The Series RHP Humidity and Temperature Transmitter offers flexibility, high accuracy, long term stability, and reliable operation. Utilizing the duct and outside air mounting configurations, the Series RHP monitors and controls humidity or both humidity and temperature in a building energy management systems, commercial and residential HVAC applications, clean rooms, museums, and climate chambers.

The state of the art sensor technology allows the Series RHP to fully recover from 100% saturation and is calibration-free. The removable filter and field replaceable sensor allows for quick service and reduced inventory of complete units. The metal mounting flange on the duct mount models reduces the time to attach the transmitter to the duct.

The Series RHP can be ordered with a single current or voltage output for humidity or can be factory configured to have an additional current, voltage, or passive RTD or thermistor temperature output. The RTD and thermistor outputs are interchangeable in the field without any additional calibration. The optional display for the duct mount models allows the user to read both the temperature and humidity simultaneously.

### Specifications - Installation and Operating Instructions

#### Duct Mount

- **SPECIFICATIONS**
  - Relative Humidity Range: 0 to 100% RH.
  - Temperature Range: -40 to 140°F (-40 to 60°C).
  - Accuracy, RH: Model RHP2 ±2% 10-90% RH @ 25°C; Model RHP3 ±3% 20-80% RH @ 25°C.
  - Accuracy, Thermistor Temp Sensor: ±0.22°C @ 25°C (±0.4°F @ 77°F).
  - Accuracy, RTD Temp Sensor: DIN Class B; ±0.3°C @ 0°C (±0.54°F @ 32°F).
  - Accuracy, Solid State Temperature Sensor: ±0.9°F @ 72°F (±0.3°C @ 25°C).
  - Hysteresis: ±1%.
  - Repeatability: ±0.1% typical.
  - Temperature Limits: -40 to 140°F (-40 to 60°C).
  - Storage Temperature: -40 to 176°F (-40 to 80°C).
  - Compensated Temperature Range: 4 to 140°F (-20 to 60°C).
  - 4-20 mA Loop Powered Models:
    - Power Requirements: 10-35 VDC.
    - Output Signal: 4-20 mA, 2 channels for humidity/solid state temperature, sensor models (loop powered on RH).
  - 0-5, 0-10V Output Models:
    - Power Requirements: 15-35 VDC or 15-29 VAC.
    - Output Signal: 0-5, 0-10V @ 5 mA max, 2 channels for humidity/solid state temperature sensor models.
  - Response Time: 15 seconds.
  - Electrical Connections:
    - Removable screw terminal block.
  - Conduit Connection: Duct mount: 1/2" NPS; OSA: 1/2" (22.3 mm).
  - Drift: <1% RH/year.
  - RH Sensor: Capacitance polymer.
  - Temperature Sensor:
    - Curves A,B,C, F: Thermistor;
    - Curves D,E: Platinum RTD DIN 385;
    - Curve 0: None.
  - Curve 1,2: Solid state band gap.
  - Housing Material:
    - Duct Mount: PBT;
    - OSA: Polycarbonate.
  - Enclosure Rating: NEMA 4X (IP65) for OSA mount only.
  - Display: Duct Mount only, Optional 2-line alpha numeric, 8 characters/line.
  - Display Resolution: RH: 0.1% 0.1°F (0.1°C).
  - Weight: Duct Mount: 0.616 lb (.3 kg) OSA 1 lb (.45 kg).
  - Agency Approvals: CE.

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**Bulletin E-90-RHP**

**DWYER INSTRUMENTS, INC.**

P.O. BOX 373 • MICHIGAN CITY, INDIANA 46361, U.S.A.  Phone: 219/879-8000 www.dwyer-inst.com Fax: 219/872-9057 e-mail: info@dwyer-inst.com
Dual 4-20 mA RH/Temperature Output Models

Dual 4-20 mA output units may be powered with a 10-35 VDC supply. The following describes the proper wiring of these transmitters: The model RHP transmitter with dual 4-20 mA output is designed as a two-wire 4-20 mA device with two channels. The channels are common on the positive side of the current loop. Sensor excitation power is derived from the RH channel, so power must always be applied to that channel. If the temperature channel is not used, it can be left disconnected. Wire as shown in figure 2.

Note: If the RH output is not required, wire the "-" terminal of the power supply to terminal 1.

0-5V and 0-10V Output Models with Thermistor, RTD, or No Temperature Sensor

The 0-5V and 0-10V output models may be powered with 15-35 VDC or 15-29 VAC. Note polarity when using DC power. The maximum load is 5 mA. Wire as shown in Figure 3.

5. Proceed with wiring according to Figure 1.
6. Replace cover and cover plugs on the face of the unit.

WIRING

Use maximum 18 AWG wire for wiring terminals. Refer to Figure 1 or Figure 2 for wiring information. Terminal blocks are removable for ease of wiring.

4-20 mA Output Models with Thermistor, RTD or No Temperature Sensor

4-20 mA output units may be powered with a 10-35 VDC supply. (Wire as shown in Figure 1).

Duct Mount

The transmitter should be mounted away from fans, corners, heating and cooling coils, and other equipment that will effect the measurement of the relative humidity. It should also be mounted in a location that receives adequate air flow for proper operation. The transmitter should be mounted such that the conduit connection points down to prevent moisture from entering.

1. Drill a 1" diameter hole into the duct at the desired location.
2. Insert the transmitter probe through the hole such that the mounting flange is flush to the duct.
3. Use three #8 x 1/2" pan head sheet metal screws to attach the mounting flange to the duct. Do not over tighten.
4. Remove top screw cover to access wiring terminals.

OSA (Outside Air)

The transmitter should be mounted under an eave, shield, or in an area that is out of the elements or direct sunlight. The transmitter should be mounted with the sensor pointing down to prevent water collection in the sensor cavity.

1. Remove the cover plugs from the face of the unit and the top cover.
2. Position the transmitter where it is to be mounted and mark the mounting holes in each corner of the housing.
3. Drill or punch out marked locations.
4. Place the transmitter box over mounting holes on wall and align. Install wall mount screws (not provided) in mounting holes.
5. Proceed with wiring according to Figure 1.
6. Replace cover and cover plugs on the face of the unit.
DISPLAY
The temperature indicated on the display, if equipped with the LCD option, is field selectable via a jumper located on the circuit board. Position the jumper for °F or °C according to Figure 5.

Note: The display will indicate temperature even if the unit does not have a temperature output.

TROUBLESHOOTING
1. Verify that the unit is mounted in the correct position.
2. **4-20 mA Models:**
   Verify appropriate supply voltage. The transmitter requires a minimum of 10 and a maximum of 35 VDC at its connection for proper operation. Choose a power supply with a voltage and current rating which meets this requirement under all operating conditions. If the power supply is unregulated, make sure voltage remains within these limits under all power line conditions. Ripple on the supply should not exceed 100 mV.

   **Loop Resistance** – The maximum allowable loop resistance depends on the power supply voltage. Maximum loop voltage drop must not reduce the transmitter voltage below the 10 VDC minimum. Maximum loop resistance can be calculated with the following equation. $V_{PS}$ is the power supply voltage.

   $$R_{\text{max}} = \frac{V_{PS} - 10.0}{20 \text{ mA}}$$

   Some receivers, particularly loop powered indicators, may maintain a fixed loop voltage to power the device. This voltage drop must also be subtracted from the power supply voltage when calculating the voltage margin for the transmitter. The following equation takes this into account. $V_{REC}$ is the receiver fixed voltage.

   $$R_{\text{max}} = \frac{V_{PS} - 10.0 - V_{REC}}{20 \text{ mA}}$$

   **0-5V and 0-10V Output Models:**
   Verify appropriate supply voltage. The 0-5V and 0-10V output models require a DC supply of 15 to 35 V or an AC supply of 15-29 V for proper operation maximum. Maximum output load is 5 mA.

FIELD SENSOR REPLACEMENT
Replacement sensors and sensor covers are available. Also, for models with removable plastic cover, a polyester filter is available for added sensor protection.

**NOTICE**
Sensor is sensitive to Electro-Static Discharge (ESD). Follow industry standard practice for control and protection against ESD. Failure to exercise good ESD practices may cause damage to the sensor.

For Duct Mount models:
1. Remove plastic cover or sintered filter.
2. Remove and discard old sensor.
3. Replace sensor making sure all six pins mate correctly with the socket and that the boards are correctly aligned as shown in Figure 6.
4. Replace plastic cover or sintered filter.

For OSA Sintered Filter:
1. Remove cover.
2. Refer to Figure 7, remove connector from socket on circuit board.
3. Loosen and remove nut, then carefully remove assembly from unit.
4. Remove second nut and o-ring on sensor and reinstall on new sensor.
5. Carefully install new sensor in unit. Place nut over cable and tighten.
6. Insert connector into socket on circuit board. Connector will only go one way.

MAINTENANCE
Upon final installation of the Series RHP Temperature/Humidity Transmitter and the companion receiver, no routine maintenance is required. A periodic check of the system calibration is recommended. Except for sensor replacement, the Series RHP is not field serviceable and should be returned if repair is needed (field repair should not be attempted and may void warranty). Be sure to include a brief description of the problem plus any relevant application notes. Contact customer service to receive a return goods authorization number before shipping.
<table>
<thead>
<tr>
<th>Example</th>
<th>RHP</th>
<th>2</th>
<th>D</th>
<th>A</th>
<th>LCD</th>
<th>RHP-2D1A-LCD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accuracy</td>
<td>RHP</td>
<td>2</td>
<td>3</td>
<td>2% Accuracy</td>
<td>3% Accuracy</td>
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<tr>
<td>Housing Type</td>
<td>D</td>
<td>F</td>
<td>O</td>
<td>S</td>
<td>Duct Mount w/Plastic Tip</td>
<td>Duct Mount w/Sintered Filter</td>
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<tr>
<td>RH Output</td>
<td>4-20mA</td>
<td>0-10V</td>
<td>0-5V</td>
<td></td>
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<tr>
<td>Temperature</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
<td>F</td>
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<tr>
<td>Sensor/Output</td>
<td>Option</td>
<td>LCD</td>
<td>LCD Display; Blank; No Options</td>
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</tbody>
</table>

### Accessories

Duct mount replacement sensor part number table:

<table>
<thead>
<tr>
<th>RHP Model #</th>
<th>Replacement Sensor Part #</th>
</tr>
</thead>
<tbody>
<tr>
<td>RHP-2(D or F)XA</td>
<td>RHPS-D2A</td>
</tr>
<tr>
<td>RHP-2(D or F)XB</td>
<td>RHPS-D2B</td>
</tr>
<tr>
<td>RHP-2(D or F)XC</td>
<td>RHPS-D2C</td>
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<tr>
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<tr>
<td>RHP-2(D or F)XF</td>
<td>RHPS-D2F</td>
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<tr>
<td>RHP-2(D or F)XF(0.1, 2)</td>
<td>RHPS-D20</td>
</tr>
<tr>
<td>RHP-3(D or F)XA</td>
<td>RHPS-D3A</td>
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<tr>
<td>RHP-3(D or F)XB</td>
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<td>RHP-3(D or F)XC</td>
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<tr>
<td>RHP-3(D or F)XF</td>
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<tr>
<td>RHP-3(D or F)XF(0.1, 2)</td>
<td>RHPS-D30</td>
</tr>
</tbody>
</table>

Duct mount replacement screw on sensor cover part numbers:

- Plastic cover - order part # A-453
- Sintered filter cover - order part # A-452

OSA Sintered filter replacement sensor part number table:

<table>
<thead>
<tr>
<th>RHP Model #</th>
<th>Replacement Sensor Part #</th>
</tr>
</thead>
<tbody>
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<td>RHP-2SXA</td>
<td>RHPS-S2A</td>
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<tr>
<td>RHP-2SXB</td>
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</tr>
<tr>
<td>RHP-2SXD</td>
<td>RHPS-S2D</td>
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<tr>
<td>RHP-2SXE</td>
<td>RHPS-S2E</td>
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<tr>
<td>RHP-2SXF</td>
<td>RHPS-S2F</td>
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<tr>
<td>RHP-2SX(0.1, 2)</td>
<td>RHPS-S20</td>
</tr>
<tr>
<td>RHP-3SXA</td>
<td>RHPS-S3A</td>
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<tr>
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</tr>
<tr>
<td>RHP-3SXC</td>
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</tr>
<tr>
<td>RHP-3SXD</td>
<td>RHPS-S3D</td>
</tr>
<tr>
<td>RHP-3SXE</td>
<td>RHPS-S3E</td>
</tr>
<tr>
<td>RHP-3SXF</td>
<td>RHPS-S3F</td>
</tr>
<tr>
<td>RHP-3SX(0.1, 2)</td>
<td>RHPS-S30</td>
</tr>
</tbody>
</table>

X = Any humidity output