

S4000 TRS

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

- 0.1°Cdp accuracy
- Measurement range: -100 to +20°Cdp
- Precision 100 Ω 4 wire platinum resistance thermometer
- Dual optics detection system
- Available with VCR couplings for optimum trace moisture sampling
- Dual multi-function LED display with unit indicator

Applications

- Standards Laboratory reference instrument
- Research and development
- Battery manufacture
- Industrial gases

S4000 TRS Precision Dew-Point Hygrometer

The Laboratory Standard

The S4000 TRS offers unmatched accuracy and reliability in dew-point measurement and calibration. The powerful three-stage Peltier thermoelectric heat pump, coupled with integrated auxiliary refrigerant cooling, gives an effective measurement range down to -100°C dew point.



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 chilled mirror dew-point meters may give reduced accuracy, poor control stability and extremely long response times at low moisture levels. The S4000 TRS is unique in that it utilizes a dual optics detection system. This greatly increases the sensitivity of the optical loop. Response, stability and sensitivity are improved by orders of magnitude at low frost points.

Calibration Integrity

The S4000 TRS is unique amongst dew-point hygrometers. 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 Co-operation on Accreditation (EA), the International Laboratory Accreditation Cooperation (ILAC) and the International Accreditation Forum (IAF). As an additional benefit, the S4000 TRS has a direct traceability path to the NIST (Washington DC, USA) National Humidity Standard.

No other hygrometer provides such comprehensive traceability to a worldwide network of standards organizations. The S4000 TRS is used by many of these organisations as part of their own humidity referencing systems.

Contamination Compensation

Any optical system carries a risk of contamination. The S4000 TRS 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 a visible alarm is generated. The sensor optical system may be cleaned with distilled water or a suitable high purity solvent such as acetone. ABC cycle time, duration and recovery time can all be adjusted according to the type of application to minimize the effect of contamination risk. The S4000 TRS also features a sophisticated data hold system, which maintains the instrument's signal outputs during an ABC cycle, allowing the S4000 TRS to be used for process control applications.

Unbeatable Measurement Capability

The S4000 TRS uses a highly accurate 4-wire PT100 temperature sensor and has a proven measurement capability of better than $\pm 0.1^{\circ}\text{C}$ dew point.

Visual Verification

Every S4000 TRS 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.

Technology: Chilled Mirror

Michell's chilled mirror dew-point hygrometers are precision instruments for critical measurement and control applications. Chilled mirror sensors measure a primary characteristic of moisture – the temperature at which condensation forms on a surface. This means that chilled mirror instruments:

- have no drift: the temperature at which condensation forms is measured directly so there are no calculated variables that could shift over time
- are inherently repeatable, giving reliable results every time

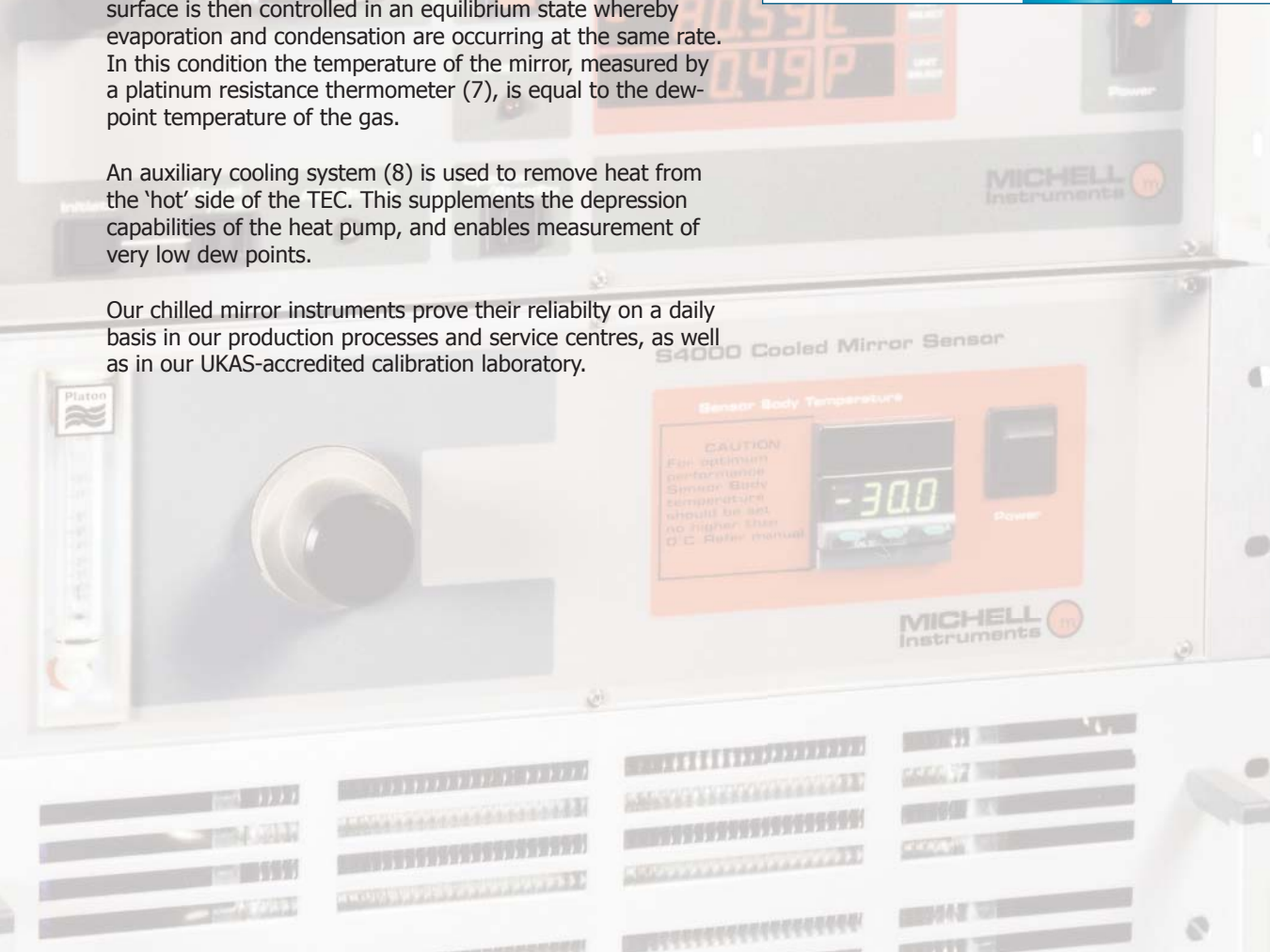
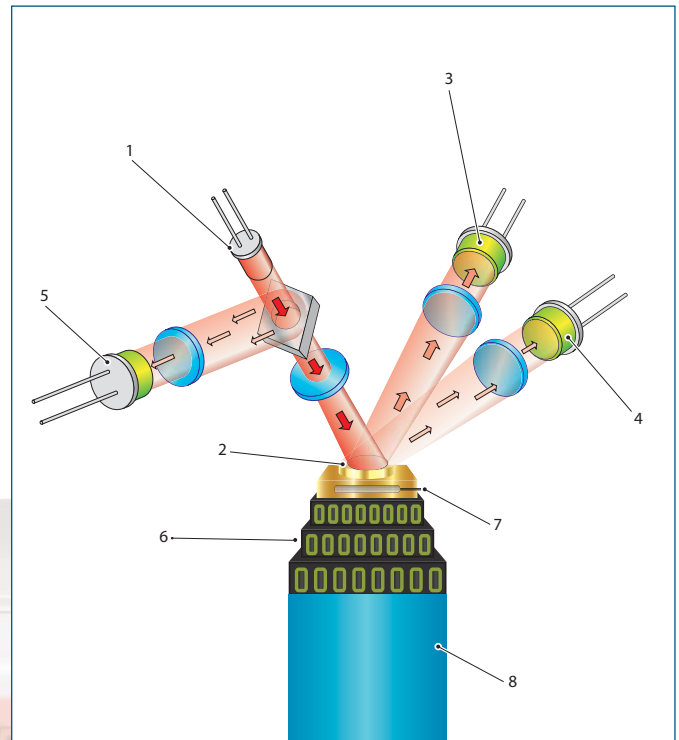
The chilled mirror sensor consists of a temperature controlled mirror and an advanced optical detection system.

A beam of light from an LED (1) is focused on the mirror surface (2) with a fixed intensity. As the mirror is cooled, less light is reflected due to the scattering effect of the condensate formed on the mirror surface. The levels of reflected and scattered light are measured by two photo-detectors (3 & 4) and compared against a third reference detector (5) measuring the intensity of light from the LED.

The signals from this optics system are used to precisely control the drive to a solid state thermoelectric cooler (TEC) (6), which heats or cools the mirror surface. 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 (7), is equal to the dew-point temperature of the gas.

An auxiliary cooling system (8) is used to remove heat from the 'hot' side of the TEC. This supplements the depression capabilities of the heat pump, and enables measurement of very low dew points.

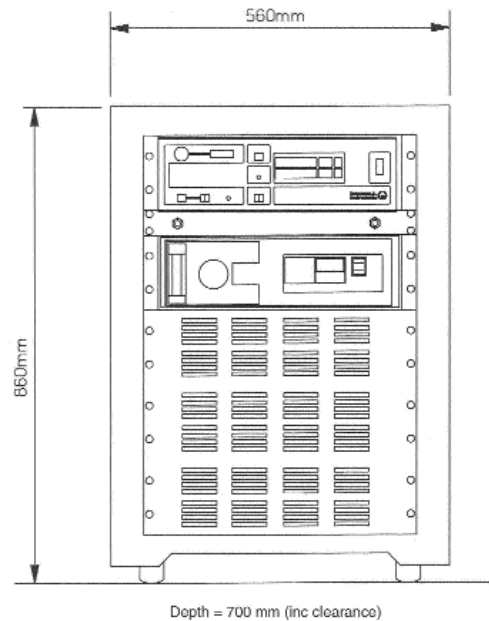
Our chilled mirror instruments prove their reliability on a daily basis in our production processes and service centres, as well as in our UKAS-accredited calibration laboratory.



Technical Specifications

| Performance | | | | | | | |
|--|--|---------|-----------------------------------|---------|--|-------|---|
| Measurement Technology | Chilled Mirror | | | | | | |
| Measurement range | -100 to +20°Cdp | | | | | | |
| Measurement accuracy | ±0.1°Cdp ±0.1°C temperature | | | | | | |
| Measurement units | °Cdp, °Fdp; °C, °F temperature; % RH, ppm _v , ppm _w , g/m ³ , g/kg, ppm _w for SF ₆ | | | | | | |
| Response speed | 0.5°C/sec + settling time (dew point dependent) | | | | | | |
| Sensitivity | 0.01°C | | | | | | |
| Repeatability | Better than 0.1°C | | | | | | |
| Resolution | 0.01 (0.1 for % RH) | | | | | | |
| Dew-Point Sensor | | | | | | | |
| Mirror | Gold plated copper | | | | | | |
| Temperature measurement | 4 wire Pt100, 1/10 DIN class B | | | | | | |
| Sample flow rate | 0.1 to 0.7 NI/min (recommended) | | | | | | |
| Integrated flowmeter | 0 to 1 NI/min | | | | | | |
| Sensor pressure | Atmospheric | | | | | | |
| Auxiliary cooling | Internal refrigeration | | | | | | |
| Remote PRT | | | | | | | |
| Temperature measurement | 4 wire Pt100, 1/10 DIN class B | | | | | | |
| Monitor | | | | | | | |
| Resolution | 0.01°C | | | | | | |
| Dual optics detection | Wide band red LED with dual photo sensors, all system insulated | | | | | | |
| Outputs | <table border="0"> <tr> <td>Analog</td> <td>2 channels 10 mV/°Cdp, 4-20 mA</td> </tr> <tr> <td>Digital</td> <td>RS232</td> </tr> <tr> <td>Logic</td> <td>Data hold, ABC Logic status, optics alarm</td> </tr> </table> | Analog | 2 channels 10 mV/°Cdp, 4-20 mA | Digital | RS232 | Logic | Data hold, ABC Logic status, optics alarm |
| Analog | 2 channels 10 mV/°Cdp, 4-20 mA | | | | | | |
| Digital | RS232 | | | | | | |
| Logic | Data hold, ABC Logic status, optics alarm | | | | | | |
| Auxiliary input Pressure transducer | 4-20 mA input for automatic compensation 0-0.34 MPa (0-50 psia) (optional) | | | | | | |
| Operating temperature | 0 to +40°C | | | | | | |
| Dimensions | 560 x 600 x 860mm (w x d x h)- mini Rack | | | | | | |
| Weight | 85kg | | | | | | |
| Power supply | <table border="0"> <tr> <td>Monitor</td> <td>90 to 265 V AC; 50/60 Hz</td> </tr> <tr> <td>Sensor</td> <td>100 to 115 or 220 to 240 V AC 50/60 Hz</td> </tr> </table> | Monitor | 90 to 265 V AC; 50/60 Hz | Sensor | 100 to 115 or 220 to 240 V AC 50/60 Hz | | |
| Monitor | 90 to 265 V AC; 50/60 Hz | | | | | | |
| Sensor | 100 to 115 or 220 to 240 V AC 50/60 Hz | | | | | | |

Dimensions



Depth = 700 mm (inc clearance)

Michell Instruments 48 Lancaster Way Business Park, Ely, Cambridgeshire, CB6 3NW
Tel: +44 (0) 1353 658000, Fax: +44 (0) 1353 658199, Email: uk.info@michell.com, Web: www.michell.com/uk

Michell Instruments adopts a continuous development programme which sometimes necessitates specification changes without notice.
Issue no: S4000 TRS_97146_V4_UK_1012