

S8000 HT

High-Precision Chilled Mirror Hygrometer

The S8000 HT is a high-precision, high-temperature reference hygrometer for humidity calibration and standards laboratories.



Highlights

- Accuracy of ± 0.1 °C (± 0.18 °F)
- Precision measurement to -30 °C to +95 °C (-22 °F to +203 °F) dew point
- ± 0.05 °Cdp (± 0.09 °Fdp) stability
- ± 0.05 °Cdp (± 0.09 °Fdp) reproducibility
- External PRT for RH measurements
- Simple configuration and operation via touchscreen interface
- Compact 19 in x 4U package for flexibility of installation
- USB + Ethernet or RS485 connections
- SD card datalogging
- Supplied with 2 m Heat Trace Lines

Applications

- Reference humidity measurements in standards laboratories
- Reference instrument in humidity calibration facilities
- Reference instrument for RH sensor manufacturing
- Precision moisture measurements in research and development

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High-Precision Chilled Mirror Hygrometer

The New Laboratory Humidity Reference Standard

The S8000 HT hygrometer directly measures the formation of condensation on a mirrored surface, offering a wide measurement range with minimal operator intervention. The instrument provides a range of digital and analog communications, allowing it to be monitored remotely or via specific S8000 logging software.

A high-contrast touch-screen LCD display gives or presents entirely customizable local indication of the measured values, along with a trend graph and fault warnings.

Optical System for High Sensitivity and Fast Response to Humidity Changes

The S8000 HT features a thermally compensated optics system that precisely detects the formation of condensation on the mirror surface. This design delivers exceptional sensitivity and fast response to changes in high dew-point conditions, ensuring accurate and reliable measurement.

Use Your Preferred Communication

The S8000 HT can be ordered with a wide range of communication protocols:

- Modbus RTU over USB
- Modbus TCP/IP over Ethernet or RS485
- 2 user configurable 0/4 mA to 20 mA
- Status and Process Alarm contacts
- Datalogging to SD Card

Uncompromising Accuracy

The advanced sensor design of the S8000 HT incorporates a high-precision Pt100 to accurately measure the mirror temperature. Combined with tightly controlled heating and enhanced thermal stability it enables $\pm 0.1^\circ\text{C}$ ($\pm 0.18^\circ\text{F}$) accuracy in dew-point measurement. The system ensures high repeatability and stability, even at elevated dew points, making it ideal for critical humidity control in demanding environments.

To further improve the accuracy of pressure-derived calculated values, a barometric pressure transducer is installed, which provides a real-time pressure input for these parameters.

Confidence Through Seeing What You Measure

It is possible for moisture to exist as a liquid at temperatures down to -30°C (-22°F). The difference in condensation temperature between water and ice can be 10 % of the reading.

The S8000 HT takes the approach described below to ensure confidence in the phase of water condensate being measured (dew or frost):

Frost Assurance (FAST)

Frost Assurance determines whether the dew point of the sample is in the temperature region where super-cooled water can exist, and if so, will drive the mirror down to -30°C (-22°F) to ensure that ice is present on the mirror surface.

DCC for Increased Reliability

The S8000 HT utilizes a system called DCC (Dynamic Contamination Correction). The DCC system is automated and adapts the instrument control to achieve optimum measurement performance at all times by guaranteeing a uniform condensate layer. This ensures highly repeatable measurement performance.

Although the DCC system is fully automatic, it can be configured by the user for individual applications.



Operating Principle

The system operates on the chilled mirror principle, whereby the gas sample flows over the surface of a chilled copper gold-plated mirror and, at a temperature dependent on the moisture content and pressure of the gas, the moisture in the gas condenses out onto the surface of the mirror.

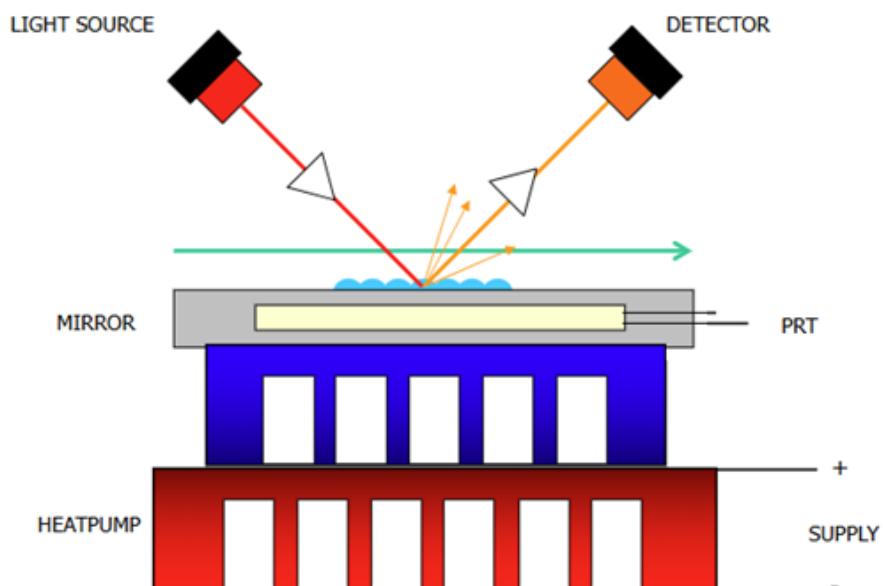
An optical system is used to detect the point at which this occurs, and this information is used to control the mirror temperature and maintain a constant thickness of the condensation layer on the mirror surface.

The above is achieved by a light-emitting diode providing

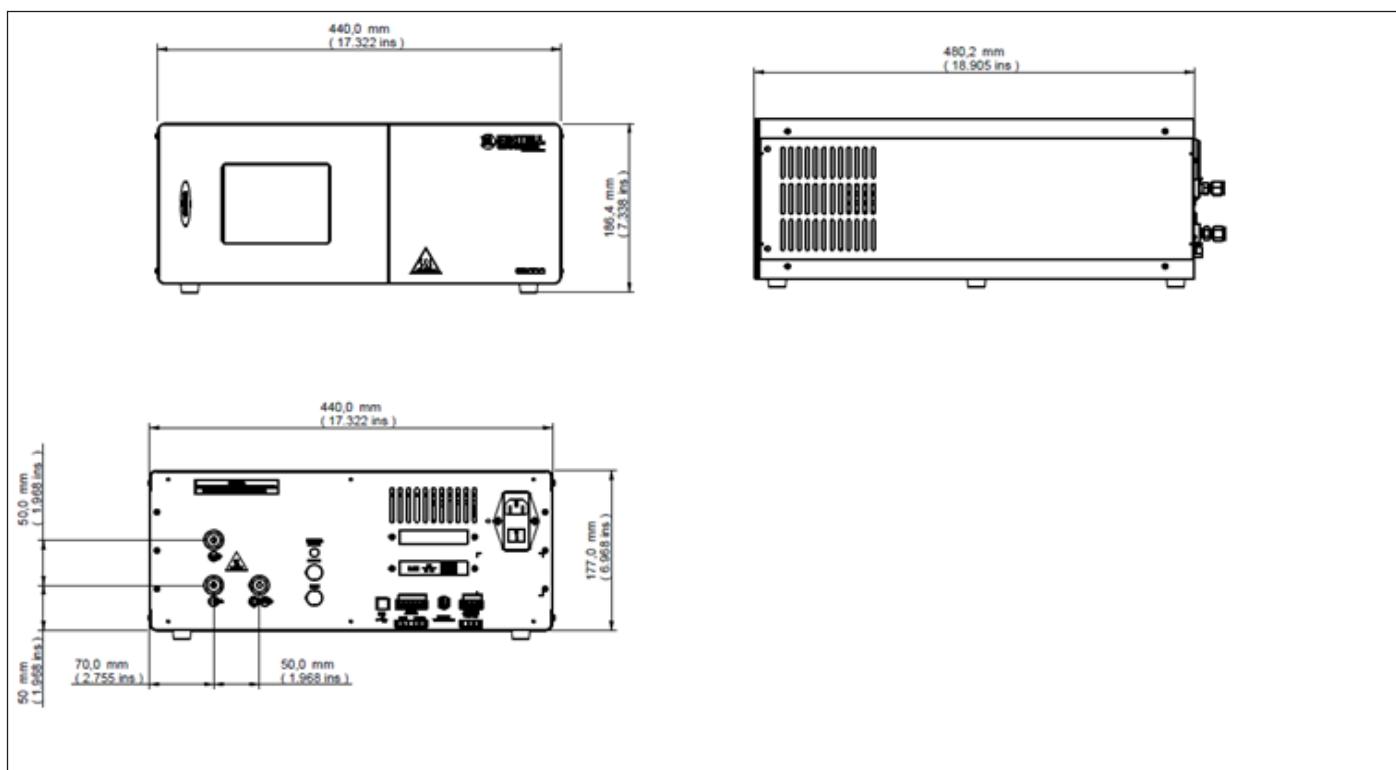
a light source of constant intensity which is focused on the mirror surface to flood it with light.

A photo detector measures the light level reflected by the mirror and its output is then used to control the drive to a heat pump/thermo-electric cooler to maintain a constant level of condensation on the mirror surface.

At this point of equilibrium, where the evaporation and condensation rates on the surface of the mirror are equal, the mirror temperature is measured via a Pt100 platinum resistance thermometer (PRT) embedded in the mirror, which is recorded as the dew point.



Dimensions



Technical Specifications

Dew-Point Sensor		Calculated Units	Relative humidity – %, Absolute humidity – g/m ³ , ppm _v , Mixing Ratio – g/kg, Wet Bulb Temperature (Twb) – °C, °F, Water Vapor Pressure (wvp) – Pa, Pressure converted DP – °C, °F, Pressure – kPa, Barg, Psia, Psig
Measurement Range	-30 °C to +95 °C (-22 °F to +203 °F) frost/dew point		
Measurement Accuracy*	±0.1 °C (±0.18 °F)		
Reproducibility	±0.05 °Cdp (±0.09 °Fdp)		
Stability	±0.05 °C (±0.09 °F)		
Mirror	Gold-plated copper		
Temperature Measurement	4-wire Pt100, 1/10 DIN class B		
Sample Flow Rate	250 mL/min to 1000 mL/min (recommended 750 mL/min)		
Sample Gas Pressure	0.5 barg (7.25 psig) max		
Remote PRT		Outputs	Analogue: 2 x active mA outputs, configurable 0 mA to 20 mA or 4 mA to 20 mA Digital: Modbus RTU over USB and Modbus TCP/IP over Ethernet or RS485 Alarm: 1x Process Relay 1x Alarm Relay Both Form C, 1 A, 30 Vdc
Temperature Measurement	4-wire Pt100, 1/10 DIN class B		
Accuracy	±0.1 °C (±0.18 °F)		
Cable Length	2 m (6.6 ft) (250 m (820 ft) max)		
Pressure Sensor (optional)		User Interface	5.7 in LCD with touchscreen
Measurement Range	0 barg to 0.6 barg (0 psig to 8.7 psig)		
Measurement Accuracy	Accuracy ≤ ±1 % FS Thermal error ≤ 1.5 % FS Temp Comp 0 °C to +80 °C (-32 °F to +176 °F)		
Flow Sensor		Data Logging	SD Card (8GB supplied) and USB interface. Supports SD Card (FAT-32) – 32 GB max. that allows 24 million logs or 560 days, logging at 2 s intervals
Measurement Range	0 mL/min to 5000 mL/min		
Measurement Accuracy	±1.5 % FS (10 to 100 % of rated flow)		
Monitor		Environmental Conditions	+10 °C to +30 °C (+50 °F to +86 °F)
Resolution	User selectable to 0.001 °C (0.0018 °F), depending on parameter		
Measurement Units	°C dew/frost point, °C temperature, ml/min flow, barg pressure		
Mechanical Specification			
Dimensions (L x W x H)	480 mm x 440 mm x 185 mm (18.9 in x 17.32 in x 7.28 in)		
Weight	22 kg (48.5 lb) (instrument only) 26 kg/57.3 lb (with HTLs)		
Sample Gas Connections	Inlet and Outlets: 1/4" Swagelok tube		
General			
Calibration	5-point UKAS calibration to +90 °Cdp (+194 °Fdp)		

* Measurement accuracy means maximum deviation between instrument under test and corrected reference. To this must be added the uncertainties associated with the calibration system and the environmental conditions during testing or subsequent use.

Michell Instruments adopts a continuous development programme which sometimes necessitates specification changes without notice.
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