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# User's Guide



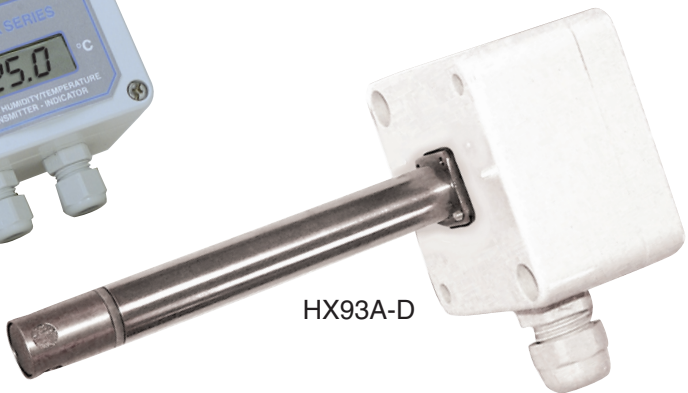
HX93A-RPI



HX93AC



HX93DAC



HX93A-D

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## HX93A, HX93DA SERIES RH/Temperature Transmitter



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**Servicing North America:**

**U.S.A.:** Omega Engineering, Inc., One Omega Drive, P.O. Box 4047  
ISO 9001 Certified Stamford, CT 06907-0047  
Toll-Free: 1-800-826-6342 Tel: (203) 359-1660  
FAX: (203) 359-7700 e-mail: info@omega.com

**Canada:** 976 Bergar  
Laval (Quebec), H7L 5A1 Canada  
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**Czech Republic:** Frystatska 184  
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Toll-Free: 0800-1-66342 TEL: +420-59-6311899  
FAX: +420-59-6311114 e-mail: info@omegashop.cz

**France:** Managed by the United Kingdom Office  
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FAX: +33 (0) 130 57 54 27 e-mail: sales@omega.fr

**Germany/Austria:** Daimlerstrasse 26  
D-75392 Deckenpfronn, Germany  
Toll-Free: 0800 6397678 TEL: +49 (0) 7056 9398-0  
FAX: +49 (0) 7056 9398-29 e-mail: info@omega.de

**United Kingdom:** OMEGA Engineering Ltd.  
ISO 9001 Certified One Omega Drive, River Bend Technology Centre, Northbank  
Irlam, Manchester M44 5BD United Kingdom  
Toll-Free: 0800-488-488 TEL: +44 (0) 161 777-6611  
FAX: +44 (0) 161 777-6622 e-mail: sales@omega.co.uk

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The information contained in this document is believed to be correct, but OMEGA 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.

# HX93A, HX93DA SERIES RH/Temperature Transmitter

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## 1. General Description

The OMEGA® HX93A and HX93DA Series Relative Humidity/ Temperature Transmitter's provide a linearized and temperature compensated output signal of 4 to 20 mA or 0 to 1 Vdc depending upon the model selected for both relative humidity and temperature measurement. The output signals have been calibrated and scaled 0 to 100% for Relative Humidity and -20 to 75°C for temperature. A thin film polymer capacitor senses relative humidity while an 100 ohm RTD measures temperature, both are protected by a stainless steel filter that is easily removed for cleaning. The NEMA rated polycarbonate enclosure and cable entry connection provides weathertight protection. Screws are provided for mounting via internal holes inside the enclosure. The HX93DA Series has dual built-in indicators for humidity and temperature.

## 2. Unpacking

Remove the packing list and verify that you have received all your equipment. If you have any questions about the shipment, please call our Customer Service Department at:

1-800-622-2378 or 203-359-1660. On the web you can find us at:  
www.omega.com      e-mail: cservice@omega.com

When you receive the shipment, inspect the container and equipment for any signs of damage. Note any evidence of rough handling in transit. Immediately report any damage to the shipping agent.

### NOTE

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

The following items are supplied in the box with your HX93A transmitter.

- This Manual, # M0933A (1 ea.)
- #6 Wall Anchor and #6 Mounting Screw (2 ea.)
- Dewpoint Card (1 ea.)

### Additional Transmitter Models Available

Model	Description
HX92AC	Wall mount RH transmitter (4 to 20 mA Output)
HX92AV	Wall mount RH transmitter (0 to 1 Vdc Output)
HX92AC-D	Duct mount RH transmitter (4 to 20 mA Output)
HX92AV-D	Duct mount RH transmitter (0 to 1 Vdc Output)

continued on next page

## 2. Unpacking continued

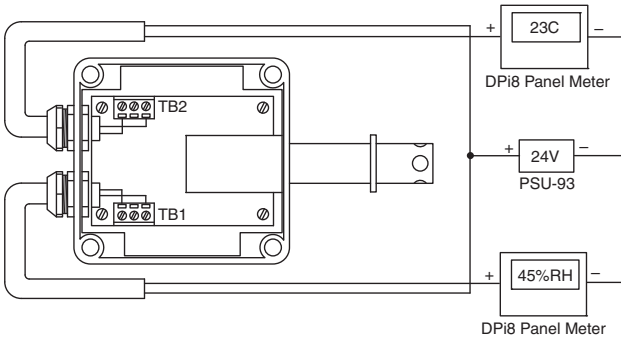
Model	Description
HX92AC-RP1	Remote probe RH transmitter (dual 4 to 20 mA Output)
HX92AV-RP1	Remote probe RH transmitter (dual 0 to 1 Vdc Output)
HX15AV-W	Wall mount "High Ambient Temperature" application RH/Temperature transmitter (dual 0 to 1 Vdc Output)
HX15AC-W	Wall mount "High Ambient Temperature" application RH/Temperature transmitter (dual 4 to 20 mA Output)
HX15AV-D	Duct mount "High Ambient Temperature" application RH/Temperature transmitter (dual 0 to 1 Vdc Output)
HX15AC-D	Duct mount "High Ambient Temperature" application RH/Temperature transmitter (dual 4 to 20 mA Output)

### 3. Theory of Operation

A 4-20 mA loop is a series loop in which a transmitter will vary the current flow depending on the input to the transmitter. In the HX93A and the HX93DA Series the amount of current allowed to flow in the loop will vary depending on the relative humidity or temperature being measured by the sensor(s). Some advantages of a current output over a voltage output is that the signal measured is less susceptible to electrical noise interference and the loop can support more than one measuring instrument as long as the maximum loop resistance is not exceeded.

A typical application utilizing a current loop will normally consist of a power supply, the transmitter and a meter, recorder or controller to measure the current flow. The loop resistance in the sum of the measuring instruments and wire used. The maximum allowable loop resistance for the HX93A or HX93DA to function properly is found by using the following formula:

- For HX93A**  $R_{max} = (\text{power supply voltage} - 6 \text{ volts}) \div .02 \text{ amps}$   
**EXAMPLE: (When using a 24 Vdc power supply).**  
 $R_{max} = (24 - 6) \div .02 \text{ amps} = 900 \text{ ohms max loop resistance}$
- For HX93DA**  $R_{max} = (\text{power supply voltage} - 12 \text{ volts}) \div .02 \text{ amps}$   
**EXAMPLE: (When using a 24 Vdc power supply).**  
 $R_{max} = (24 - 12) \div .02 \text{ amps} = 600 \text{ ohms max loop resistance}$



**Figure 1 - Basic Transmitter Set-up With Current Loop Output**

### Complimentary Instruments

Power Supply, OMEGA® Part No.: PSU-93  
Csi32 Series Panel Meters and Controllers

### Recommended Accessories

Shielded Transmitter Cable, OMEGA® Part No.: TX4-100 (100 ft)  
RH Calibration Kit, OMEGA® Part No.: HX92-CAL

## 4. Mounting

OMEGA's HX93A and HX93DA transmitter's are designed for either wall, duct or remote probe mounting depending upon model. Plastic wall anchors and mounting screws are included for wall mounting and remote probe models. A duct mounting kit is included with duct mount models.

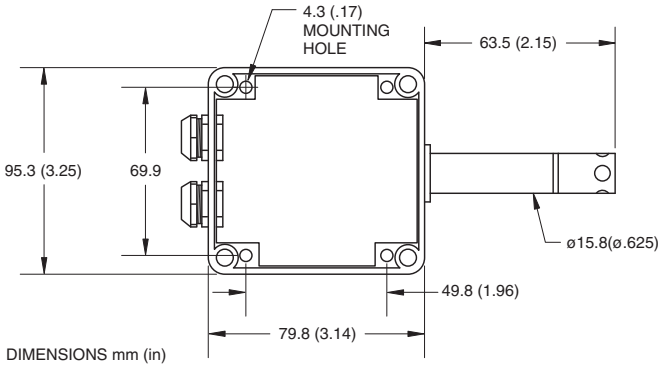


Figure 2 - Wall Mount Model Dimensions,

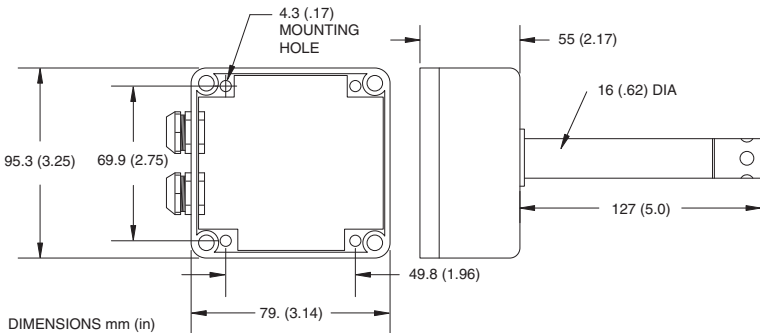


Figure 3 - Duct Mount & Remote Probe Model Dimensions



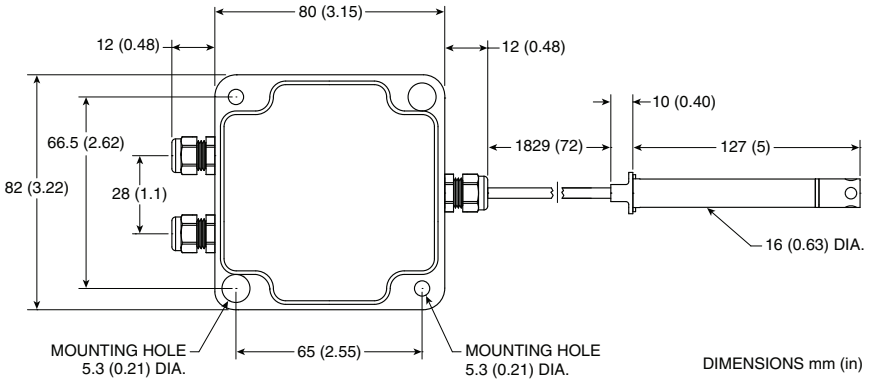


Figure 4 - Remote Probe Model Dimensions

### 5. Electrical Connections

#### CAUTION

All electrical connections and wiring should be performed by a suitably trained professional only.

**Models:** HX93AC, HX93AC-D, HX93AC-RP1, HX93DAC, HX93DAC-D, HX93DAC-RP1 (Current Output)

**TB1 - Relative Humidity**

1. + Power Supply

2. No Connection

3. 4-20 mA Output

**TB2 - Temperature**

1. + Power Supply

2. No Connection

3. 4-20 mA Output

### 6. Current Transmitter Wiring Examples

For current output models (4 – 20 mA)

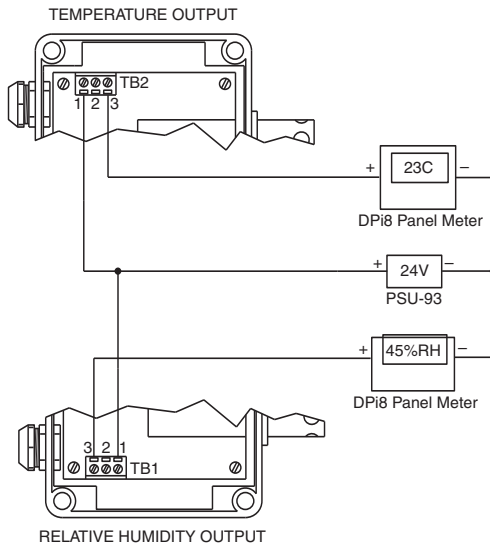


Figure 5 - Current Transmitter Wiring Example, (4 - 20 mA)

#### CAUTION

All electrical connections and wiring should be performed by a suitably trained professional only.

# HX93A, HX93DA SERIES RH/Temperature Transmitter

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Models: HX93AV, HX93AV-D HX93AV-RP1 (Voltage Output)

TB1 - Relative Humidity

TB2 - Temperature

1. + Power Supply

1. + Power Supply

2. + Output

2. + Output

3. - Power Supply

3. - Power Supply

## 7. Voltage Transmitter Wiring Examples

For voltage output models (0 to 1 Vdc)

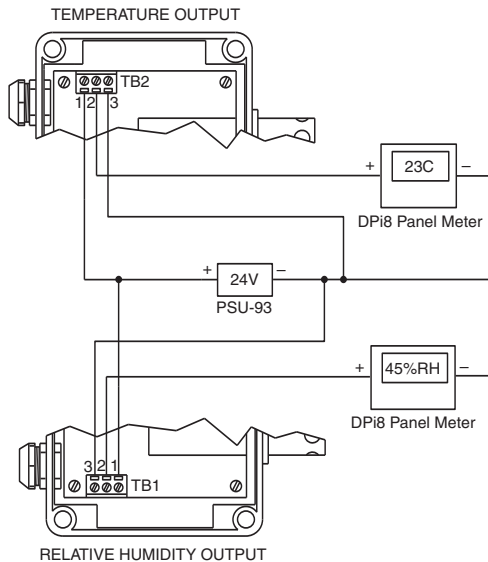


Figure 6 - Voltage Transmitter Wiring Example

## 8. Relative Humidity Output Calculations

To calculate % Relative Humidity by measuring the current or voltage output use the following formulas.

**For current output:**

% RH = (Current measured in milliamps - 4) ÷ .16

**EXAMPLE:** (11.04 mA - 4) ÷ .16 = 44% RH

**For voltage output:**

% RH = (Voltage measured in volts x 100)

**EXAMPLE:** .44 x 100 = 44% RH

## 9. RH Measured Vs Output Reading

% Relative Humidity	Output	
	Current (mA)	Voltage (Vdc)
5.4	4.8	.05
10	5.6	.10
15	6.4	.15
20	7.2	.20
25	8.0	.25
30	8.8	.30
35	9.6	.35
40	10.4	.40
45	11.2	.45
50	12.0	.50
55	12.8	.55
60	13.6	.60
65	14.4	.65
70	15.2	.70
75	16.0	.75
80	16.8	.80
85	17.6	.85
90	18.4	.90
95	19.2	.95

## 10. Temperature Output Calculations

To calculate Temperature by measuring the current or voltage output use the following formulas.

**For Current output in °C (-20 to 75°C)**

$$^{\circ}\text{C} = (\text{Output measured in milliamps} - 4) \div .1684 - 20 = ^{\circ}\text{C}$$

**EXAMPLE:**  $(12.0 \text{ mA} - 4) \div .1684 - 20 = 27.5^{\circ}\text{C}$

**For Current output °F (-4 to 167°F)**

$$^{\circ}\text{F} = (\text{Output measured in milliamps} - 4) \div .0935 - 4 = ^{\circ}\text{F}$$

**EXAMPLE:**  $(12.0 \text{ mA} - 4) \div .0935 - 4 = 81.6^{\circ}\text{F}$

**For Voltage output in °C (-20 to 75°C)**

$$^{\circ}\text{C} = (\text{Output measured in volts} \div .010526) - 20 = ^{\circ}\text{C}$$

**EXAMPLE:**  $(0.50 \text{ Vdc} \div .010526) - 20 = 27.5^{\circ}\text{C}$

**For Voltage output °F (-4 to 167°F)**

$$^{\circ}\text{F} = (\text{Output measured in volts} \div .005848) - 4 = ^{\circ}\text{F}$$

**EXAMPLE:**  $(0.50 \text{ Vdc} \div .005848) - 4 = 81.5^{\circ}\text{F}$

## 11. Calibration

Your transmitter has been factory calibrated to meet or exceed the specifications outlined in this manual. To maintain original specifications it is generally recommended that your transmitter be recalibrated on an annual basis depending on operating conditions.

## 12. Calibration Procedure for HX93AC (all styles)

### Relative Humidity Adjustment

#### Recommended equipment:

- Humidity Calibration Kit, OMEGA® Model No.: HX92-CAL
- Handheld Digital Multi-meter, OMEGA® Model No.: HHM29
- DC Power Supply, OMEGA® Model No.: PSU-93

1. Remove enclosure cover
2. Connect transmitter as shown in figure below.
3. Apply power to transmitter and allow to warm up for 15 min.
4. Place unit in a 11% RH environment and allow to stabilize for 15 min.
5. Adjust potentiometer "P1" for a output reading of 5.76 mA
6. Place unit in a 75% RH environment and allow to stabilize for 15 min.
7. Adjust potentiometer "P2" for a output reading of 16.0 mA
8. Repeat steps 4, 5, 6, and 7 as necessary until proper readings are maintained.
9. Calibration complete.

**NOTE:**  
Do not adjust P3. This is a factory setting.

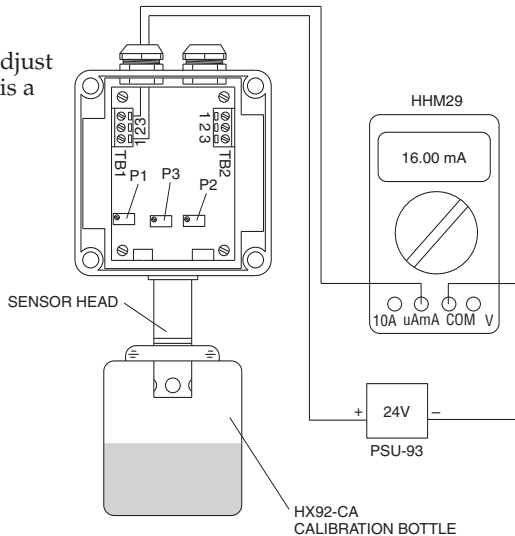


Figure 7 - HX93AC Calibration Procedure  
Relative Humidity Adjustment

### 13. Calibration Procedure for HX93AC (all styles)

#### Temperature Adjustment

##### Recommended equipment:

- RTD Simulator OMEGA® Model No.: CL510-1
  - Handheld Digital Multi-meter, OMEGA® Model No.: HHM29
  - DC Power Supply, OMEGA® Model No.: PSU-93
1. Remove enclosure cover
  2. Connect the power supply and multimeter as shown in the figure below.
  3. Disconnect the 2-wire Connector "J4" from the main Board.
  4. Connect the RTD simulator to the "J4" header on the main board as shown below.
  5. Apply power to transmitter and allow to warm up for 10 min.
  6. Set the RTD simulator to the 0°F position.
  7. Adjust potentiometer "P5" on the main board for a output reading of 4.43 mA @ 0°F
  8. Set the RTD simulator to the 150°F position.
  9. Adjust potentiometer "P4" for a output reading of 18.46 mA 150°F
  10. Repeat steps 6, 7, 8 and 9 as necessary until proper readings are maintained.
  11. Calibration complete.

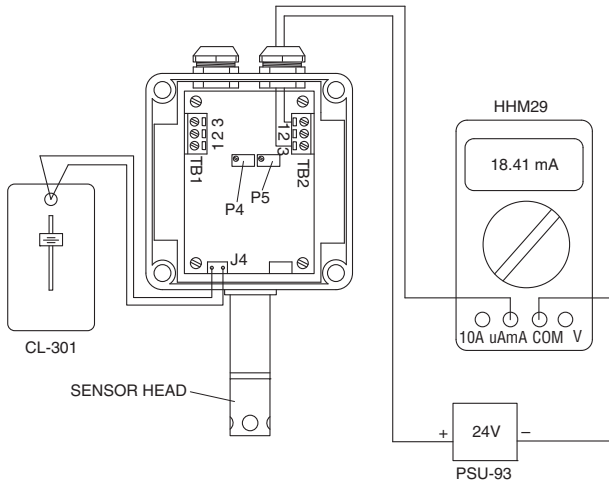


Figure 8 - HX93AC Calibration Procedure  
Temperature Adjustment

## 14. Calibration Procedure for HX93AV (all styles)

### Relative Humidity Adjustment

#### Recommended equipment:

- Humidity Calibration Kit, OMEGA® Model No.: HX92-CAL
  - Handheld Digital Multi-meter, OMEGA® Model No.: HHM29
  - DC Power Supply, OMEGA® Model No.: PSU-93
1. Remove enclosure cover.
  2. Connect transmitter as shown in figure below.
  3. Apply power to transmitter and allow to warm up for 15 min.
  4. Place unit in a 11% RH environment and allow to stabilize for 15 min.
  5. Adjust potentiometer "P3" for a output reading of .110 Vdc.
  6. Place unit in a 75% RH environment and allow to stabilize for 15 min.
  7. Adjust potentiometer "P2" for a output reading of .750 Vdc.
  8. Repeat steps 4, 5, 6, and 7 as necessary until proper readings are maintained.
  9. Calibration complete.

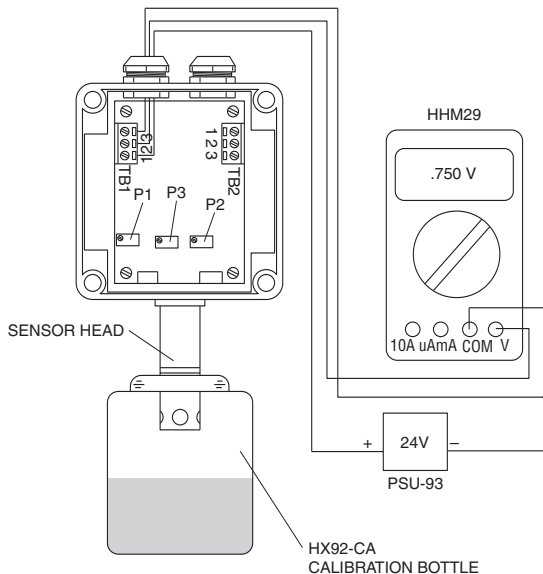


Figure 9 - HX93AV Calibration Procedure  
Relative Humidity Adjustment

## 15. Calibration Procedure for HX93AV (all Styles)

### Temperature Adjustment

#### Recommended equipment:

- 100 Ohm RTD Simulator OMEGA® Model No.: **CL510-1**
- Handheld Digital Multi-meter, OMEGA® Model No.: **HHM29**
- DC Power Supply, OMEGA® Model No.: **PSU-93**

1. Remove enclosure cover
2. Connect the power supply and multimeter as shown in the figure below.
3. Disconnect the 2-wire Connector "J4" from the main Board.
4. Connect the RTD simulator to the "J4" header on the main board as shown below.
5. Apply power to transmitter and allow to warm up for 10 min.
6. Set the RTD simulator to the 0°F position.
7. Adjust potentiometer "P5" on the main board for a output reading of 0.023 Vdc
8. Set the RTD simulator to the 150°F position.
9. Adjust potentiometer "P4" for a output reading of 0.901 Vdc
10. Repeat steps 6, 7, 8 and 9 as necessary until proper readings are maintained.
11. Calibration complete.

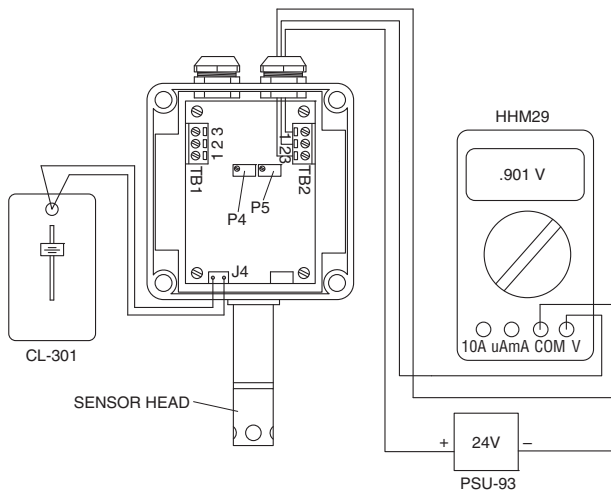


Figure 10 - HX93AV Calibration Procedure  
Temperature Adjustment



## 15A. Display Scaling for HX93DAC (all styles)

Your HX93DA transmitter comes with dual built-in LCD indicators for displaying both Humidity and Temperature. Before the meter adjustment or re-scaling can be done the transmitters current output should be checked as per the calibration procedure in Section 12 and 13 to verify the display will be adjusted correctly and match the analog output.

### Relative Humidity Display Scaling

#### **Recommended equipment:**

- Humidity Calibration Kit, OMEGA® Model No.: **HX92-CAL**
- Handheld Digital Multi-meter, OMEGA® Model No.: **HHM29**
- Dc Power Supply, OMEGA® Model No.: **PSU-93**

1. Remove enclosure cover
2. Connect transmitter as shown in figure 6.
3. Apply power to transmitter and allow to warm up for 15 min.
4. Place unit in a 11% RH environment and allow to stabilize for 15 min.
5. Adjust potentiometer "ZERO" on the back of the RH display for a reading of 11.0%
6. Place unit in a 75% RH environment and allow to stabilize for 15 min.
7. Adjust potentiometer "GAIN" on the back of the RH display for a reading of 75.0%
8. Repeat steps 4, 5, 6, and 7 as necessary until proper readings are maintained.
9. Re-scaling complete.

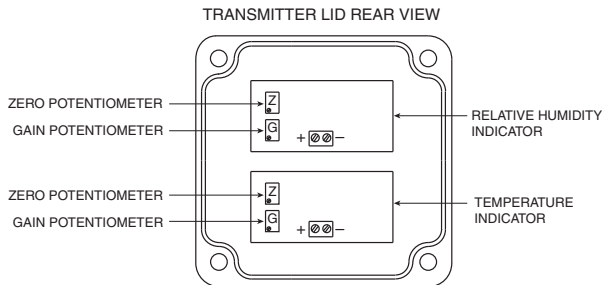


Figure 11 - Transmitter Lid Rear View

### Temperature Display Scaling

#### **Recommended equipment:**

- RTD Simulator OMEGA® Model No.: **CL510-1**
- Handheld Digital Multi-meter, OMEGA® Model No.: **HHM29**
- DC Power Supply, OMEGA® Model No.: **PSU-93**

#### **For °F Display**

1. Remove enclosure cover
2. Connect the power supply and multimeter as shown in the figure 7.
3. Disconnect the 2-wire Connector "J4" from the main Board.
4. Connect the RTD simulator to the "J4" header on the main board as shown below.
5. Apply power to transmitter and allow to warm up for 10 min.
6. Set the RTD simulator for 0°F output. (See figure on page 11.)
7. Adjust potentiometer "ZERO" on the back of the Temp display for a reading of 0.0°F
8. Set the RTD simulator for 150°F output.
9. Adjust potentiometer "GAIN" on the back of the RH display for a reading of 150.0°F
10. Repeat steps 6, 7, 8 and 9 as necessary until proper readings are maintained.
11. Calibration complete.

#### **For °C Display**

12. Remove enclosure cover
  13. Connect the power supply and multimeter as shown in the figure 7.
  14. Disconnect the 2-wire Connector "J4" from the main Board.
  15. Connect the RTD simulator to the "J4" header on the main board as shown below.
  16. Apply power to transmitter and allow to warm up for 10 min.
  17. Set the RTD simulator for 0°C output. (See figure on page 11.)
  18. Adjust potentiometer "ZERO" on the back of the Temp display for a reading of 0.0°C
  19. Set the RTD simulator to the 150°C output.
  20. Adjust potentiometer "GAIN" on the back of the RH display for a reading of 150.0°F
  21. Repeat steps 6, 7, 8 and 9 as necessary until proper readings are maintained.
- Calibration complete.

## 16. Maintenance

If your Humidity transmitter will be used in a dusty environment, the protective sensor filter, if clogged, may be removed for cleaning. Unscrew the protective cover and gently blow compressed air through the filter screen. A soft brush may also be used to remove dirt particles from the screen.

If the sensor is subjected to 100% condensation, it must be dried to obtain correct readings. There will be no permanent damage or calibration shift to the unit.

Units should not be exposed to high concentrations of ammonia or alcohol vapors.

## 17. Specifications

### Relative Humidity

<b>Measuring Range:</b>	3 - 95% (non-condensing)
<b>Accuracy:</b>	±2.5% @ 22°C (72°F) from 20 to 80% RH; ±3.1% @ 22°C (72°F) below 20 and above 80% RH; with an added temperature coefficient error of ±0.1% RH/°F (both increasing and decreasing in temperature).
<b>Repeatability:</b>	± 1 % RH
<b>Operating Temperature Range:</b>	-20 to 75°C (-4 to 167°F)
<b>Output:</b>	
<b>Model: HX93AC</b>	4 to 20 mA (Scaled for 0 to 100% RH)
<b>Model : HX93AV</b>	0 to 1 Vdc (Scaled for 0 to 100% RH)
<b>Power:</b>	6 -30 Vdc @ 20mA
<b>Max Loop Resistance:</b>	Ohms = (V supply - 6 V)/.02 A
<b>RH Time Constant (90% response at 25°C, in moving air at 1m/s):</b>	>10 seconds, 10 to 90% RH >15 seconds, 90 to 10% RH
<b>Sensor Type:</b>	Thin Film Polymer Capacitor

### Temperature

<b>Measuring Range:</b>	-20 to 75°C (-4 to 167°F)
<b>Accuracy:</b>	±0.6°C (1°F) See EMC note below for addition errors*

#### \*EMC (Electro Magnetic Compatibility)

Your HX93A or HX93DAC may be subject to an addition reading error caused by RFI (Radio Frequency Interference) at these listed values. For temperature add ±4°C for 96, to 112 MHz @ 3V/M  
For RH add ±1% RH for 241 to 247 or 584 to 587 MHz @ 3V/M

<b>Repeatability:</b>	± 0.3°C (0.5°F)
<b>Output:</b>	
<b>Model: HX93AC</b>	4 to 20 mA (Scaled for 0 to 100% RH)
<b>Model : HX93AV</b>	0 to 1 Vdc (Scaled for 0 to 100% RH)
<b>Power:</b>	
<b>No Displays</b>	6 - 30 Vdc @ 20mA
<b>With Displays</b>	12 - 30 Vdc @ 30mA
<b>Max Loop Resistance:</b>	Ohms = (V supply – 6 V)/.02 A
<b>Sensor Type:</b>	100 Ohm Platinum RT

## 18. General Specifications

<b>Enclosure Housing:</b>	Gray Polycarbonate, (IP 65, DIN 40050) NEMA rated up to 13, UL Listed.
<b>Connections</b>	
<b>Cable Strain Relief:</b>	Nylon, Liquid-tight with neoprene gland for 2.29 to 6.73 mm (.09 to .265") diameter cable.
<b>Wire Connections:</b>	Internal 3-Position Terminal Strip. Accepts from 14 to 22 gage wire.
<b>Remote Connections</b>	
<b>(Remote Probe Model):</b>	_____
<b>Dimensions:</b>	See "Mounting" Section
<b>Weight</b>	
<b>Wall Mount Model:</b>	82 g. (3 oz)
<b>Duct Mount Model:</b>	100 g. (3.5 oz)
<b>Remote Probe Model:</b>	_____



**NOTES:**



**HX93A, HX93DA SERIES**  
**RH/Temperature Transmitter**

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**NOTES:**



## 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 in which wear is not warranted, include but are 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 the company will be as specified and free of defects. OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESSED 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.**

CONDITIONS: Equipment sold by OMEGA is not intended to be used, nor shall it be used: (1) as a "Basic Component" under 10 CFR 21 (NRC), used in or with any nuclear installation or activity; or (2) in medical applications or used on humans. Should any Product(s) be used in or with any nuclear installation or activity, medical application, used on humans, or misused in any way, OMEGA assumes no responsibility as set forth in our basic WARRANTY/DISCLAIMER language, and, additionally, purchaser will indemnify OMEGA and hold OMEGA harmless from any liability or damage whatsoever arising out of the use of the Product(s) in such a manner.

## 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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