

KAHN Hygrometers

Optisure Hygrometer

An optical (chilled mirror) hygrometer for determining dewpoint using a fundamental measurement technology

- Fundamental, Accurate, Drift-Free Measurement
- -76°F to +104°F Dewpoint Range
- Dewpoint Accuracy of $\pm 0.18^\circ\text{F}$
- Advanced Dual Optics System
- Analog and Digital Outputs
- Multiple Engineering Units
- Easy Mirror Access
- Integral Flow Transducer
- Data Logging to USB or SD Card
- Vertical or Horizontal Configuration
- NIST Traceability

General Description

The Optisure hygrometer provides a fundamental and therefore highly accurate and reliable method of continuously measuring the dewpoint temperature of a gas sample. This instrument features fast response, a clear readable display and a simple, intuitive customer interface. Available in two configurations, vertical and horizontal, the Optisure offers unmatched accuracy ($\pm 0.18^\circ\text{F}$) in dewpoint measurements of air and gas systems.

The heart of the Optisure is a new sensor head that has an advanced, dual optics system offering excellent measurement sensitivity and accuracy. The new sensor head also features built-in compensation for optics output and is hinged to allow easy accessibility for mirror cleaning and inspection. An innovative frost assurance system eliminates any ambiguity in determining ice versus super-cooled water formation. The high-resolution LCD display is divided into two sections. Measured or calculated operational data, such as temperature, dewpoint, ppm, relative humidity, pressure, flow rate and others are shown in three large horizontal panes on the left side of the display. Status of measurement and instrument output, such as instrument operating phase, dewpoint stability, sensor operating mode, process alarm state and mirror contamination level are shown on the right side of the display.



Operating Principle

A chemically resistant, polished gold plated copper mirror is thermally bonded to a three-stage Peltier thermoelectric heat pump. The temperature of the mirror is controlled by applying a direct current to the heat pump. The heat pump cools the mirror surface until condensation begins to form. This condensation causes a corresponding reduction in the reflected light intensity seen by photodetectors. Closed loop control of the system results in rapid equilibrium of the mirror surface at the precise temperature at which condensation starts to form. This is, by definition, the dewpoint (or frostpoint) of the gas under test and is measured by the instrument directly with a highly accurate 100 ohm platinum resistance thermometer embedded within the mirror. This measurement technique is the reason the Optisure is characterized as using a fundamental method of determining dewpoint.

Two photo detectors are used: one measures reflected light, the other scattered light. Using the differential of the outputs from these two photodetectors, the exact temperature that dew or frost forms can be measured. By using two photodetectors, the thinnest possible condensation films can be detected, yielding faster response times and greater repeatability.

What is Dewpoint?

Dewpoint is defined as the temperature at which the water vapor pressure of a gas equals the saturated water vapor pressure. It is therefore the temperature at which condensation "just begins" to occur if a gas is cooled.

Dewpoint is a fundamental unit and directly equivalent to water vapor pressure or parts per million. It is a very convenient measure of actual water content (absolute humidity) because it is not a function of temperature in the same way that relative humidity is.

Measurement Reliability

To compensate for the presence of undesirable contaminants on the mirror, Optisure includes an improved contamination compensation system. The enhanced Dynamic Contamination Correction (DCC) automatically eliminates any error that may be caused by mirror particulate contamination. DCC is a self-learning system that adapts itself to the user's specific operating conditions. Although the DCC system is fully automatic, it can be user configured to accommodate your own process conditions.

Installation

The Optisure hygrometer may be supplied in either a vertical or horizontal bench-top enclosure. In addition, a panel mounting kit is available to allow the horizontal instrument to be installed in a 19 inch instrumentation rack. Two 1/4" NPT gas ports are provided to accept the sample gas tubing.

SPECIFICATIONS

Display:
High resolution backlit LCD

Measurement Units:
Humidity: °Fdp, °Cdp, PPMv,
PPMw for SF₆, % RH, g/kg, g/m³
Temperature: °F, °C
Flow: ml/min
Pressure: PSIA, KPa, BarA

Dewpoint Range:
-76°F to +104°F depending
on ambient conditions

Accuracy:
Dewpoint ±0.18°F
Temperature ±0.18°F

Resolution:
To 0.001 for all units

Repeatability:
Less than 0.18°F

Response Speed:
1.8°F per second

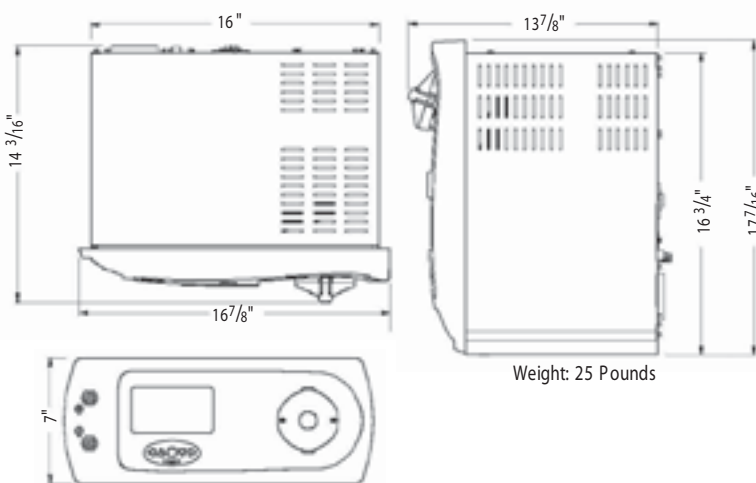
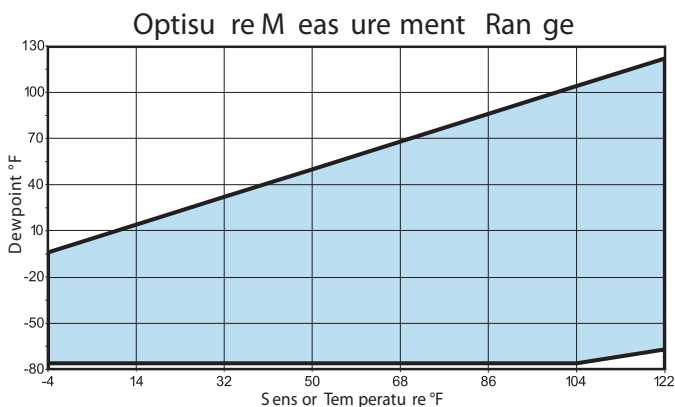
Operating Conditions:
Temperature: -4°F to +122°F
Pressure: 0 to 30 PSIG

Sample Flow Rate:
0.02 to 2.0 SCFH
(0.01 to 1.0 liters/minute)

Outputs:
Analog: 4-20 mA, 0-20 mA, 0-1 VDC
Digital: USB, MODBUS RTU
Alarm: Relay

Power Requirements:
85 to 264 VAC, 47/63 Hz,
100 watts

Options:
Microscope
19" Panel mounting kit
(for horizontal instrument)
Built-in pressure transducer
Transportation case



NOTE: The information included herein was correct at the time of publication and supercedes 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.

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