

# QMA401

## Trace Moisture Analyzer

The next generation Advanced Quartz Crystal Microbalance analyzer from Michell Instruments is designed to provide reliable, fast and accurate measurement of trace moisture content in a variety of applications where keeping moisture to a minimum is of critical importance.



### Highlights

- Precision measurement from 0.1 to 2000 ppm<sub>v</sub>
- Simple, low cost, on-site maintenance
- Accuracy of 0.1ppm<sub>v</sub> or 10% of reading, whichever is greater
- Reliable measurement even in varying sample conditions — analyzer corrects automatically for flow variations
- Unaffected by changes in background gas composition
- Long intervals between maintenance
- Dryer can be replaced by the user in 10 minutes
- Intuitive user interface
- Ethernet or USB digital communications
- SD card datalogging
- Optional internal sample handling and bypass loop

### Applications

- High purity gas production
- Air separation plants
- Semiconductor CVD chamber cleaning
- Semiconductor etching chambers
- H<sub>2</sub> coolant for generators
- Polymer chip drying



Air Separation Plant

## Introducing the QMA401 Trace Moisture Analyzer

### Precision Measurement

The QMA401 is the result of Michell Instruments' continuous improvement of Quartz Crystal Microbalance technology. The analyzer utilizes a new generation of precision crystal oscillators, guaranteeing high accuracy moisture measurements which are completely insensitive to changes in background gas composition.

While measurements at quantities of moisture  $<1\text{ppm}_v$  stretch the capabilities of other technologies, the new QMA401 offers reliability, simplicity and greatly reduced cost of ownership from the industry-proven Quartz Crystal technology.

### Reliability

For maximum stability, all critical components of the QMA401 — the moisture generator, sensor and flow control devices — are precisely temperature controlled. This ensures that fluctuations in sample gas or environmental temperature have no influence on the measurement.

The analyzer utilizes a mass flow controller to ensure precise control of the sample and reference gas flows to  $\pm 0.1\text{ml/min}$ . Coupled with a pressure transducer, this system ensures continued accuracy of measured and calculated parameters even during fluctuations in sample pressure.

### Simplicity

The QMA401 provides a highly intuitive, color, touch-screen interface. This powerful UI makes control, logging and configuration of analyzer parameters very simple. Both real-time trend graphing and alarm indication are immediately visible on the main display.



### Minimal & Straightforward Maintenance

Sophisticated analyzers are often complicated and require experience and special care in use and maintenance, increasing cost of ownership.

The QMA401 differs through its straightforward approach to field service, which can be carried out in-situ. The desiccant dryer is easy to replace via the 'quick release' service panel on the rear of the analyzer. The moisture generator has an average lifespan of 3 years before replacement is required, therefore the unit can perform reliably for many years with just basic maintenance and housekeeping.

### Integrated Sample Handling

The analyzer can be specified with an integral sample handling system, including a pressure regulator and 'fast loop' bypass, to ensure quick transit of the sample from the point of interest to the sensor.

### Use Your Preferred Communication Media

For greater flexibility, the QMA401 offers:

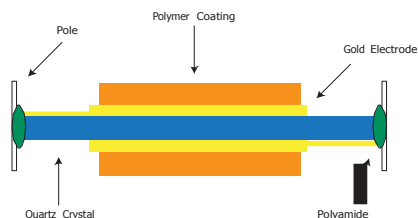
- Modbus over USB and Ethernet
- Datalogging to SD card
- 2 user-configurable analog outputs
- Status and process alarms

### Automatic Verification

The QMA401 incorporates an automatic verification system that uses either the internal traceable moisture generator or an external reference supplied by the user. Carried out on the sample gas flow, these periodic validation-checks of sensor performance can be initiated on demand, or automatically (at user-defined intervals and time of day), providing a verification of analyzer performance and automatically adjusting out any change. The moisture generator at the core of the system is supplied with a calibration traceable to NPL and NIST.

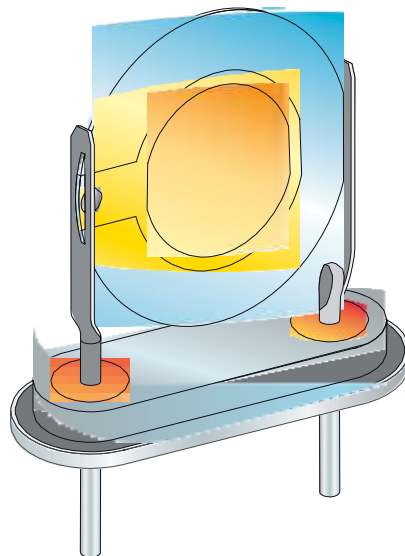
## Technology: Quartz Crystal Microbalance

The Quartz Crystal Microbalance (QCM) technology for moisture measurement is based on monitoring the frequency modulation of a hygroscopic-coated quartz crystal with specific sensitivity to water vapor.



Bulk adsorption of water vapor onto the coated crystal causes an increase in the crystal's effective mass, modifying its oscillation frequency in a very precise and repeatable manner. The frequency change is in direct proportion to the water vapor pressure in the sample gas, providing a direct measurement of moisture content.

The sorption process is fully reversible with no long-term drift effect, giving a highly reliable and repeatable measurement.

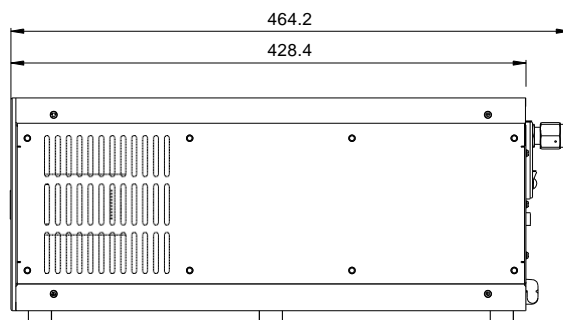
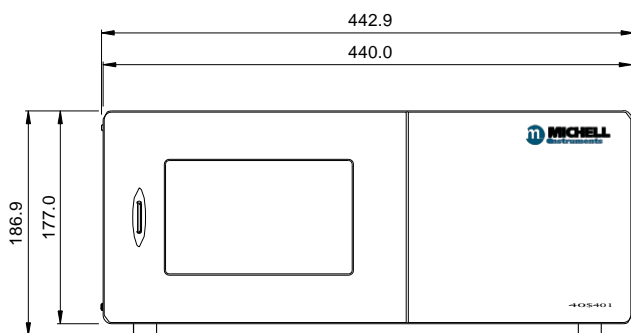


## Technical Specifications

Performance	
<b>Measurement technology</b>	Fast Response Quartz Crystal Microbalance
<b>Calibrated range</b>	0.1 to 700ppm <sub>v</sub>
<b>Measurement range</b>	0.1 to 2000 ppm <sub>v</sub>
<b>Accuracy</b>	±10% of reading from 1 to 2000 ppm <sub>v</sub> 0.1 ppm <sub>v</sub> between 0.1 and 1 ppm <sub>v</sub>
<b>Repeatability</b>	±5% of reading from 1 to 2000 ppm <sub>v</sub> ±0.1 ppm <sub>v</sub> between 0.1 and 1 ppm <sub>v</sub>
<b>Detection limit</b>	0.1 ppm <sub>v</sub>
<b>Available units</b>	ppm <sub>v</sub> , ppm <sub>w</sub> , mg/nm <sup>3</sup> , vapor pressure (Pa), frost point (°C), lb/MMscf
<b>Response speed</b>	T63 <2 mins to step change in either direction T95 <5 mins to step change in either direction
<b>Automatic calibration</b>	Internal moisture generator source calibrated traceable to NPL and NIST
<b>Sensitivity</b>	0.1 ppm <sub>v</sub> or 1% of reading, whichever is greater
Electrical Specifications	
<b>Supply voltage</b>	85 to 264 V AC, 47/63Hz, 110 to 300 V DC
<b>Max power consumption</b>	111 W
<b>Alarms</b>	1 x System alarm, volt-free change-over (FORM C) 3 x process alarms, selectable for various parameters, volt free changeover (FORM C)
<b>Communications</b>	Analog Outputs: 2 channels, user selectable 4-20 mA or 1 to 5 V Digital Communications: RS485/USB Modbus RTU, Ethernet Modbus TCP

<b>Data logging</b>	Direct logging to SD card or PC via application software
<b>Local interface</b>	7" color touch screen LCD
Operating Conditions	
<b>Inlet pressure</b>	1 barg max With optional inlet pressure regulator: 300 barg max
<b>Outlet pressure</b>	Atmospheric
<b>Sample flow</b>	300ml/min total flow without bypass
<b>Sample gas temperature</b>	0 to +100°C (+32 to +212°F)
<b>Operating environment</b>	+5 to +45°C (+41 to +113°F) up to 90% RH
Mechanical Specifications	
<b>Enclosure</b>	19" Rackmount , 4U x 434mm
<b>Gas connections</b>	1/4" VCR(M)
<b>Weight</b>	13.5kg (29.8lbs)

## Dimensions



**Michell Instruments Ltd**, Rotronic Instruments Corp. 135 Engineers Road, Suite 150, Hauppauge NY 11788. Tel: 631 427 3898, Email: [us.info@michell.com](mailto:us.info@michell.com), Web: [www.michell.com/us](http://www.michell.com/us)

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