

# S4000 Remote

## Precision Dew-Point Hygrometer

A precision laboratory dew-point hygrometer with the ultimate accuracy, reliability and long-term performance for humidity measurement and calibration.



### Highlights

- Super-sensitive dual optics
- Three stage Peltier cooling
- Precision 100  $\Omega$  4-wire platinum resistance thermometer
- 0.1°Cdp accuracy (0.18°Fdp)
- Dual multi-function LED display with unit indicator
- Current, voltage outputs and RS232 digital communications

### Applications

- Environmental chambers
- Metrology and standard laboratories
- Pharmaceutical humidity measurement and calibration
- Meteorological humidity calibration
- R&D Laboratories

## S4000 Remote Precision Dew-Point Meter

### The Laboratory Standard

The S4000 Remote Precision Dew-Point Meter offers unmatched accuracy and reliability in dew-point measurements of air and gas systems and in calibration laboratories. Its powerful three-stage Peltier thermoelectric heat pump gives a depression capability of more than 80°C (176°F) at normal laboratory temperature. The S4000 Remote can measure and control at dew points (frost points) down to -50°C (-58°F) from a normal room temperature, and with additional water-cooling through the integral cooling jacket can measure as low as -80°C (-112°F) dew point. As its name suggests, the S4000 Remote comprises a free-standing sensor and a 19" x 3 U monitor unit, connected by individual power and signal cables for the most stable and precise dew-point control.

### Contamination Compensation

Any optical system carries a risk of contamination. The S4000 Remote automatically compensates for any such build-up with its ABC (Automatic Balance Compensation) System. ABC ensures continuous optimum operation of the sensor by periodically driving off condensation to allow the optical loop to be re-balanced. When the contamination level is too high the control electronics provide a visible alarm and the sensor optical system may be cleaned with distilled water or a suitable high purity solvent (e.g. acetone).

ABC cycle time, duration and recovery time can all be adjusted according to the type of application to minimise the effect of contamination risk. The S4000 Remote also features a sophisticated data hold system, which maintains the instrument's signal outputs during an ABC cycle, allowing the S4000 Remote to be used for process control applications.

### Dual Optics for Supreme Sensitivity

At low frost points the rate of formation of frost on the mirror surface is extremely slow. As a result other cooled mirror hygrometers may give reduced accuracy, poor control stability and extremely long response times at low moisture levels. The S4000 Remote is unique in that it utilises a dual optics detection system that measures both the increase in scattered light intensity and the reduction in reflected light intensity from the mirror surface as frost forms. This greatly increases the sensitivity of the optical loop and response, stability and sensitivity are improved by orders of magnitude at low frost points.

In addition the S4000 Remote can optionally be fitted with Michell's unique speed pipe technology, giving further improvements in response speed at low moisture levels. The speed pipe concentrates the formation of ice crystals on the mirror surface and can reduce response times by a factor of four times. Typical response times are as follows:

Dew point °C (°F)	+10 (+50)	-20 (-4)	-50 (-58)	-70 (-94)
Response time, minutes	0.5	4	20	40

### Unbeatable Measurement Capability

The S4000 Remote uses a highly accurate 4 wire PT100 temperature sensor and has a proven measurement capability of better than 0.1°C (0.18°F) dew point. It is the only instrument that is delivered, as standard, with a full UKAS certificate providing official traceability to the UK National Standard. UKAS is the United Kingdom member of European Cooperation on Accreditation (EA), the International Laboratory Accreditation Cooperation (ILAC) and the International Accreditation Forum (IAF). The S4000 Remote is also calibrated traceable to the NIST (Washington DC, USA) National Humidity Standard. No other hygrometer provides such comprehensive traceability to a worldwide network of standards organisations. That's why the S4000 Remote is used by so many of these very organisations as part of their own humidity referencing systems.

### Visual Verification

Every S4000 Remote is delivered complete with an M4K Viewing Microscope. Fitting neatly into the sensor viewing port, this microscope allows the user to confirm the presence of water or ice on the mirror surface.

### Climatic Sensor Option

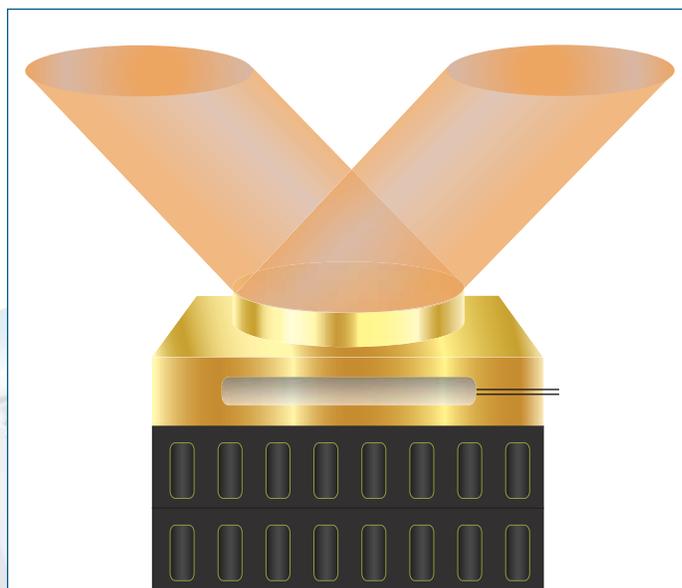
For applications where high humidities are to be measured, or where it is necessary for the sensor to react quickly to changing ambient temperatures (for example environmental test chamber measurements) a climatic sensor version is available. The climatic sensor offers the same accuracy and reliability as the standard S4000 Remote sensor but is provided with a minimum volume, open housing arrangement to give maximum thermal stabilisation and protection from condensation conditions.

## Technology: Chilled Mirror

Michell's chilled mirror dew-point meters are precision instruments for critical measurement and control applications. The fundamental nature of this method means that chilled mirror instruments can be used as either extremely reliable and stable field instruments or as laboratory reference standards for the calibration of other devices. Michell's chilled mirror sensors are fundamental in their method of operation.

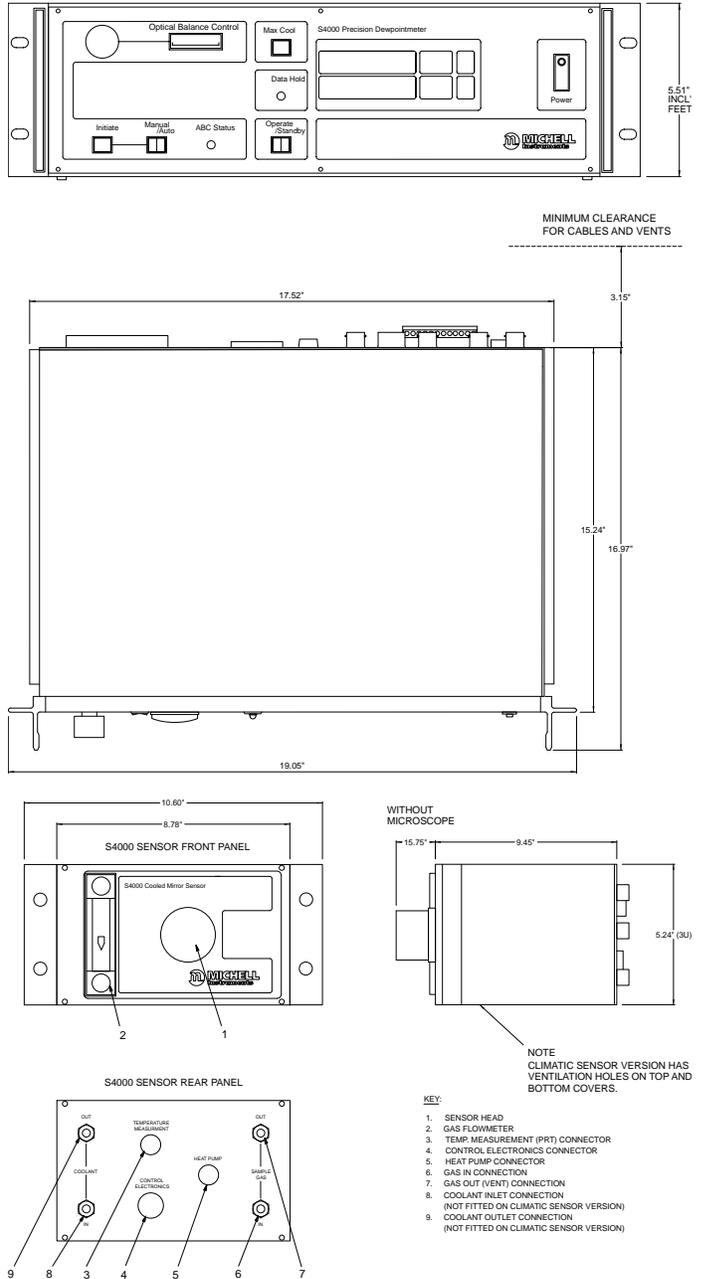
A miniature mirror is cooled by a solid state Peltier thermoelectric heat pump until it reaches the dew point of the gas under test. When this temperature has been reached, condensation will begin to form on the mirror surface. An electro-optical loop detects that condensation is forming, by a reduction in the intensity of light reflected from the mirror surface and through the control electronics of the chilled mirror instrument. This modulates the cooling power applied to the Peltier.

The mirror surface is then controlled in an equilibrium state whereby evaporation and condensation are occurring at the same rate. In this condition the temperature of the mirror (measured by a platinum resistance thermometer) is equal to the dew-point temperature of the gas.



# Technical Specifications

Performance	
Measurement Technology	Chilled Mirror
Measurement Units	°Cdp, °Fdp; °C, °F temp; % RH, ppm <sub>v</sub> , ppm <sub>w</sub> , g/m <sup>3</sup> , g/kg, ppm <sub>w</sub> for SF <sub>6</sub>
Measurement Range	- 80 to +20°Cdp (-112 to +68°Fdp) (remote); - 80 to +85 °Cdp(112 to +185°F) (climatic sensor)
Accuracy	±0.1°Cdp (0.18°Fdp) (typical system accuracy)
Sensitivity	0.01°C (0.018°F)
Response Speed	0.5°C/sec + setting time (0.9°F) (dew point dependent)
Repeatability	Better than 0.1°C (0.18°F)
Sample Flow Rate	0.1 to 0.7 l/min (0.2 to 1.5 scfh) (recommended)
Sensor Pressure	0.1 MPa (1 barg/14.5 psig)
Electrical input/output	
Output: Analog	10 mV/ °Cdp, 4-20 mA
Output: Digital	RS232; data hold, ABC status, optics alarm (logic)
Output Ranges	
Display Resolution	0.01 for all units
Power Supply	90 to 265 V AC; 50-60 Hz (monitor)
Operating conditions	
Sensor Operating Temperature	-30 to +30 °C (-22 to +86°F) (remote); -30 to +90 °C (-22 to +194°F) (climatic)
Mechanical specification	
Sensor Housing Type	Bench case; space frame (climatic version)
Dimensions	268mm x 300mm x 133mm (w x d x h) 10.6 in x 11.8 in x 5.2 in (w x d x h)
Weight	5.5 kg; 4.8 kg (climatic version) 12.1 lbs; 10.6 lbs (climatic version)
Cable Length	50 metres (164 ft) (max)
Display	Dual 6 digit LED, with 2 digit eng unit indicators
Dual Optics Detection System	Wide band red LED with dual photo sensors
Integrated Flow Meter	0 to 1 l/min (0 to 2 scfh)



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