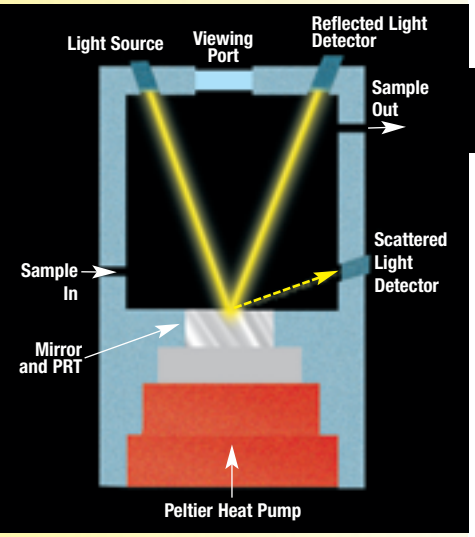
Chilled Mirror Optical Hygrometers

the ultimate standard in moisture measurement technology

KAHN

Principle of Operation

Kahn optical hygrometers use a fundamental and therefore highly accurate and reliable 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.



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 (Optidew) or dual (Series 4000) optical detection system consisting of a light source and photodetector(s) measures reflected and/or scattered light off the mirror. Closed-loop temperature control 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 100W 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 a optical hygrometer. All Kahn optical hygrometer products feature either Dynamic Contamination Correction (DCC) or Automatic Balance Compensation (ABC), 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.

KAHN: The Ultimate Standard in Moist

Product Scope

Kahn offers two optical (chilled mirror) hygrometer products, Optidew and Series 4000, 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 20 years of experience in chilled mirror technology has produced extremely sensitive (part 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:

Optidew

- -60 to +115°C dewpoint measurement range
- Accuracy of ±0.2°C
- 1-Stage or 2-Stage Peltier cooling
- Automatic contamination compensation
- Built-in data hold function
- Analog and digital outputs
- Transmitter or display models
- High temperature sensor available

Models

Optidew-Wall

- Wall mount transmitter with integral sensors

Optidew-Remote

- Transmitter with remote sensors and 6 foot cables

Optidew-Probe

- Transmitter with probe type sensor

Optidew-Bench

- Bench mount hygrometer with monitor, carry handle, remote sensors and 6 foot sensor cables

SERIES 4000

Ultimate in Dewpoint Monitoring

The Series 4000 Hygrometer family features the most accurate and versatile optical hygrometers available in the marketplace today. Key features include:

Series 4000

- Dewpoint measurements from -100°C to +85°C
- Accuracy of ±0.1°C
- Resolution of ±0.01°C
- 3-Stage Peltier cooling
- Automatic contamination compensation
- Current, voltage and RS232 digital outputs
- Dual optics detection system
- Precision platinum resistance thermometer
- Microscope to monitor condensation on mirror
- Optional pressure compensation
- Built-in data hold function

Models

S4000 Integrale

- Lightweight with measurement range to -60°C
- Dual display: °F or °C dewpoint and PPM or %RH

S4000 Remote

- Remote sensor in a compact housing
- Climatic version: dewpoints to +85°C

S4000RS*

- Temperature-controlled sensor body for dewpoint measurements to -85°C (230 ppb)

S4000TRS*

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

*The S4000RS and S4000TRS also feature 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.

ture Measurement Technology

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.

Utility Switchgear Performance Monitoring

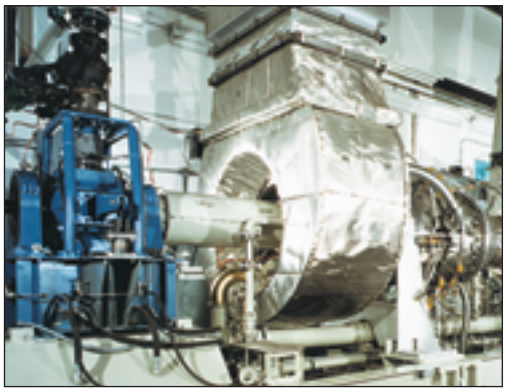
Sulfur hexaflouride (SF6) is used by electric utilities as an insulating gas in high voltage switchgear. Because humidity compromises the ability of SF_6 to insulate, Kahn optical hygrometers are used to monitor its dewpoint and preserve the integrity of vital utility company equipment.

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.

Heat Treating

Annealing, carburizing and other heat treat processes require precise monitoring and control of moisture content. Kahn optical hygrometers allow manufacturers and independent heat treaters to control the quality of their processes, minimize scrap and ensure compliance with quality standards including ISO 9000.



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 50 years, provides innovative solutions to practical measurement problems. Since Kahn's first moisture measurement designs were introduced 40 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
Duke Energy
ExxonMobil
Ford
General Electric
Harvard University
Honeywell
IBM
Intel
Lockheed Martin
Merck
NASA
National Weather Service
Pratt & Whitney Aircraft
Qualcomm
Tennessee Valley Authority
Texas Instruments
Transwestern Pipeline
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 all of these instruments.

CHILLED MIRROR HYGROMETER SPECIFICATIONS

	Optidew Wall	Optidew Remote	Optidew Probe	Optidew Bench	S4000 Integrale	S4000 Remote	S4000RS	S4000TRS
GENERAL								
System Accuracy	±0.2°C* *Optional accuracy:	±0.2°C* : ±0.15°C	±0.2°C*	±0.2°C*	±0.1°C	±0.1°C	±0.1°C	±0.1°C
Cooling Rate	1°C/Sec	1°C/Sec	1°C/Sec	1°C/Sec	0.5°C/Sec	0.5°C/Sec	0.5°C/Sec	0.5°C/Sec
Digital Display	Optional Integrated	Optional Integrated	Optional Integrated	Integrated	Dual	Dual	Dual	Dual
Units °C or °F	°C, °F, %RH g/m³, g/kg	°C, °F, %RH g/m³, g/kg	°C, °F, %RH g/m³, g/kg	°C, °F, %RH g/m³, g/kg	°C, °F, PPM(V), PPM(W), %RH, g/m³, g/Kg or kPa	°C, °F, PPM(V), PPM(W), %RH, g/m³, g/Kg or kPa	°C, °F, PPM(V), PPM(W), %RH, g/m³, g/Kg or kPa	°C, °F, PPM(V), PPM(W), %RH, g/m³, g/Kg or kPa
Outputs 4-20 mA, 4-20 mA,	4-20 mA, 0-20 mA, RS232 RS485 opt. Alarm Relay	4-20 mA, 0-20 mA, RS232 RS485 opt. Alarm Relay	4-20 mA, 0-20 mA, RS232 RS485 opt. Alarm Relay	4-20 mA, 0-20 mA, RS232 RS485 opt. Alarm Relay	4-20 mA, mV/°C RS232	4-20 mA, mV/°C RS232	4-20 mA, mV/°C RS232	4-20 mA, mV/°C RS232
Sensor Location	Integral	Remote	Integral	Remote	Integral	Remote	Integral	Integral
Configuration	Wall	Bench or panel	Flange	Bench or panel	Bench or 19" rack	Bench or 19" rack	Bench or 19" rack	Bench or 19" rack
Pressure Compensation	No	No	No	No	Yes	Yes	Yes	Yes
Power Requirements	90-264 VAC 47-440 Hz	90-264 VAC 47-440 Hz	90-264 VAC 47-440 Hz	90-264 VAC 47-440 Hz	90-264 VAC 47-440 Hz	90-264 VAC 47-440 Hz	115 VAC 50-60 Hz	115 VAC 50-60 Hz
Dimensions Monitor Dimensions H x W x D Sensor Dimensions L x Dia.	14.5"x9"x4" 5"x1.8"	9"x9"x4" 5"x1.8"	18.4"x10"x22.7" 5"x1.8"	4"x11.5"x10.3" 5"x1.8"	5.5"x19"x17" includes sensor	5.25"x10.5"x8.5" 5.5"x19"x17" (H x W x D)	16"x19"x20" includes sensor	34"x22"x24" includes sensor
Weight	7 lbs.	8 lbs.	13.5 lbs.	6.5 lbs.	21.6 lbs.	Sensor 14 lbs. Monitor 15 lbs.	Sensor 71 lbs Monitor 15 lbs.	110 lbs.
DEWPOINT SENSOR								
Measurement Range Dewpoint	-50°C to +90°C (Single Stage) -60°C to +90°C (Dual Stage) -50°C to +115°C (High Temperature)	-50°C to +90°C (Single Stage) -60°C to +90°C (Dual Stage) -50°C to +115°C (High Temperature)	-50°C to +90°C (Single Stage) -60°C to +90°C (Dual Stage) -50°C to +115°C (High Temperature)	-50°C to +90°C (Single Stage) -60°C to +90°C (Dual Stage) -50°C to +115°C (High Temperature)	-60°C to +20°C	-50°C to +20°C* *Climatic Version to +85°C	-85°C to +20°C	-100°C to +20°C
Operating Pressure	Vacuum to 3600 PSIG	Vacuum to 3600 PSIG	Vacuum to 3600 PSIG	Vacuum to 3600 PSIG	Vacuum to 150 PSIG	Vacuum to 150 PSIG	Vacuum to 150 PSIG	Vacuum to 150 PSIG
Operating Temperature Standard Sensor Electronics	-40°C to +90°C* -20°C to +50°C *High Temperature Sensor: -40°C to +115°C	-40°C to +90°C* -20°C to +50°C	-40°C to +90°C* -20°C to +50°C	-40°C to +90°C* -20°C to +50°C	-20°C to +50°C -20°C to +50°C	-30°C to +30°C** -20°C to +50°C **Climatic Version to +90°C	+10°C to +30°C -20°C to +50°C	+10°C to +30°C -20°C to +50°C
Sample Flow Rate	0.1 to 2 L/min.	0.1 to 2 L/min.	0.1 to 2 L/min.	0.1 to 2 L/min.	0.05 to 0.2 L/min.	0.1 to 0.7 L/min.	0.1 to 0.7 L/min.	0.1 to 0.7 L/min.

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