Chilled Mirror Optical Hygrometers

the ultimate standard in moisture measurement technology
Principle of Operation

Kahn optical hygrometers use a fundamental and therefore highly accurate, reliable and drift-free method of continuously measuring the dewpoint of a gas sample. A mirror is chilled by a Peltier thermoelectric heat pump; a light is focused on the mirror; a photodetector measures the amount of light being reflected or scattered off the mirror; a platinum resistance thermometer (PRT) measures the temperature of the mirror which is dewpoint or frostpoint, by definition.

NOTE: The information included herein was correct at the time of publication and supersedes all previous data. It is our policy to continually improve our products to insure even better performance. Consequently current Kahn products may incorporate modifications not shown on these pages.

Kahn: The Ultimate Standard in Moisture Measurement Technology

Product Scope

Kahn offers several optical (chilled mirror) hygrometer products, Optidew, Optisure and S4000TRS, to meet the requirements of a broad range of dewpoint measurement applications. Each product is available in a variety of models to suit the user’s specific needs. Kahn’s 40 years of experience in chilled mirror technology has produced extremely sensitive (parts per billion), accurate and drift-free instrumentation for measurement of gas dewpoint. All Kahn hygrometers offer measurement traceability to national and international standards.

Optidew
Compact, Economical & Rugged

The Optidew Dewpoint and RH Hygrometer is a compact, sturdy and economical instrument that provides continuous dewpoint measurement, display and output. Key features include:

- Built-in data hold function
-文明城市 dewpoint measurement range
- Dewpoint accuracy of ±0.15°C
- 1-Stage or 2-Stage Peltier cooling
- Automatic contamination compensation
- Data logging SD card
- Built-in data hold function
- Analog and digital outputs
- Transmitter or display models
- High temperature sensor available

Optidew-Bench Top
- Wall mount transmitter with display
- Transmitter with remote sensors and 1 foot cable

Optidew-Wall Mount
- Bench top hygrometer with integral display, remote sensor and sensor cable

Optisure and S4000TRS
Ultimate in Dewpoint Monitoring

The Optisure and S4000TRS family feature the most accurate and versatile optical hygrometers available in the marketplace today. Key features include:

- Lightweight with measurement range to -60°C
- Triple display: 10 parameters (dewpoint, RH, temperature, pressure, etc.) available in each window

Optisure Integrale
- Dewpoint measurements from -90°C to +120°C
- Dewpoint accuracy and resolution ±0.1°C
- Dewpoint, temperature and %RH display and output
- 3-stage thermoelectric heat pump
- Automatic contamination compensation
- Current, voltage and RS232 digital outputs, USB, Ethernet, and SD card
- Dual optics detection system
- Precision platinum resistance thermometer
- Microscope to monitor condensation on mirror
- Optional pressure compensation
- Built-in data hold function

Optisure Remote
- Remote sensor in a compact housing
- Climactic version: dewpoints to +120°C

Optisure RS
- Temperature-controlled sensor body for dewpoint measurements to -90°C (92 ppb)

S4000TRS*
- Temperature-controlled sensor body for dewpoint measurements to -100°C (13 ppb)

*The S4000TRS also features our unique “speed pipe” technology that improves the response speed at trace moisture levels. The “speed pipe” concentrates the formation of ice crystals on the mirror surface and can reduce response time at trace moisture levels by a factor of four times.

Mirror and Cooling System

A chemically resistant, polished metal mirror is thermally bonded to a multi-stage Peltier thermoelectric heat pump. Direct current delivered to the heat pump allows the mirror to cool until condensation begins to form.

Electro-Optical Detection System

A single or dual optical detection system consisting of a light source and photodetector(s) ensures rapid equilibrium between condensation and evaporation at the mirror surface.

Temperature Measurement System

The temperature of the mirror surface is measured directly with a highly accurate PRT embedded within the mirror, and is displayed in selectable units on the instrument’s front panel.

Contamination Compensation

Contamination can compromise the measurement accuracy of an optical hygrometer. All Kahn optical hygrometer products feature Dynamic Contamination Correction (DCC), which ensures continuous optimal operation of the sensor in contaminated environments. The contamination compensation system periodically heats the mirror to vaporize the accumulated dew or frost. The instrument then readjusts itself to allow for altered reflectivity due to contaminants and returns to normal measuring. Although the DCC system is fully automatic, it can be user configured for individual applications.
Applications

**Motor Vehicle Emissions Testing**
Measurement of motor vehicle emissions such as nitrous oxide, carbon monoxide, lead and residual hydrocarbons is affected by humidity. By precisely measuring dewpoint, Kahn optical hygrometers help ensure an accurate determination of emissions concentrations.

**Calibration Reference Testing**
Instrument manufacturers, calibration laboratories and other end users utilize Kahn optical hygrometers as reference standards when verifying the calibration or performance of relative humidity probes or dewpoint sensors.

**Electronic Component Manufacturing**
Moisture is an unwanted contaminant in the manufacture of semi-conductors, integrated circuits and other electronic components. Kahn optical hygrometers are used to monitor dewpoint levels in gases used in production processes and to control humidity in fabrication and assembly areas.

**Utility Switchgear Performance Monitoring**
Sulfur hexafluoride (SF₆) is used by electric utilities as an insulating gas in high voltage switchgear. Because humidity compromises the ability of SF₆ to insulate, Kahn optical hygrometers are used to monitor its dewpoint and preserve the integrity of vital utility company equipment.

**Gas Turbine Inlet Air Monitoring**
The moisture content of air drawn into industrial gas turbines must be monitored to optimize combustion and minimize harmful emissions. Durability and accuracy of moisture measurement instrumentation are essential. These benefits are provided by Kahn optical hygrometers to turbine manufacturers and users worldwide.

Count on Kahn Experience
Kahn, a leader in pneumatic, hydraulic and electronic technology for over 70 years, provides innovative solutions to practical measurement problems. Since Kahn’s first moisture measurement designs were introduced 60 years ago, we have manufactured high quality, durable hygrometers for many specialized applications, often under demanding conditions. Our long-standing success in customer satisfaction and our expanding product line ensure that Kahn can provide you with hygrometers to suit all your needs.

Kahn provides technical support and maintenance for all of its equipment, from the earliest models to the latest innovations. Our hygrometers are also backed by the finest warranty in the industry: One full year on calibration and workmanship for both the instrument and sensor.

Some Satisfied Customers
Air Products
Cargill
Dow DuPont
Duke Energy
ExxonMobil
Ford
General Electric
General Motors
Harvard University
Hewlett Packard
Honeywell
IBM
Intel
Lockheed Martin
Merck
NASA
National Weather Service
Pratt & Whitney Aircraft
Qualcomm
Spectra Energy
Tennessee Valley Authority
Texas Instruments
U.S. Navy
United Technologies

The calibrations of Kahn hygrometers are traceable to the National Institute of Standards and Technology. Sensors are calibrated through a master optical hygrometer which has been calibrated at the NIST and is periodically re-calibrated. A certificate of traceability is provided with any of these instruments.
# CHILLED MIRROR HYGROMETER SPECIFICATIONS

## GENERAL

<table>
<thead>
<tr>
<th></th>
<th>Optidew Wall Mount</th>
<th>Optidew Bench Top</th>
<th>Optisure Integrale</th>
<th>Optisure Remote</th>
<th>Optisure RS</th>
<th>S4000TRS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>System Accuracy</strong></td>
<td>±0.15°C</td>
<td>±0.15°C</td>
<td>±0.1°C</td>
<td>±0.1°C</td>
<td>±0.1°C</td>
<td>±0.1°C</td>
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<tr>
<td><strong>Repeatability</strong></td>
<td>±0.05°C</td>
<td>±0.05°C</td>
<td>±0.05°C</td>
<td>±0.05°C</td>
<td>±0.05°C</td>
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<tr>
<td><strong>Digital Display</strong></td>
<td>Color LED Touch Screen</td>
<td>Color LED Touch Screen</td>
<td>Color LED Touch Screen</td>
<td>Color LCD Touch Screen</td>
<td>Color LCD Touch Screen</td>
<td>Dual Meters</td>
</tr>
<tr>
<td><strong>Units</strong></td>
<td>°C, °F, %RH g/m³, g/kg, ppm Twb, Psi, kPa, Bar</td>
<td>°C, °F, %RH g/m³, g/kg, ppm Twb, Psi, kPa, Bar</td>
<td>°C, °F, %RH g/m³, g/kg, ppm Psi, kPa, Bar</td>
<td>°C, °F, %RH g/m³, g/kg, ppm Psi, kPa, Bar</td>
<td>°C, °F, %RH g/m³, g/kg, ppm Psi, kPa, Bar</td>
<td>°C, °F, %RH g/m³, g/kg, ppm Psi, kPa, Bar</td>
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<tr>
<td><strong>Outputs</strong></td>
<td>4-20 mA</td>
<td>0-20 mA</td>
<td>4-20 mA</td>
<td>4-20 mA</td>
<td>4-20 mA</td>
<td>4-20 mA</td>
</tr>
<tr>
<td></td>
<td>0-20 mA</td>
<td>RS485 Alarm relay</td>
<td>0-20 mA</td>
<td>0-20 mA</td>
<td>0-20 mA</td>
<td>0-20 mA</td>
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<tr>
<td></td>
<td>0-1V</td>
<td>0-1V Alarm relay</td>
<td>0-1V Alarm relay</td>
<td>0-1V Alarm relay</td>
<td>0-1V Alarm relay</td>
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<tr>
<td></td>
<td>USB</td>
<td>SD Card Sensor</td>
<td>SD Card Sensor</td>
<td>SD Card Sensor</td>
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<td></td>
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<tr>
<td></td>
<td>Ethernet (optional)</td>
<td>Ethernet (optional)</td>
<td>Ethernet (optional)</td>
<td>Ethernet (optional)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sensor Location</strong></td>
<td>Remote</td>
<td>Remote</td>
<td>Integral</td>
<td>Remote</td>
<td>Integral</td>
<td>Integral</td>
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<tr>
<td><strong>Configuration</strong></td>
<td>Wall Mount</td>
<td>Bench Top</td>
<td>Bench Top or 19&quot; rack</td>
<td>Bench Top</td>
<td>Bench Top</td>
<td>Bench Top or 19&quot; rack</td>
</tr>
<tr>
<td><strong>Pressure Measurement</strong></td>
<td>Optional</td>
<td>Optional</td>
<td>Optional</td>
<td>Optional</td>
<td>Optional</td>
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<tr>
<td><strong>Power Requirements</strong></td>
<td>100-240 VAC 50-60 Hz</td>
<td>85-264 VAC 47-63 Hz</td>
<td>85-264 VAC 47-63 Hz</td>
<td>85-264 VAC 47-63 Hz</td>
<td>90-265 VAC 50-60 Hz</td>
<td></td>
</tr>
<tr>
<td><strong>Dimensions</strong></td>
<td>7.1&quot; x 10.2&quot; x 2.7&quot;</td>
<td>6.8&quot; x 8.7&quot; x 4.7&quot;</td>
<td>5&quot; x 1.8&quot; x 1.8&quot;</td>
<td>5&quot; x 10.0&quot; x 8.4&quot;</td>
<td>7.5&quot; x 17.5&quot; x 21.6&quot;</td>
<td>34&quot; x 22&quot; x 24&quot;</td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>3.3 lb.</td>
<td>3.3 lb.</td>
<td>25.1 lb.</td>
<td>9.3 lb.</td>
<td>49.4 lb.</td>
<td>187 lb.</td>
</tr>
<tr>
<td><strong>Dewpoint Sensor</strong></td>
<td>-25°C to +90°C (Single Stage)</td>
<td>-25°C to +90°C (Single Stage)</td>
<td>-60°C to +40°C</td>
<td>-40°C to +90°C (RS80)</td>
<td>-100°C to +20°C</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-40°C to +90°C (Dual Stage)</td>
<td>-40°C to +90°C (Dual Stage)</td>
<td>-40°C to +90°C (Optional)</td>
<td>-90°C to +20°C (RS90)</td>
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<tr>
<td></td>
<td>-40°C to +120°C (Harsh Environment)</td>
<td>-40°C to +120°C (Harsh Environment)</td>
<td>-40°C to +120°C (Optional)</td>
<td>-40°C to +120°C (Optional)</td>
<td></td>
<td></td>
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<tr>
<td><strong>Operating Pressure</strong></td>
<td>360 Psig Max.</td>
<td>360 Psig Max.</td>
<td>Vacuum to 290 Psig</td>
<td>Vacuum to 3625 Psig</td>
<td>Vacuum to 145 Psig</td>
<td>Atmospheric</td>
</tr>
<tr>
<td><strong>Operating Temperature</strong></td>
<td>-40°C to +90°C (20°C to +50°C)</td>
<td>-40°C to +90°C (20°C to +50°C)</td>
<td>-20°C to +40°C</td>
<td>-40°C to +90°C (0°C to +40°C)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-40°C to +50°C (Harsh Environment)</td>
<td>-40°C to +50°C (Harsh Environment)</td>
<td>-20°C to +50°C</td>
<td>-40°C to +50°C (optional)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sensor: to +120°C</td>
<td>Sensor: to +120°C</td>
<td></td>
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</tr>
<tr>
<td><strong>Sample Flow Rate</strong></td>
<td>0.1 to 2 L/min.</td>
<td>0.1 to 2 L/min.</td>
<td>0.1 to 1 L/min.</td>
<td>0.1 to 2 L/min.</td>
<td>0.5 to 1 L/min.</td>
<td>0.1 to 0.7 L/min.</td>
</tr>
</tbody>
</table>

## CHILLED MIRROR HYGROMETER

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