

Moisture Measurement as Quality Assurance in High Purity Gas Manufacturing Applications

High purity gases are used across an enormous range of applications, from carbon dioxide used as a refrigerant gas, to argon used in the production of silicon wafers for the electronics industry. Moisture is a common and undesirable contaminant in many high purity gases, and measuring moisture content provides assurance that drying and purification processes are effective. Meeting customer quality expectations where gas has a certified purity level is vital to maintain reputation as a world class gas manufacturer.

The permitted moisture content will vary depending on the type of gas and certified purity. Moisture can be harmful to the end customer process for a variety of reasons. Excessive moisture content in gases can cause corrosion to tubing and, at low temperatures, lead to the formation of ice, causing premature wear and failure of equipment. Moisture in liquid form can also react with other chemicals or gases in a process, forming corrosive compounds, contaminating products, and contributing to inferior finishes.

High purity gas is supplied in different grades, with some typical examples of moisture content listed in the table below:

Gas Type	Purity	Maximum Moisture Content
R744 Refrigerant Grade CO2	99.9%	< 10ppm
Synthetic Air	99.99%	≤ 5ppm
High Purity Nitrogen	99.999%	≤ 3ppm
High Purity Argon	99.9999%	≤ 0.5ppm

It is important to establish a routine check of the moisture content of manufactured gas, so drying and purification processes are known to be effective. This provides assurance that the gas is being produced to the required purity and customers expectations are being met. The gas can be measured at the point of production, or directly from a sample of freshly filled bottles. The sample gas will need to be regulated down to an appropriate pressure and flow rate that is suitable for the connected measuring instrument.

Kahn Instruments offers a range of optical hygrometers, which measure a primary characteristic of moisture – the temperature at which condensation forms on a surface. This means that optical hygrometers:

- 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 Optisure RS is the ideal measurement instrument for this task. The rate of formation of frost on the mirror surface can be slow at low levels of moisture content. An accurate and reliable measurement with a non-fundamental hygrometer can be difficult to perform. The Optisure RS utilizes a unique advanced dual optics system to detect very small changes in moisture condensed on the mirror surface, resulting in very high sensitivity and fast response when making measurements at low levels of moisture content.

Optisure RS

The Optisure RS uses a fundamental cooled mirror measurement technique that is dependable, reliable, and highly accurate. Measurements are repeatable, and drift free. The Optisure RS comes with a high contrast LCD touch screen, many user selectable measurement units and multiple analog and digital outputs. Other features include datalogging and Ethernet communications. The instrument is supplied with NIST traceable calibration as standard.



Key Features

Measurement Range	RS80: -80 to +20 °C dewpoint RS90: -90 to +20 °C dewpoint	HMI	5.7" Resistive Touch Screen
Measurement Units	Moisture: °C/°F dp, %RH, g/m ³ , ppmv, ppmw (SF ₆) Pressure: barg, psig, kPa, Mpa	Data Logging	SD Card, 32GB Max 560 days at 2 second interval
Accuracy	±0.1 °C	Outputs	Analog: 3x User selectable, 0/4-20mA, or 0-1V Digital: USB or Ethernet (Modbus TCP) Alarms: 1x Process, 1x Fault
Repeatability	±0.05 °C	Additional Features	Integrated flow sensor, remote temperature probe, optional integrated pressure sensor.