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HX11, HX12, HX13, & HX21
RH/TEMPERATURE TRANSMITTERS

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SECTION 1 INTRODUCTION

1.1 DESCRIPTION

The HX11, HX12, HX13, and HX21 relative humidity and temperature transmitters provide temperature compensated RH output and linearized RH and temperature outputs. A thin film polymer capacitor senses relative humidity, and the temperature sensor is an integrated circuit temperature sensor. The sensors are protected by a stainless filter that is easily removable for cleaning. A low compliance voltage (12 volts) allows the use of large impedances for longer wire runs.

1.2 FEATURES

- ✓ Duct and surface mount design ideal for HVAC application
- ✓ Available in 4 different styles
- ✓ 316 Stainless steel and ABS NEMA-4 enclosure protects surface mounted electronics
- ✓ Compact design allows easy mounting in tight locations
- ✓ Two standard 4-20mA or 1-5V outputs
- ✓ 2% RH, 0.6°C accuracy

1.3 AVAILABLE MODELS

The following models are available:

PART NUMBER	DESCRIPTION
HX11C	RH/Temperature transmitter with 3 ft lead wires and current output
HX11V	RH/Temperature transmitter with 3 ft lead wires and voltage output
HX12C	RH/Temperature transmitter with Bendix 4-pin connector and current output
HX12V	RH/Temperature transmitter with Bendix 4-pin connector and voltage output
HX13C	RH/Temperature transmitter with 1/2" male NPT fitting and 3 ft leads and current output
HX13V	RH/Temperature transmitter with 1/2" male NPT fitting and 3 ft leads and voltage output
HX21C	RH/Temperature transmitter for surface mounting. Compression strain relief for wiring and current output.
HX21V	RH/Temperature transmitter for surface mounting. Compression strain relief for wiring and voltage output

SECTION 2 UNPACKING

Remove the Packing List and verify that all equipment has been received. If there are any questions about the shipment, please call the Customer Service Department at the number listed on the inside cover.

Upon receipt of shipment, inspect the container and equipment for any signs of damage. Take particular note of any evidence 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.

Make sure you have the following in your packing box:

One (1) HX Series RH/Temperature Transmitter
One (1) Operator's Manual

NOTE: A NIST certificate is available on request.

SECTION 3 THEORY OF OPERATION

A 4-20mA loop is a series loop in which a transmitter will vary the current flow depending on the input to the transmitter. In the HX11C, HX12C, HX13C and HX21C, the amount of current allowed to flow will vary depending on the relative humidity. Some of the advantages of a current output over a voltage output is that is less susceptible to noise interference and it allows the connection of more than one meter or recorder to the loop as long as the maximum resistance is not exceeded.

The typical current loop will consist of a power supply, a transmitter and a meter to measure the current flow. The loop resistance is the sum of the impedance of the meter(s) and the lead wire. The maximum allowable loop impedance for the HX11C, HX12C, HX13C, and HX21C is found by using the formula:

$$R_{\max} = (\text{power supply voltage} - 12 \text{ volts}) / 0.02 \text{ amps}$$

Example: When using a 24 VDC power supply:

$$R_{\max} = \frac{24 - 12}{0.02} = 600$$

If the meter or recorder being used accepts only voltage, then the current can be converted to a voltage using a shunt resistor, and Ohm's law (voltage = current x resistance). By installing a 250 ohm resistor across the input terminals of the recorder, the input voltage would equal 1 - 5 volts.

SECTION 4 TERMINAL CONNECTIONS

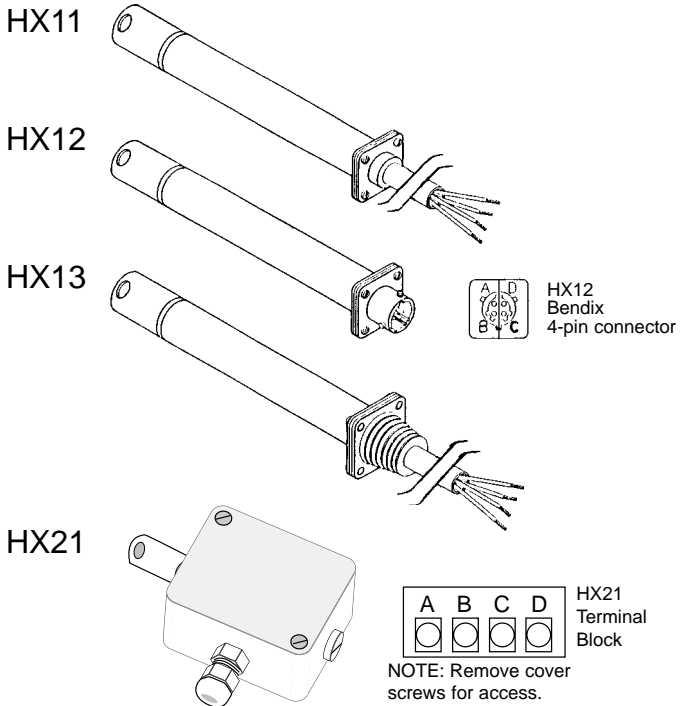


Figure 4-1. HX11, HX12, HX13 and HX21 Transmitters

**TABLE 4-1
TERMINAL CONNECTIONS AND WIRE COLORS**

	HX11C	HX12C	HX13C	HX21C
RH Positive	RED	A	RED	A
RH Negative	BLACK	B	BLACK	B
Temp. Positive	WHITE	C	WHITE	C
Temp. Negative	GREEN	D	GREEN	D

	HX11V	HX12V	HX13V	HX21V
Positive Supply	RED	A	RED	A
Negative Supply	WHITE	C	WHITE	C
RH Volt Out	BLACK	B	BLACK	B
Temp Volt Out	GREEN	D	GREEN	D

SECTION 5 WIRING

Figure 5-1 shows how to wire up the HX11C, HX12C , HX13C, and HX21C. Table 4-1 shows the color scheme and pin out configurations for the transmitters.

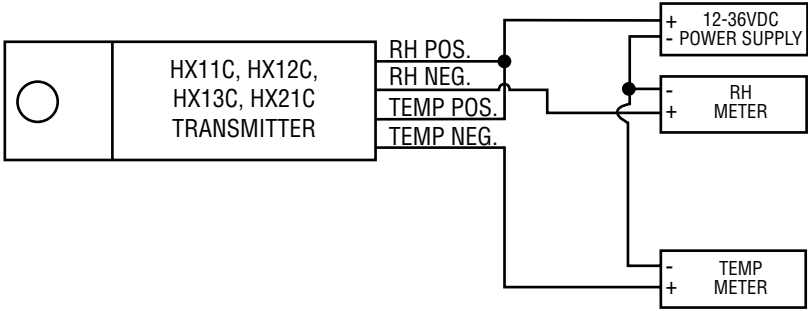


Figure 5-1. Wiring Diagram for the HX11C, HX12C, HX13C, and HX21C

Figure 5-2 shows how to wire up the HX11V, HX12V, HX13V and HX21V. Table 4-1 shows the color scheme and pin out configurations for the transmitters.

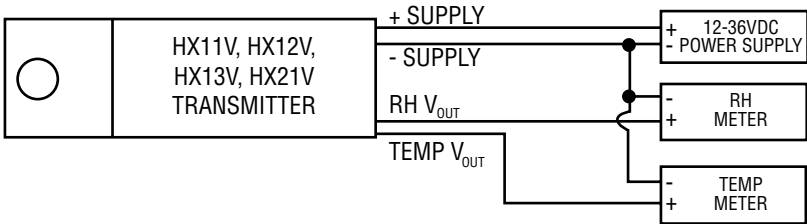


Figure 5-2. Wiring Diagram for the HX11V, HX12V, HX13V and HX21V

SECTION 6 RH/TEMPERATURE CALCULATIONS

To find maximum loop impedance:

$$R_{\max} = \frac{(V_{\text{supply}} - 12)}{0.02}$$

HX11C, HX12C, HX13C and HX21C:

To calculate %RH by measuring current output in milliamperes (I):

$$\%RH = \frac{(I - 4)}{0.16}$$

To calculate temperature in °C or °F:

$$^{\circ}\text{C} = (I - 4) \times 6.25$$

$$^{\circ}\text{F} = ((I - 4) \times 11.25) + 32$$

HX11V, HX12V, HX13V and HX21V:

To calculate temperature in °C or °F from voltage outputs (V):

$$^{\circ}\text{C} = (V - 1) \times 25$$

$$^{\circ}\text{F} = ((V - 1) \times 45) + 32$$

To calculate %RH:

Voltage units:

$$\%RH = \frac{(V - 1)}{0.04}$$

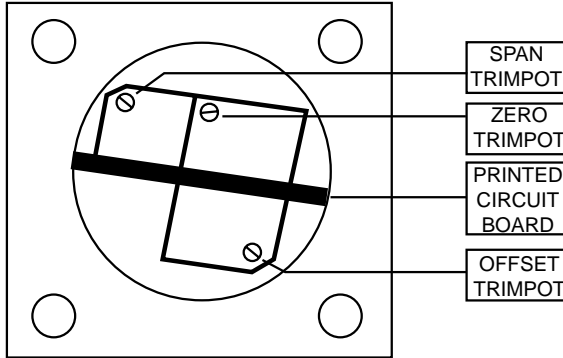
Current units:

$$\%RH = \frac{(I_{\text{mA}} - 4)}{0.16}$$

SECTION 7 CALIBRATION

Refer to Figure 7-1 for the location of the span, zero, and offset trimpots.

Figure 7-1. Trimpot Locations



(NOTE: The four wires normally attached to the board are removed from the figure.)

Required equipment and conditions:

- Long small-bladed screwdriver
 - Known low RH environment (5 to 25%)
 - Known high RH environment (75 to 95%)
 - Known temperature environment (0 to 100°C - not liquid)
- Remove the four flange screws for HX10 Series; remove case cover screw for HX20 Series
 - For HX10 Series, gently pull on the four wires to stretch them out to gain access to the trimpots. The adjustments are available on the HX20 Series via screw cover removal.
 - Place the sensor in a known low RH environment. Adjust the zero trimpot to obtain the corresponding current or voltage output as appropriate.
 - Place the sensor in a known high RH environment. Adjust the span trimpot to obtain the corresponding current or voltage output as appropriate.
 - Place the sensor in known temperature environment and adjust the offset trimpot to obtain the corresponding current or voltage output as appropriate.
 - Gently "stuff" the four wires back into the long tube of the transmitter by curling in a circular pattern.
 - Replace the cover with the screws.

SECTION 8 MAINTENANCE

If the transmitter is operated in a dusty environment, the protective sensor filter, if clogged, may be removed for cleaning. Unscrew filter and gently blow compressed air through screen. If necessary, use a soft brush to remove lint from the sensors.

If the sensors are subjected to 100% condensation, they must be dried to obtain correct readings. There is no permanent calibration shift, nor is recalibration necessary if 100% condensation occurs. It may take from 24 to 48 hours for the transmitter to return to calibrated accuracy.

SECTION 9 ACCESSORIES

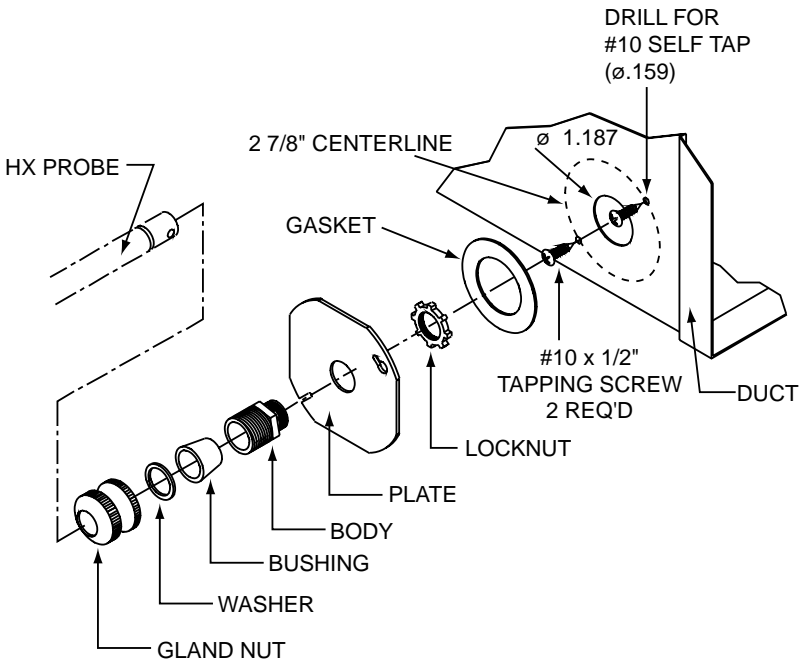
The following accessories may be obtained by contacting our sales department at the number listed on the inside cover of this manual.

PART NUMBER	DESCRIPTION
PT06F-8-4S	Mating Bendix 4-pin connector for the HX12
U24Y101	24VDC, 1000mA, unregulated power supply
PSU-24B	24VDC, 200mA, unregulated power supply
HX10-DM	HX10 Series Duct Mounting Kit

SECTION 10 DUCT MOUNTING INSTRUCTIONS

The following instructions describe how to mount the HX10 Series Transmitters in a duct using HX10-DM Duct Mounting Kit.

1. Mark and cut out center hole for probe clearance.
2. Mark and drill 2 holes for mounting screws.
3. Apply gasket to plate.
4. Pass body through plate and secure with locknut.
5. Attach plate assembly to duct wall with screws.
6. Pass probe through gland nut, beveled washer and rubber bushing into body.
7. Adjust probe depth as desired.
8. Secure probe by tightening gland nut (finger tight).



SECTION 11 SPECIFICATIONS

RELATIVE HUMIDITY

INPUT VOLTAGE RANGE:	12 - 36 VDC (polarity protected)
RH RANGE:	5% to 95% RH
ACCURACY:	±2% RH
RH TEMPERATURE COMPENSATION RANGE:	-4° to 140°F (-20° to 60°C)
HX11C, HX12C, HX13C AND HX21C RH OUTPUT:	4-20mA for 0 to 100% RH
HX11V, HX12V, HX13V AND HX21V RH OUTPUT:	1-5V for 0 to 100% RH
RH TIME CONSTANT:	100 sec, 20 - 90%; 60 sec, 90 - 20%
REPEATABILITY:	±1% RH

TEMPERATURE

INPUT VOLTAGE RANGE:	12 - 36 VDC (polarity protected)
TEMPERATURE RANGE:	32° to 212°F (0° to 100°C)
ACCURACY:	±1°F (±0.6°C)
HX11C, HX12C, HX13C AND HX21C TEMP OUTPUT:	4-20mA for 0° to 100°C
HX11V, HX12V, HX13V AND HX21V TEMP OUTPUT:	1-5V for 0° to 100°C
TEMP TIME CONSTANT (WITHOUT SCREEN):	(for 63.2% response) less than 9 seconds in moving air (1M/sec); less than 30 seconds in still air
REPEATABILITY:	±0.5°F (±0.3°C)

MECHANICAL

HOUSING: 316SS watertight enclosure; ABS Plastic for HX20 Series
Meets NEMA-1, 2, 3, 3R, 4, 4X, 5, 12, and 13 specs.

CONNECTORS:

- HX11:** 36" braided and shielded cable, PVC sheathing
- HX12:** Bendix 4-pin (#PT02A-8-4P); mating connection optional
- HX13:** 1/2" male NPT conduit with 36" braided/shielded PVC cable
- HX21:** Internal Screw Terminal - Thru cable clamp access

DIMENSIONS:

- HX11, HX12, HX13:** 5.1" long x 0.625" dia. (130 x 16mm)
- HX21:** 1.96"x2.55" x 1.37" (49.8 x 64.8 x 34.8mm)

WEIGHT:

- HX11, HX12, HX13:** 0.6 lb. (270 g)
- HX21:** 0.5 lb. (230 g)