals or other documents, whether electronic or in writing, relating to the sale of goods or services (collectively, the "Goods") by Omron Electronics LLC and its subsidiary companies ("Seller"). Seller hereby 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. Please contact your Omron representative to confirm any additional terms for sales from your Omron company.
2. Prices. All prices stated are current, subject to change without notice by Seller. Buyer agrees to pay the price in effect at time of shipment.
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 Seller's payment terms and (ii) Buyer has no past due amounts owing to Seller.
4. Orders. Seller will accept no order less than $200 net billing.
5. 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 Goods.
6. 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 Seller or required to be collected directly or indirectly by Seller for the manufacture, production, sale, delivery, importation, consumption or use of the Goods sold hereunder (including customs duties and sales, excise, use, turnover and license taxes) shall be charged to and remitted by Buyer to Seller.
7. Financial. If the financial position of Buyer at any time becomes unsatisfactory to Seller, Seller 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, Seller may (without liability and in addition to other remedies) cancel any unshipped portion of Goods sold hereunder and stop any Goods 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.
8. Cancellation; Etc. Orders are not subject to rescheduling or cancellation unless Buyer indemnifies Seller fully against all costs or expenses arising in connection therewith.
9. Force Majeure. Seller 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.
10. Shipping; Delivery. Unless otherwise expressly agreed in writing by Seller:
    a. Shipments shall be by a carrier selected by Seller;
    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 Goods shall be FOB shipping point (unless otherwise stated in writing by Seller), at which point title to and all risk of loss of the Goods shall pass from Seller to Buyer, provided that Seller shall retain a security interest in the Goods until the full purchase price is paid by Buyer;
    d. Delivery and shipping dates are estimates only.
    e. Seller will package Goods as it deems proper for protection against normal handling and extra charges apply to special conditions.
11. Claims. Any claim by Buyer against Seller for shortage or damage to the Goods occurring before delivery to the carrier must be presented in writing to Seller within 30 days of receipt of shipment and include the original transportation bill signed by the carrier noting that the carrier received the Goods from Seller in the condition claimed.
12. Warranties. (a) Exclusive Warranty. Seller's exclusive warranty is that the Goods will be free from defects in materials and workmanship for a period of twelve months from the date of sale by Seller (or such other period expressed in writing by Seller). Seller disclaims all other warranties, express or implied. (b) Limitations. SELLER MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, ABOUT NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OF THE GOODS. BUYER ACKNOWLEDGES THAT IT ALONE HAS DETERMINED THAT THE GOODS WILL SUITABLY MEET THE REQUIREMENTS OF THEIR INTENDED USE. Seller further disclaims all warranties and responsibility of any type for claims or expenses based on infringement by the Goods or otherwise of any intellectual property right. (c) Buyer Remedy. Seller's sole obligation hereunder shall be to replace (in the form originally shipped with Buyer responsible for labor charges for removal or replacement thereof) the non-complying Good or, at Seller's election, to repay or credit Buyer an amount equal to the purchase price of the Good; provided that in no event shall Seller be responsible for warranty, repair, indemnity or any other claims or expenses regarding the Goods unless Seller's analysis confirms that the Goods were properly handled, stored, installed and maintained and not subject to contamination, abuse, misuse or inappropriate modification. Return of any goods by Buyer must be approved in writing by Seller before shipment. Seller shall not be liable for the suitability or unsuitability or the results from the use of Goods 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.
13. Damage Limits; Etc. SELLER SHALL NOT BE LIABLE FOR SPECIAL, INDIRECT OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITS OR PRODUCTION OR COMMERCIAL LOSS IN ANY WAY CONNECTED WITH THE GOODS, WHETHER SUCH CLAIM IS BASED IN CONTRACT, WARRANTY, NEGLIGENCE OR STRICT LIABILITY. Further, in no event shall liability of Seller exceed the individual price of the Good on which liability is asserted.
14. Indemnities. Buyer shall indemnify and hold harmless Seller, its affiliates and its 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 Seller 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 Goods. Without limiting the foregoing, Buyer (at its own expense) shall indemnify and hold harmless Seller and defend or settle any action brought against Seller to the extent that it is based on a claim that any Good made to Buyer specifications infringed intellectual property rights of another party.
15. Property; Confidentiality. The intellectual property embodied in the Goods is the exclusive property of Seller and its affiliates and Buyer shall not attempt to duplicate it in any way without the written permission of Seller. Notwithstanding any charges to Buyer for engineering or tooling, all engineering and tooling shall remain the exclusive property of Seller. All information and materials supplied by Seller to Buyer relating to the Goods are confidential and proprietary, and Buyer shall limit distribution thereof to its trusted employees and strictly prevent disclosure to any third party.
16. Miscellaneous. (a) Waiver. No failure or delay by Seller in exercising any right and no course of dealing between Buyer and Seller shall operate as a waiver of rights by Seller. (b) Assignment. Buyer may not assign its rights hereunder without Seller's written consent. (c) Amendment. These Terms constitute the entire agreement between Buyer and Seller relating to the Goods, and no provision may be changed or waived unless in writing signed by the parties. (d) Severability. If any provision hereof is rendered ineffective or invalid, such provision shall not invalidate any other provision. (e) Setoff. Buyer shall have no right to set off any amounts against the amount owing in respect of this invoice. (f) As used herein, "including" means "including without limitation".

Certain Precautions on Specification and Use

1. Suitability of Use. Seller shall not be responsible for conformity with any standards, codes or regulations which apply to the combination of the Good in the Buyer's application or use of the Good. At Buyer's request, Seller will provide applicable third party certification documents identifying ratings and limitations of use which apply to the Good. This information by itself is not sufficient for a complete determination of the suitability of the Good 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 this Good, nor is it intended to imply that the uses listed may be suitable for this Good:
    (i) Outdoor use, uses involving potential chemical contamination or electrical interference, or conditions or uses not described in this document.
    (ii) 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.
    (iii) Systems, machines and equipment that could present a risk to life or property. Please know and observe all prohibitions of use applicable to this Good.

    NEVER USE THE PRODUCT 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 SELLER'S PRODUCT IS PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.
2. Programmable Products. Seller shall not be responsible for the user's programming of a programmable Good, or any consequence thereof.
3. 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 Seller's test conditions, and the user must correlate it to actual application requirements. Actual performance is subject to the Seller'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 Good 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 Seller's representative at any time to confirm actual specifications of purchased Good.
5. Errors and Omissions. The information in this catalog has been carefully checked and is believed to be accurate; however, no responsibility is assumed for clerical, typographical or proofreading errors, or omissions.

Complete "Terms and Conditions of Sale" for product purchase and use are on Omron's website at www.omron.com/oei – under the "About Us" tab, in the Legal Matters section.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

OMRON

OMRON ELECTRONICS LLC
One Commerce Drive
Schaumburg, IL 60173
847-843-7900
For US technical support or other inquiries:
800-556-6766

OMRON CANADA, INC.
885 Milner Avenue
Toronto, Ontario M1B 5V8
416-286-6465

OMRON ON-LINE
Global - http://www.omron.com
USA - http://www.omron.com/oei
Canada - http://www.omron.ca

Cat. No. H127-E3-01 8/04 Specifications subject to change without notice Printed in USA

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

Omron:
ES1B 10-70C