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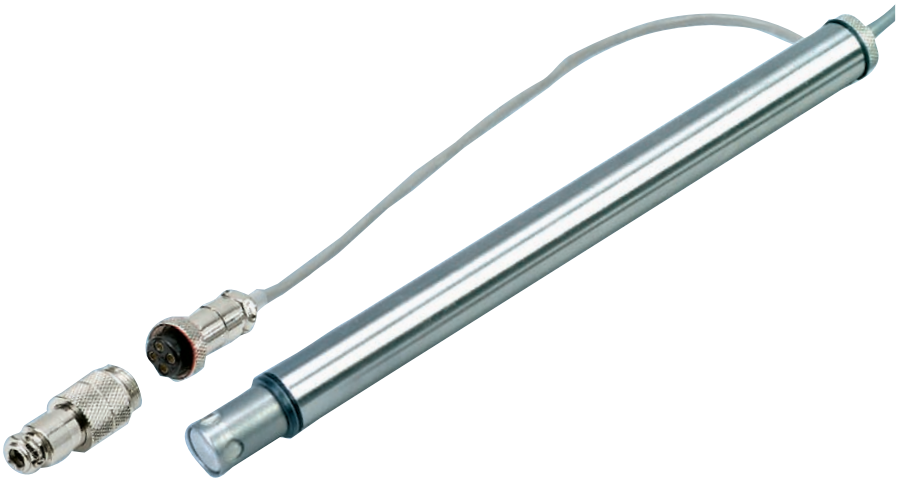

HX94A SERIES
RH/Temperature Transmitter

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1. General Description

The OMEGA® HX94A 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 0 to 100ºC (32 to 212ºC) 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-4 stainless steel enclosure and cable entry connection provides weathertight protection.

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:
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 HX94A transmitter.

- This Manual, # M2750A (1 ea.)
- Wall/Duct Mounting Kit (1 ea.)
- 4-Pin Mating Connector; with connector models only (1ea.)
- Dewpoint Card (1 ea.)

Additional Transmitter Models Available

Model	Description
HX94AC	RH/Temperature Transmitter (4 to 20 mA Output) with 4 Pin Connector.
HX94AV	RH/Temperature Transmitter (0 - 1 Vdc Output) with 4 Pin Connector.
HX94ACW	RH/Temperature Transmitter (4 to 20 mA Output) with 1 m (3') lead wires.

HX94AVW,	RH/Temperature Transmitter (0 - 1 Vdc Output) with 1 m (3') lead wires.
HX94ACNPT	RH/Temperature Transmitter (4 to 20 mA Output) with 1/2" male NPT fitting and 1 m (3') lead wires.
HX94AVNPT	RH/Temperature Transmitter (0 - 1 Vdc Output) with 1/2" male NPT fitting and 1 m (3') lead wires.

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 HX94A 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 HX94A to function properly is found by using the following formula:

R_{max} = (power supply voltage – 6 volts) ÷ 0.02 amps

EXAMPLE: (When using a 24 Vdc power supply).
R_{max} = (24 – 6) ÷ 0.02 amps = 900 ohms max loop resistance

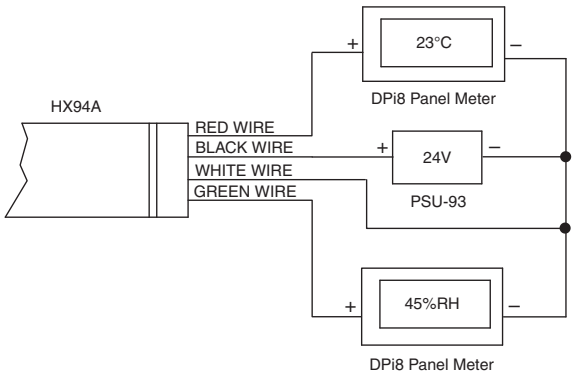

Figure 1 - Basic Transmitter Set-up With Voltage Output

Complimentary Instruments

Unregulated 16 -23 Vdc Power Supply, OMEGA® Part No.: PSU-93
Regulated 24 Vdc Power Supply, OMEGA® Part No.: PSR-24L
iSeries® Panel Meters and Controllers

Recommended Accessories

Shielded Transmitter Cable, OMEGA® Part No.: TX4-100 (100 ft)
RH Calibration Kit, OMEGA® Part No.: HX92-CAL
Spare 4 pin mating connector, OMEGA® Part No.: HX94-MC

4. Mounting

OMEGA's HX94A transmitter's are designed for either wall or duct mounting. A wall/duct mounting kit is included with each unit.

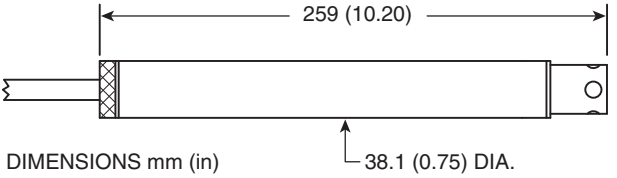

Figure 2 - HX94A Dimensions

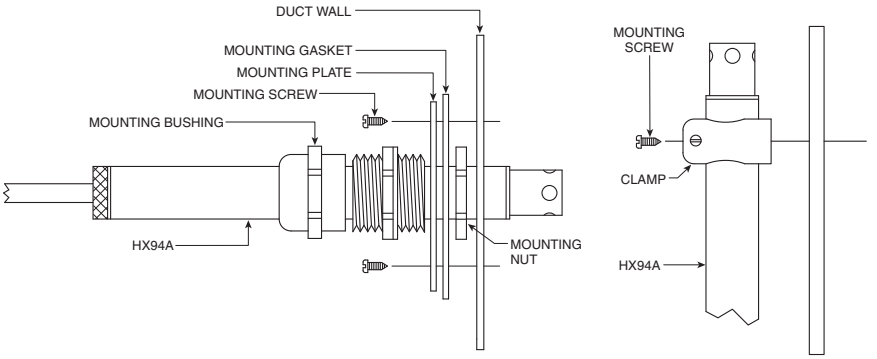

Figure 3 - HX94A Mounting

5. Electrical Connections

CAUTION

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

Models: HX94AC
(2-Wire Current Output with connector)

Temperature	Relative Humidity
Pin #2. + Power Supply	Pin #1. + Power Supply
Pin #3. 4-20 mA Output	Pin #4. 4-20 mA Output

Connector Body: Shield, Earth Ground

Models: HX94ACW, HX94ACNPT
(2-Wire Current Output with stripped leads)

Temperature	Relative Humidity
White Wire: + Power Supply	Black Wire: + Power Supply
Red Wire: 4-20 mA Output	Green Wire: 4-20 mA Output

Bare Wire: Shield, Earth Ground

Models: HX94AV
(3-Wire Voltage Output with connector)

Temperature	Relative Humidity
Pin #1. + Power Supply	Pin #1. + Power Supply
Pin #3. 0 - 1 Vdc Output	Pin #4. 0 - 1 Vdc Output
Pin #2. - Power Supply	Pin #2. - Power Supply

Connector Body: Shield, Earth Ground

Models: HX94AVW, HX94AVNPT
(3-Wire Voltage Output with stripped leads)

Temperature	Relative Humidity
Black Wire: + Power Supply	Black Wire: + Power Supply
Red Wire: 0 - 1 Vdc Output	Green Wire: 0 - 1 Vdc Output
White Wire: - Power Supply	White Wire: - Power Supply

Bare Wire: Shield, Earth Ground

6. Wiring Examples

For current output models (4 to 20 mA)

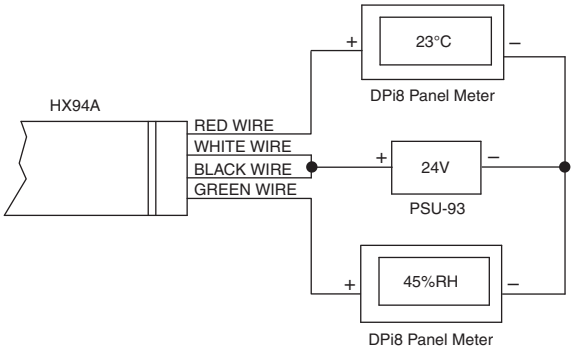

Figure 4 - Current Transmitter Wiring Example

For voltage output models (0 to 1 Vdc)

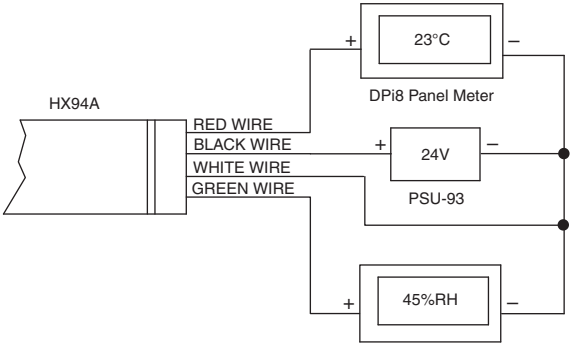

Figure 5 - Voltage Transmitter Wiring Example

7. 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 miliamps – 4) ÷ 0.16
EXAMPLE: **(11.04 mA – 4) ÷ 0.16 = 44% RH**

For voltage output:
% RH = (Voltage measured in volts x 100)
EXAMPLE: **0.44 x 100 = 44% RH**

8. RH Measured Vs Output Reading Table

% Relative Humidity	Output	
	Current (mA)	Voltage (Vdc)
5	4.8	0.05
10	5.6	0.10
15	6.4	0.15
20	7.2	0.20
25	8.0	0.25
30	8.8	0.30
35	9.6	0.35
40	10.4	0.40
45	11.2	0.45
50	12.0	0.50
55	12.8	0.55
60	13.6	0.60
65	14.4	0.65
70	15.2	0.70
75	16.0	0.75
80	16.8	0.80
85	17.6	0.85
90	18.4	0.90
95	19.2	0.95

9. Temperature Output Calculations

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

For Current output in °C (0 to 100°C)
°C = (Output measured in miliamps – 4) ÷ 0.16 = °C
EXAMPLE: (8.0 mA – 4) ÷ 0.16 = 25°C

For Current output °F (32 to 212°F)
°F = (Output measured in miliamps – 4) ÷ 0.08888 +32 = °F
EXAMPLE: (8.0 mA – 4) ÷ 0 .08888 +32 = 77°F

For Voltage output in °C (0 to 100°C)
°C = (Output measured in volts ÷ 0.10) = °C
EXAMPLE: (0.25 Vdc ÷ 0.10) = 25°C

For Voltage output °F (32 to 212°F)
°F = (Output measured in volts ÷ 0.005555) +32 = °F
EXAMPLE: (0.25 Vdc ÷ 0.005555) +32 = 77°F

10. 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.

11. Calibration Procedure for HX94AC (all styles)

Relative Humidity Adjustment

Recommended equipment:

- RH Calibration Kit, OMEGA® Model No.: HX92-CAL
- Handheld Digital Multi-meter, OMEGA® Model No.: HHM29B
- Unregulated DC Power Supply, OMEGA® Model No.: PSU-93 or Regulated DC Power Supply, OMEGA® Model No.: PSR-24L

1. Remove sensor head and main electronics boards from the stainless steel housing.
2. Connect transmitter as shown in the figure below.
3. Apply power to transmitter and allow to warm up for 10 min.
4. Place the sensor head into the 11% RH calibration bottle as shown and allow the readings to stabilize for 10 min.
5. Adjust potentiometer "P1" for an output reading of 5.76 mA.
6. Place the sensor head into the 75% RH calibration bottle and allow the readings to stabilize for 10 min.
7. Adjust potentiometer "P2" for a output reading of 16.0 mA.
8. Repeat steps 4, 5, 6, 7 as necessary until proper readings are maintained.
9. Reinstall the sensor head and main electronics back into the stainless steel housing.
10. Calibration complete.

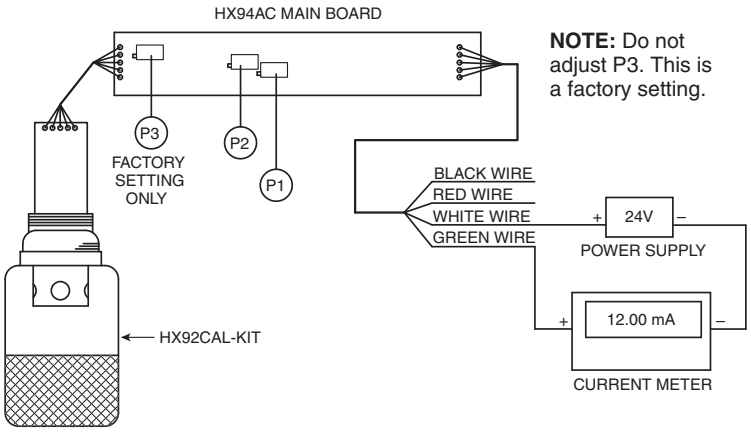

Figure 6 - HX94AC Calibration Procedure
Relative Humidity Adjustment

12. Calibration Procedure for HX94AC

Temperature Adjustment

Recommended equipment:

- Thermistor Temperature Meter, OMEGA® Model No.: HH41
- Thermistor Probe, OMEGA® Model No.: ON-403-PP
- Handheld Digital Multi-meter, OMEGA® Model No.: HHM29B
- Unregulated DC Power Supply, OMEGA® Model No.: PSU-93 or Regulated DC Power Supply, OMEGA® Model No.: PSR-24L

1. Remove sensor head and main electronics boards from the stainless steel housing.
2. Connect transmitter as shown in figure below.
3. Apply power to transmitter and allow unit to warm up for 10 min.
4. Place a precession temperature meter/probe like the recommended HH41 meter and ON-403-PP probe next to the sensor head of your HX94A. Record the ambient temperature measured by the precession meter/probe.
5. Based on the ambient temperature that you measured in step 4, calculate what the correct "Output Setting" should be for your HX94A.

   Use one of these two formulas:

   Ambient Temperature (°C) x (16/100) + 4 = Output Setting
   Example: (22°C) x (0.16) + 4 = 7.52 mA

   Ambient Temperature (°F - 32) x (16/180) + 4 = Output Setting
   Example: (72°F - 32) x (0.0888) + 4 = 7.55 mA
6. Adjust potentiometer "P4" for the correct output reading from your HX94A you calculated in step 5.
7. Calibration complete.

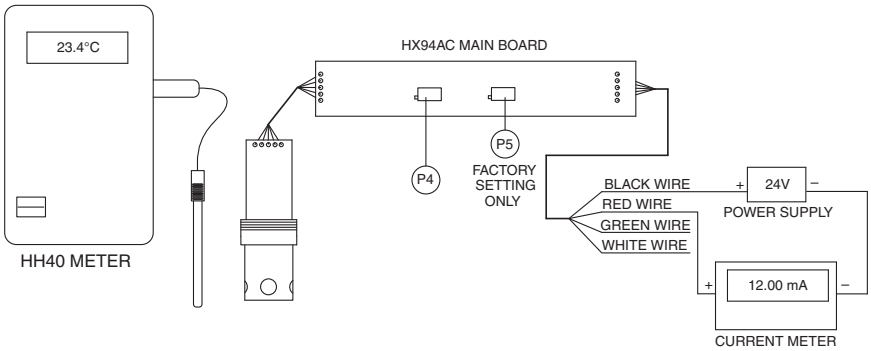

Figure 7 - HX94AC Calibration Procedure Temperature Adjustment

13. Calibration Procedure for HX94AV

Relative Humidity Adjustment

Recommended equipment:

- Humidity Calibration Kit, OMEGA® Model No.: HX92-CAL
- Handheld Digital Multi-meter, OMEGA® Model No.: HHM29B
- Unregulated DC Power Supply, OMEGA® Model No.: PSU-93 or Regulated DC Power Supply, OMEGA® Model No.: PSR-24L

1. Remove sensor head and main electronics boards from the stainless steel housing.
2. Connect transmitter as shown in figure below.
3. Apply power to transmitter and allow to warm up for 10 min.
4. Place the sensor head into the 11% RH calibration bottle as below and allow the readings to stabilize for 10 min.
5. Adjust potentiometer "P3" for an output reading of 0.110 Vdc.
6. Place the sensor head into the 75% RH calibration bottle and allow the readings to stabilize for 10 min.
7. Adjust potentiometer "P2" for a output reading of 0.750 Vdc.
8. Repeat steps 4, 5, 6, 7 as necessary until proper readings are maintained.
9. Reinstall the sensor head and main electronics back into the stainless steel housing.
10. Calibration complete.

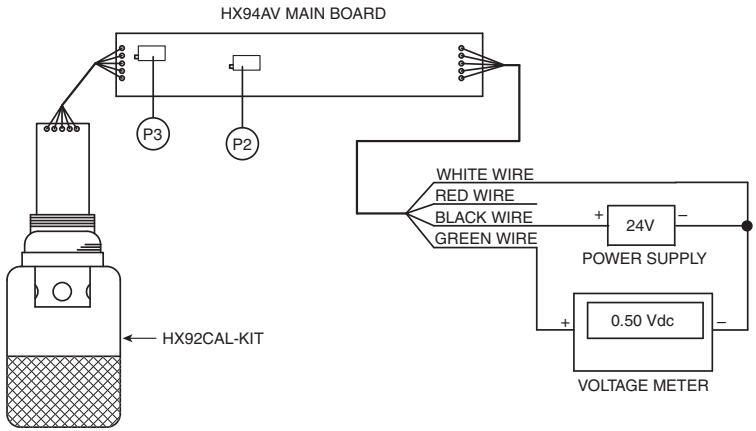

Figure 8 - HX94AV Calibration Procedure
Relative Humidity Adjustment

14. Calibration Procedure for HX94AV

Temperature Adjustment

Recommended equipment:

- Thermistor Temperature Meter, OMEGA® Model No.: HH41
- Thermistor Probe, OMEGA® Model No.: ON-403-PP
- Handheld Digital Multi-meter, OMEGA® Model No.: HHM29B
- Unregulated DC Power Supply, OMEGA® Model No.: PSU-93 or Regulated DC Power Supply, OMEGA® Model No.: PSR-24L

1. Remove sensor head and main electronics boards from the stainless steel housing.
2. Connect transmitter as shown in figure below.
3. Apply power to transmitter and allow unit to warm up for 10 min.
4. Place a precession temperature meter/probe like the recommended HH41 meter and ON-403-PP probe next to the sensor head of your HX94A. Record the ambient temperature measured by the meter/probe.
5. Based on the ambient temperature that you measured in step 4., calculate what the correct "Output Setting" should be for your HX94A.

   Use one of these two formulas:

   Ambient Temperature (°C) x (1/100) = Output Setting
   Example: 22°C x 0.010 = 0.220 Vdc

   Ambient Temperature (°F - 32) x (1/180) = Output Setting
   Example: (72°F - 32) x (0.0888) + 4 = 7.55 mA
6. Adjust potentiometer "P4" for the correct output reading from your HX94A you calculated in step 5.
7. Calibration complete.

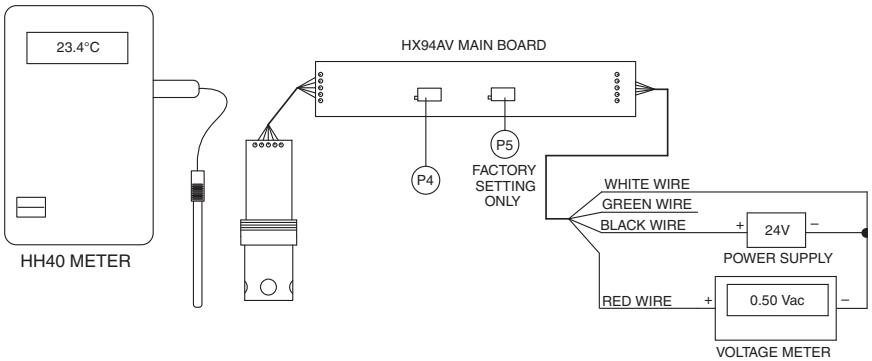

Figure 9 - HX94AV Calibration Procedure Temperature Adjustment

15. 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.

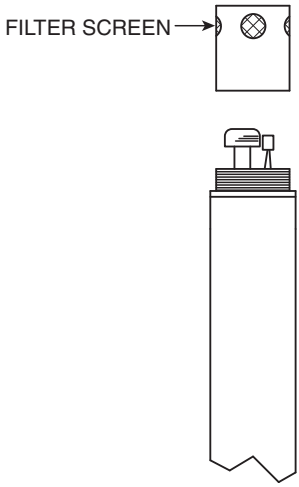

Figure 10 - Sensor Filter Cap Removal

16. Specifications

Relative Humidity

Measuring Range:	3 - 95% (non-condensing)
Accuracy:	±2.5% @ 22°C (72ºF) from 20 to 80% RH; ±3.1% @ 22°C (72ºF) below 20 and above 80% RH; with an added temperature coefficient error of ±0.1% RH/°F (both increasing and decreasing in temperature).
Repeatability:	± 1 % RH
Operating Temperature Range:	0 to 100ºC (32 to 212ºF)
Output:	
Model: HX94AC	4 to 20 mA (Scaled for 0 to 100% RH)
Model : HX94AV	0 to 1 Vdc (Scaled for 0 to 100% RH)
Power:	6 –30 Vdc @ 20mA
Max Loop Resistance:	Ohms = (V supply – 6 V)/0.02 A
Max Output Load:	200 Ohms (Voltage models)
RH Time Constant (90% response at 25ºC, in moving air at 1m/s):	>10 seconds, 10 to 90% RH >15 seconds, 90 to 10% RH
Sensor Type:	Thin Film Polymer Capacitor

Temperature

Measuring Range:	0 to 100ºC (32 to 212ºF)
Accuracy:	±0.6ºC (1ºF)
Repeatability:	± 0.3ºC (0.5ºF)
Output:	
Model: HX94AC4 to	20 mA, Scaled 0 to 100ºC (32 to 212ºF)
Model : HX94AV	0 to 1 Vdc, Scaled 0 to 100ºC (32 to 212ºF)
Power:	12 - 30 Vdc @ 30mA
Max Loop Resistance:	Ohms = (V supply – 6 V)/0.02 A
Sensor Type:	100 Ohm Platinum RTD

17. General Specifications

Enclosure Housing:	316 Stainless Steel, Nema-4
Electrical Connections	
HX94AC, HX94AV:	1 m (3') 4-conductor shielded PVC cable with connector termination. 4 pin mating connector included that accepts 26 to 18 AWG wire.
HX94ACW, HX94AVW, HX94ACNPT HX94AVNPT:	1 m (3') 4 conductor , shielded PVC cable with stripped lead termination.
Dimensions:	See "Mounting" Section
Weight (with mounting kit)	200 g. (7 oz)

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.

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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 theproduct, and
3. Repair instructions and/or specific problems relative to the product.

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