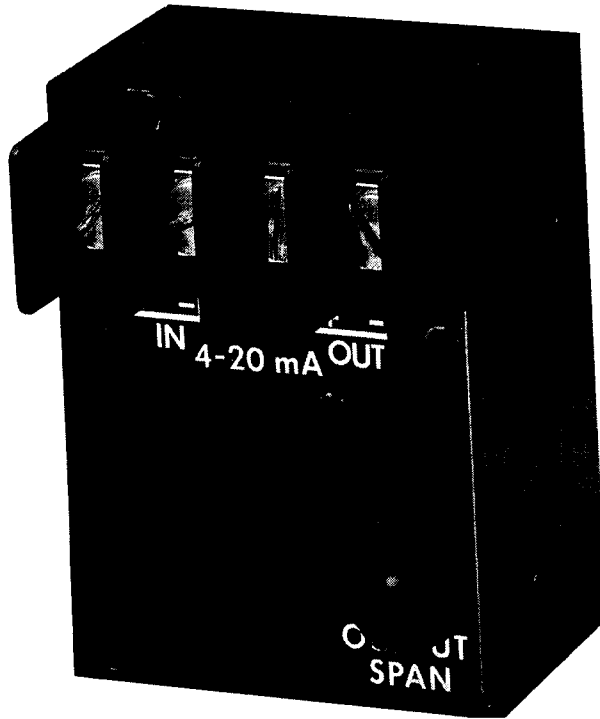


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# User's Guide



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## **PHA-50** **Loop-Powered Isolators**



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The information contained in this document is believed to be correct, but OMEGA Engineering, Inc. accepts no liability for any errors it contains, and reserves the right to alter specifications without notice.  
**WARNING:** These products are not designed for use in, and should not be used for, human applications.

## GENERAL DESCRIPTION

The OMEGA® PHA-50 loop-powered isolator provides an isolated 4 to 20 mA output equal to the 4 to 20 mA non-isolated output. This one-to-one current isolator is used in a 4 to 20 mA two-wire loop to prevent ground loops. To eliminate moisture and humidity problems, the electronics are encapsulated in epoxy and the output is compensated for virtually zero temperature drift. A red LED lights to indicate the isolator is operating (as loop current increases, LED becomes brighter). The PHA-50 can be surface mounted in any position, and a trimpot control to adjust the output span is accessed by removing a protective cap.

## UNPACKING

Remove the packing list and verify that all equipment has been received. If there are any questions about the shipment, please call OMEGA Customer Service Department at (203) 359-1660.

Upon receipt of the shipment, inspect the container and equipment for any signs of damage. Take particular note of rough handling in transit. Immediately report any damage to the shipping agent.

## NOTE

The carrier will not honor any claims unless all shipping material is saved for their examination. After examining and removing contents, save packing material and carton in the event reshipment is necessary.

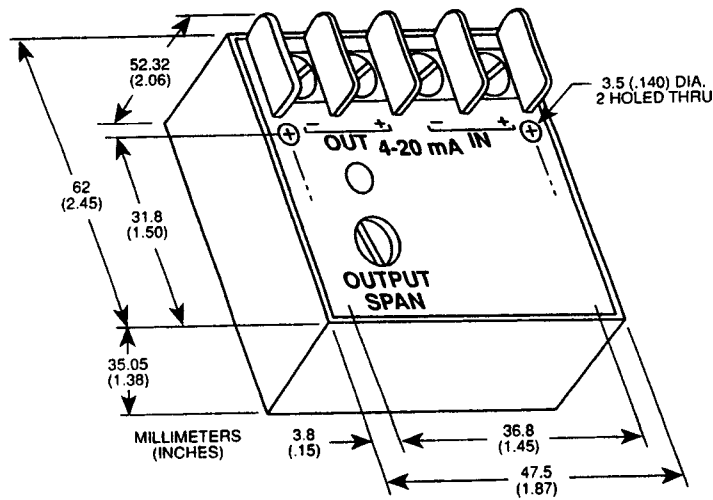


Figure 1  
Dimensions

## ELECTRICAL HOOK-UP

The PHA-50 isolator is connected between the signal source and the load device intended to be isolated (indicator, recorder, etc.). To determine the maximum load which can be isolated by the PHA-50, the signal source's maximum load rating (or maximum voltage capability) and the resistance (or voltage drop) of any loads, including a two-wire transmitter if used, in the non-isolated 4-20 mA loop must be known.

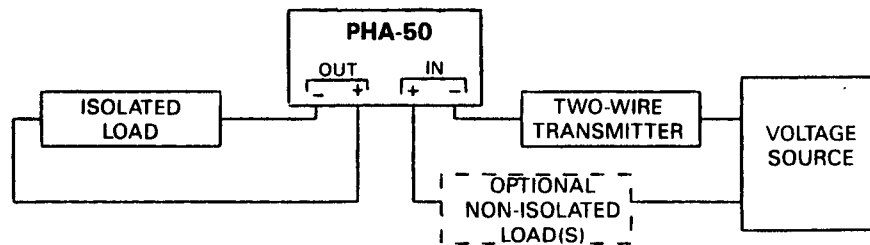
### CAUTION

Do not connect loads of less than 20 ohms or more than 500 ohms to the PHA-50.

### EXAMPLE USING VOLTAGE SOURCE

Suppose the voltage source ( $V_s$ ) is 24.0 volts and the voltage drop across the two-wire transmitter (VTWT) at 20 mA is 14.0 volts. A recorder which presents a load of 100 ohms is connected in the non-isolated loop. Use the following equation to determine the isolated load's maximum allowable resistance, which must be between 20 and 500 ohms:

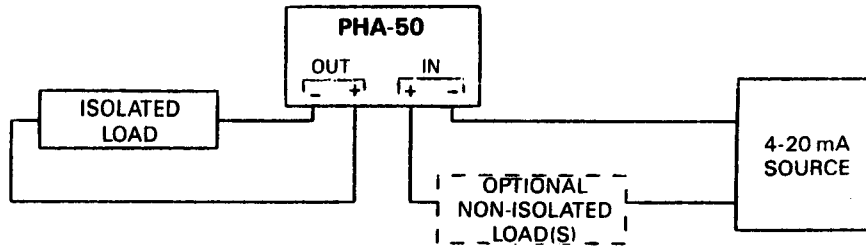
$$\begin{aligned} \text{ISOLATED LOAD MAX. (in ohms)} &= \left[ \frac{V_s - V_{TWT} - 4.5}{.020} \right] - \left[ \text{OPTIONAL NON-ISOLATED LOAD (in ohms)} \right] \\ &= \left[ \frac{24.0 - 14.0 - 4.5}{.020} \right] - \left[ 100 \right] = 275 - 100 \text{ or } 175 \text{ ohms} \end{aligned}$$



### EXAMPLE USING 4-20 mA SOURCE

Suppose the 4 to 20 mA signal source has a maximum load rating ( $R_{max}$ ) of 625 ohms and a recorder which presents a load of 100 ohms is connected in the non-isolated 4 to 20 mA loop. Use the following equation to determine the isolated load's maximum allowable resistance, which must be between 20 and 500 ohms:

$$\begin{aligned} \text{ISOLATED LOAD MAX. (in ohms)} &= \left[ \frac{R_{\text{MAX}} (.020) - 4.5}{.020} \right] - \left[ \text{OPTIONAL NON-ISOLATED LOAD (in ohms)} \right] \\ &= \left[ \frac{625 (.020) - 4.5}{.020} \right] - \left[ 100 \right] = 400 - 100 \text{ or } 300 \text{ ohms} \end{aligned}$$



Connect 4 to 20 mA or voltage source to "4 to 20 mA IN" terminals, matching polarity as indicated. Connect load device to be isolated to "4 to 20 mA OUT" terminals, matching polarity as indicated.

### OUTPUT SPAN ADJUSTMENT

The isolator's output span may be adjusted with or without a milliammeter. Using a milliammeter provides best accuracy, but the adjustment procedure without it may be used if approximate accuracy is acceptable, or a milliammeter is not available.

#### Adjustment without Milliammeter

1. Adjust source display to indicate full scale.
2. Remove protective cap to access OUTPUT SPAN trimpot control. Adjust OUTPUT SPAN trimpot until isolated load indicates full scale. This completes output span adjustment.

### **Adjustment with Milliammeter**

Two considerations must be kept in mind when adjusting output span with a milliammeter. First, the milliammeter acts as an additional load. Combined total impedances of milliammeter and isolated load must not exceed source's maximum load rating after subtracting PHA-50 impedance of 225 ohms. Secondly, the milliammeter's impedance should be less than 3% of isolated load's impedance for best output span adjustment accuracy (the smaller the percentage, the better).

1. Connect milliammeter in series with source output and PHA-50 input. Adjust source output until milliammeter indicates exactly 18 mA.
2. Disconnect milliammeter and reconnect source output to PHA-50 input terminal.
3. Connect milliammeter in series with PHA-50 output and isolated load. Remove protective cap to access OUTPUT SPAN trimpot control. Adjust OUTPUT SPAN trimpot until milliammeter indicates exactly 18 mA.
4. Disconnect milliammeter and reconnect isolated load to PHA-50 output terminal. This completes output span adjustment.

### **SPECIFICATIONS**

**INPUT:** 4 to 20 mA non-isolated

**OUTPUT:** 4 to 20mA isolated

**INSERTION LOSS AT 20 mA:** 4.5 Vdc (this represents a max. resistance of 225 ohms into the 4 to 20 mA loop)

**ALLOWABLE ISOLATED LOAD:** 20 to 500 ohms

**ISOLATION:** 1000 Vac or dc, transformer isolated

**SENSITIVITY:** 0.01 mA

**STABILITY:** 0.01 mA

**NON-LINEARITY:**  $\pm 0.03\%$  of span

**ACCURACY:**  $\pm 0.01\%$  of span

**TEMPERATURE RANGE:**  $-20$  to  $50^{\circ}\text{C}$

**DIMENSIONS:**  $2\frac{1}{4}$ " x  $1\frac{3}{4}$ " x 1"



## WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **13 months** from date of purchase. OMEGA's Warranty adds an additional one (1) month grace period to the normal **one (1) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

If the unit malfunctions, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective, it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of having been damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components which wear are not warranted, including but not limited to contact points, fuses, and triacs.

**OMEGA is pleased to offer suggestions on the use of its various products. However, OMEGA neither assumes responsibility for any omissions or errors nor assumes liability for any damages that result from the use of its products in accordance with information provided by OMEGA, either verbal or written. OMEGA warrants only that the parts manufactured by it will be as specified and free of defects. OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESS OR IMPLIED, EXCEPT THAT OF TITLE, AND ALL IMPLIED WARRANTIES INCLUDING ANY WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. LIMITATION OF LIABILITY: The remedies of purchaser set forth herein are exclusive, and the total liability of OMEGA with respect to this order, whether based on contract, warranty, negligence, indemnification, strict liability or otherwise, shall not exceed the purchase price of the component upon which liability is based. In no event shall OMEGA be liable for consequential, incidental or special damages.**

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## RETURN REQUESTS/INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. **BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS).** The assigned AR number should then be marked on the outside of the return package and on any correspondence.

The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR **WARRANTY** RETURNS, please have the following information available **BEFORE** contacting OMEGA:

1. Purchase Order number under which the product was **PURCHASED**,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR **NON-WARRANTY** REPAIRS, consult OMEGA for current repair charges. Have the following information available **BEFORE** contacting OMEGA:

1. Purchase Order number to cover the **COST** of the repair,
2. Model and serial number of the product, and
3. Repair instructions and/or specific problems relative to the product.

OMEGA's policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering.

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