Moisture and Hydrocarbon Dew Point Measurement

MICHELL Instruments

Moisture and Hydrocarbon Dew-Point

Michell Instruments offers a comprehensive range of process analyzers for measuring water dew point, trace moisture and hydrocarbon dew point for the petro-chemical and natural gas industries.

The range includes intrinsically safe and flameproof/explosion proof systems which are supplied as complete packages consisting of an analyzer – or combination of analyzers – and a fully integrated sampling system and control unit. A wide choice of standard process sampling systems is available, as well as the option of customized systems designed by our dedicated Systems Engineering department to suit especially demanding or complex applications.

Michell's Condumax II is the hydrocarbon and water dew-point analyzer of choice for the majority of gas transmission companies across the whole European gas distribution network.

On-Line Process Analyzers: Universal Features

In the petrochemical industry the measurement of moisture content in a multitude of process gases and liquids is one of the most difficult and demanding tasks for the process engineer. To maintain certain moisture content or avoid defined moisture levels is crucial for most chemical processes.

Michell's state-of-the-art, on-line analyzers help increase plant efficiency and safety in many petrochemical sites across the globe.

Comprehensive analyzer packages with selection of standardized sampling systems or customized solutions to suit exact application and installation requirements

- Choice of certified explosion-proof (EExd) or intrinsically safe (I.S.) measurement systems
- CSA (US) approved for Class 1, Division 1
- ATEX approved for Zone 1 and 2 installation
- Unique Michell Calibration Exchange Service provides cost effective field maintenance of moisture measurement certified traceable to NIST
- Systems compatible with aggressive samples such as sour natural gas
- Engineering and applications specialists available through global network of Michell offices and factory trained representatives
- Professional commissioning services and site maintenance personnel training available worldwide.

Background to Michell Instruments

Michell Instruments is the international leader in the field of moisture and humidity measurement solutions. With over 30 years experience, Michell designs and manufactures a wide range of transmitters, instruments and system solutions capable of measuring trace moisture, humidity, dew point and oxygen in a vast range of applications and industries ranging from compressed air, power generation, process, oil and gas, pharmaceutical and many more.

With a fast-growing international subsidiary and distribution network, the Michell Group provides solutions in dew point, moisture and humidity to the most demanding applications worldwide.

Michell uses four key dew point measurement technologies in its products:

- Impedance method using a ceramic tile which delivers unrivalled speed of response and robustness.
- Chilled mirror method which has been incorporated into advanced, precision instruments for industrial and laboratory use.
- Dark spot technology, which was developed in partnership with Shell, to offer a world-class solution for the measurement of hydrocarbon dew point.
- Quartz crystal technology for a high precision, fast responding moisture measurement with self-calibration.

Applications

Natural Gas Applications

- Gas quality measurements to ensure compliance to transmission pipeline tariff specifications
- Avoiding hydrate formation and corrosion by monitoring the glycol dehydration plant output
- Gas heater "Superheat" control of fuel gas to protect turbine power plants and save energy
- Protect turbo expanders and pipeline compressors from liquid impact damage

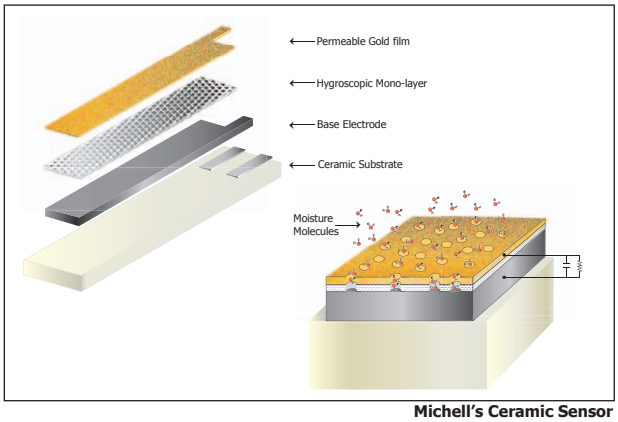
Petrochemical Applications

- Monitoring recycle gases during catalytic processes to maximize catalyst life and productivity
- HDPE and LDPE process gases and liquids – ethylene, hexane, butane and many more
- LNG/LPG production and quality control
- Liquid benzene for styrene manufacture
- Fuels refining and custody transfer to avoid liquid water phase separation

Moisture Sensing Technology for Process Gases and Liquids

Michell's Advanced Ceramic Sensor technology provides rugged and reliable measurement of the water dew point and moisture content in both gases and liquids throughout natural gas and petrochemical industries. Our sensors are resilient to chemical attack and will not fail even when subjected to the most severe pressure shock. The Ceramic Sensor works by adsorbing water vapour in equilibrium with the fluid being measured into its porous active layer, sandwiched between two conductive plates.

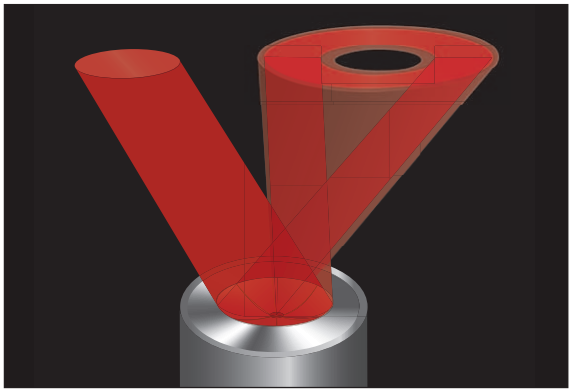
High sensitivity even at ultra low trace moisture levels is achieved by use of semiconductor techniques to achieve an extremely thin active layer, protected by a micro-porous metallic surface coating. Therefore the sensor responds rapidly to changes in applied moisture, both when being dried (on process start-up) and when called into action if there is moisture ingress into a process. All Michell Ceramic Moisture Sensors provide up to 1°C accuracy and excellent long-term stability in process applications. The unique Michell Calibration Exchange Service enables all our customers worldwide to maintain traceable certified calibration of our process moisture analyzers at modest cost with minimal spares stock and down time.



Michell's Ceramic Sensor

Hydrocarbon Dew Point for Natural Gas

Michell's hydrocarbon dew point technology uses the patented Dark Spot™ optical principle, a technique radically different from that of any other chilled mirror system. Sensitivity of the order of 5 mgm^{-3} of condensate enables the analyzer to detect the almost invisible films of condensate which are characteristic of hydrocarbon gases at dew point, due to their low surface tension and colourless appearance.



Dark Spot Principle

The optical surface is the key element of the sensor cell and comprises an acid etched, semi-matt surface with a central

conical shaped depression. A collimated beam of visible red light is focussed onto the central region of the optical surface to form an annulus ring of light. Optical detection is made of light dispersed. As the sensor is cooled during measurement cycle, hydrocarbon condensates form on the optical surface and its optical properties are modified – the reflected light intensity of the annulus ring increases and there is a dramatic reduction in the scattered light intensity within the dark spot region. This highly sensitive secondary effect is used to determine the hydrocarbon dew point.

Multi-Channel Solutions

MCU – Multi-Channel Process Moisture Analyzer

Liquidew I.S. and Promet I.S. are offered in the multi-channel MCU for up to four channels of liquid or gas phase measurement. Addition of further MCU units extends the capability to 8, 12 or more measurement channels, offering ultimate flexibility and cost efficiency.

Remote Interface

For users of our EExd analyzers wishing to have a dedicated host system within a convenient safe area location, the optional RI provides advanced graphical display, status information, comprehensive logging functions and all programme configuration functions for up to 31 analyzers. Global access to full functionality is available through any web browser.

Hydrocarbon Dew Point in Natural Gas

The accurate and reliable measurement of the moisture content and hydrocarbon dew point in natural gas is critical for gas quality measurements in pipelines and gas turbine applications.

Condumax II

Continuous on-line measurement of the hydrocarbon dew-point temperature of natural gas, with optional water dew point.

Hydrocarbon Dew Point Range	Up to Δ 55°C measurement depression from Main Unit operating temperature
Water Dew Point Range	Calibrated from -100 to +20°C dp
Accuracy	±0.5°C hydrocarbon dew point (single and multiple condensible component analysis) ±1°C from -59 to +20°C water dew point; ±2°C from -100 to -60°C water dew point
Operating Temperature	Indoors/Outdoors -20 to +50°C. Max 95 % rh
Pressure	Max 100 barg
Certification	ATEX: II 2 G EExd IIB + H2 T4 Tamb =60°C CSA: certified to Class 1, Div 1, Groups B, C & D, T4
Outputs	Two 4-20 mA outputs. RS485 Modbus RTU
Alarms	Process and analyser status via software register and display annotation. Integrated low flow alarms for each sample flow. Analyser status fault flag 23mA on mA output 1.

Moisture in Process Gases

Promet I.S

A complete, turnkey hygrometer system for moisture measurement in critical process gas applications.

Dew Point Range	-100 to +20 °C dp
Accuracy	Dew point: ±1°C between -60 & +20°C dp Moisture content: ±10 % of reading Dew point: ±2°C between –60.1 & -100°C dp
Operating Temperature	Sensor outdoor: -40 to +60°C Control unit: 0 to +50°C
Pressure	Max 450 barg
Certification	ATEX certified by EECS for use in hazardous areas to Ex II 1G EEx ia IIC T4. CSA certified IS Class I, Division 1, Groups A, B, C & D, T4 IECEx: Ex ia IIC T4 FM: IS/I/1/ABCD/T4
Outputs	Two 4-20mA per channel. RS485 Modbus RTU.
Alarms	4 alarm relays per channel

Promet EExd

Wholly hazardous area installed analyzer system for critical process gas applications.

Dew Point Range	-120 to +30ºC dp.
Accuracy	Dew point: ±1°C between –59.9 & +20°C dp Moisture content: ±10 % of reading Dew point: ±2°C between –60 & -100°C dp
Operating Temperature	Indoor/Outdoor -20 to +60°C Max 95 % rh.
Pressure	Max. 206 Barg
Certification	ATEX Certification: II 2 G Code: EEx d IIB + H2 T4 (135°C) cCSAus approved: Div 1, Class 1, Group B,C,D
Outputs	Two 4-20 mA per channel. RS485 Modbus RTU
Alarms	Two alarm relays per channel; optional flow alarm.

Moisture in Process Liquids

Liquidew I.S.

Precise real-time measurement and control of process moisture conditions without the need for collection and analysis of liquid samples in a laboratory.

Dew Point Range	-100 to +20°C dp (0.01 ppm_W to saturation)
Accuracy	Dew point: ±1°C between –60 & +20°C dp Moisture content: ±10 % of reading Dew point: ±2°C between –60.1 & -100°C dp
Operating Temperature	Sensor: outdoor -20 to +60°C Control Unit: indoor 0 to +50°C
Pressure	Max 300 barg
Certification	ATEX certified by EECS for use in hazardous areas to Ex II 1G EEx ia IIC T4. CSA certified IS Class I, Division 1, Groups A, B, C & D, T4 IECEx: Ex ia IIC T4 FM: IS/I/1/ABCD/T4
Outputs	Two 4-20 mA per channel. RS485 Modbus RTU
Alarms	Four alarm relays per channel.

Liquidew EExd

The Moisture in Liquid Analyzer that offers the complete moisture measurement package for critical petrochemical liquid applications.

Dew Point Range	-120 to +30°C dp (0.001 ppm_W to saturation)
Accuracy	Dew point: ±1°C between –59.9 & +20°C dp Moisture content: ±10 % of reading Dew point: ±2°C between –60 & -100°C dp
Operating Temperature	Indoor/outdoor max -20 to +60°C, max 95% rh
Pressure	Max. 50 barg
Certification	ATEX Certification: II 2 G Code: EEx d IIB + H2 T4 (135°C) cCSAus approved: Div 1, Class 1, Group B,C,D
Outputs	Two 4-20 mA per channel. RS485 Modbus RTU
Alarms	Two alarm relays per channel

Michell's Liquidew I.S sensors and sample conditioning system, housed in a temperature-controlled enclosure. Tamoil refinery, Switzerland.

Michell Instruments operates in the following markets:

- Compressed Air Dryers
- Pharmaceutical
- Standards Laboratories and Metrology
- Semiconductors
- Natural Gas and Petrochemicals
- Industrial and Pure Gas Production
- Power Generation

Other Product Ranges

Dew-Point Transmitters
Michell offers the widest range of dew-point sensors and transmitters on the market. From the industry standard Easidew 2-wire transmitter to the new, rugged Easidew PRO IS for hazardous areas, all are supplied with sensors traceable to national standards.

Portable Instruments
Michell's range of easy-to-operate portable instruments provides fast, accurate and stable measurement of dew point, relative humidity and moisture concentration. They are designed to satisfy the most demanding industrial conditions, and are unique in the market for giving repeatedly fast response to low dew points.

Chilled Mirror Instruments
Chilled Mirror is a fundamental measuring technology offering the user exceptionally accurate, reliable and repeatable measurements from trace moisture to high humidity. Michell offers a range of instruments based on a rugged sensor design that is equally suitable for installation in demanding process environments or for use as an accurate reference instrument in a National Standards Laboratory.

Calibration Instruments
Michell has a wide offering of calibration equipment for the verification of trace moisture, dew-point and relative humidity sensors. A modular concept means that Michell's engineers can build for you a customised calibration solution that meets your exact needs. Components may include air compressor and dryer; low range or high range humidity generator; simple sensor housing or environmentally controlled test chamber and finally, verification using a traceable Michell Chilled Mirror Hygrometer.

Oxygen Analyzers
Michell brings you the very latest technologies in oxygen measurement, designed to give years of reliable and accurate service in laboratory, process and flue gas applications. From instruments featuring a unique sealed reference zirconia sensor to a transmitter with the latest generation thermo-paramagnetic oxygen technology, all Michell oxygen analyzers are available in a range of different configurations.

Relative Humidity Instruments
Michell's own RH sensing technology provides excellent resolution, long term stability and speed of response. We offer a wide range of humidity and temperature measuring sensors and instruments, including relative humidity transmitters, humidity and temperature transmitters as well as handheld indicators. The humidity generator range includes the most stable humidity generator on the market.

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