Liquidew I.S.

Moisture in Liquid Analyzer

On-line measurement of moisture content in liquids is accurate, fast and reliable with the Liquidew I.S. Moisture in Liquid Analyzer from Michell. A wide variety of non-polar liquids can be measured continuously, on-line, including flammable liquids and hazardous area applications, petrochemicals, power industry and pharmaceutical manufacturing.





Highlights

- Simple, cost-efficient operation and low maintenance
- Retrofit functionality, easy to integrate into existing sampling or distribution systems
- High integrity moisture in liquid measurement from 0.01 ppm_W to saturation point
- Multi-channel with up to four completely independent measurement channels
- Robust design for undisturbed operation in many non-polar liquids over a long time
- Two 4...20 mA configurable outputs and digital Modbus RTU-based communication
- Replaceable sensor element with Michell Calibration Exchange Service for reliable cost-efficient calibration
- NIST and NPL traceable calibration
- EExd version available

Applications

- Naphtha feedstock to isomerization catalyst
- Hexane solvent in HDPE and LDPE process
- Benzene in styrene manufacture
- LNG LPG production and product checking
- Diesel and aero fuels to avoid liquid water phase separation
- BTX process monitoring—benzene, toluene and xylene
- Ethylene and proylene feed to polymer process
- Butadiene for the manufacture of synthetic rubber.

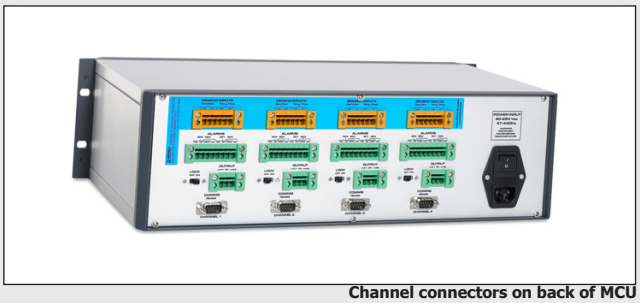
Michell Liquidew I.S. Moisture in Liquid Analyzer

Michell Liquidew I.S. moisture in liquid analyzer provides a complete solution for accurate, on-line moisture measurement in process liquids, and offers many advantages over sample collection and laboratory analysis methods.

Continuous on-line measurement allows monitoring and control of moisture conditions to achieve optimum efficiency for production or maintenance. Intrinsically safe sensors, with a sampling system, can be installed in the hazardous zones to minimize sample transportation time and ensure a fast response to process moisture changes. The rack-mounted Liquidew I.S. Control Unit, which is conveniently located in a safe area, provides real-time display of moisture content, user settable alarms as well as analog output and digital communications.

The Control Unit is connected to the sensors/sampling system in the field by standard instrument pairs cable, so existing cable runs can often be used where Liquidew I.S. is installed as a site retrofit.

The Control Unit in multi-channel MCU format can also include moisture in gas analysis function by combining with Promet I.S. Moisture in Gas Analyzer.



Channel connectors on back of MCU

Features

Reliable

Michell's Thick- and Thin-film Ceramic Metal-Oxide Moisture Sensor is exceedingly durable; chemically inert materials coupled with physical resilience provide long-term reliable service in liquid phase measurements.

The robust construction prevents Michell sensors from damage caused by dense liquid flow or even pressure shocks from rapid process pressure changes during start-up and maintenance.

Easy to use with complete functionality

The 19" sub-rack mounting Liquidew I.S. Control Unit provides complete operational functionality. The bright alphanumeric LED display with auto-scale function gives measurement values across six orders of magnitude, from sub-ppm levels to saturation conditions. There are pre-set saturation constant (C_S) values of most common hydrocarbon liquids for moisture calculation, together with 2 user-defined liquids and ability to mix any 2 liquids from the list, so the user has the flexibility to select or enter the appropriate liquid profile for the specific application.

Four user-adjustable alarm points and two analog 4...20 mA outputs are provided as well as a digital RS485 RTU for connection to external devices.

Accurate on-line moisture measurement in liquid

Michell's Calibration Laboratories are world recognized through the UKAS accreditation scheme under the auspices of EAL (European co-operation for the Accreditation of Laboratories). Each sensor is calibrated and certified traceable to the humidity standards of leading international metrology institutes, NPL (UK) and NIST (USA), so assuring correct measurement of the moisture in your process.

Certified Intrinsically Safe

Liquidew I.S. sensors and sampling systems are designed for measurement of flammable and non-flammable gas and complete packages can be supplied for use in explosive atmospheres in accordance with the requirements of ATEX/IECEx/UKCA to II 1G Ex ia IIC T4 and meeting the equivalent NEC HazLoc requirements for Class I Div 1, and Class I ZONES.

Flexible configuration. Total analyzer system tailored to specific customer requirements

Liquidew I.S. is available in a multi-channel format (MCU). This MCU enables up to four measurement channels within a single 19" sub-rack unit. The sister product for moisture in gas analysis, Promet I.S., can be combined together with Liquidew I.S. into an MCU to enable both gas and liquid samples measurement with a single analyzer system. With the MCU, each measurement channel functions independently, so that any maintenance on one channel will not affect the others. Customers can also order blank channels for future expansion.

The Liquidew I.S uses the rugged Easidew PRO I.S. sensor, allowing the transmitter to be installed directly outdoors.

Simple to maintain with a sensor calibration exchange program

For Liquidew I.S., calibration maintenance is simple. The unique Michell Calibration Exchange Service offers fast, world-wide delivery of replacement ceramic sensors certified traceable to metrology standards of NPL and NIST. As the calibration data for the sensor is factory programmed into on-board non-volatile memory, fitment of a Calibration Exchange Sensor renews the calibration, with minimal down-time. No programming or data input is required by the user to complete the calibration process. The Calibration Exchange Service facilitates a professional, scheduled user QA programme at a lower cost than a traditional 'return to manufacturer' re-calibration service.

Retrofit ready

If customers or system integrators wish to use their own sampling systems, the analyzer solution can easily be integrated into any existing sampling or distribution system offering an extremely cost-efficient, low-maintenance, multi-channel solution that can be cascaded to any number of channels.

Best practice sampling systems

The design of the Liquidew I.S. Premium Sampling System has drawn on Michell's 35 years of expertise in on-line process gas analyzers. Particulate filtration is provided in single or dual stages so that sensor and system performance is maintained even in processes prone to contamination. A panel-mounted version of the sampling system and sensor are offered for internal installations, while various enclosures and heating options are available for field installation next to the sample source. Sample cooling, using a water heat exchanger, is available for process fluids at elevated temperature.



Liquidew I.S Sampling system

If your need is not accommodated by standard options, Michell's Systems Engineering department will work with you to provide a customized solution for your specific application.

Technology

Reliable and robust sensor design is fundamental to achieving accurate measurement of moisture in liquids over a long period of time. Proprietary thick- and thin-film techniques are applied in the Michell Ceramic Metal-Oxide Moisture Sensor. Base metal layers on semi-conductor grade ceramic substrate sense dissolved moisture within the sample liquid flow. The inert materials of the sensor have a high resistance to aggressive media while the inherent strength of the sensor and the thermal bonded connections to the active device ensure reliable operation even in dense fluid samples.

The ceramic sensor responds to the partial pressure of water vapor of dissolved moisture in the liquid being measured, which is directly related to the dew-point temperature. Every Liquidew I.S sensor is calibrated against fundamental dew point measurement systems in Michell's world-class laboratory, which is internationally accredited and directly traceable to both NPL (UK) and NIST (USA) base standards.

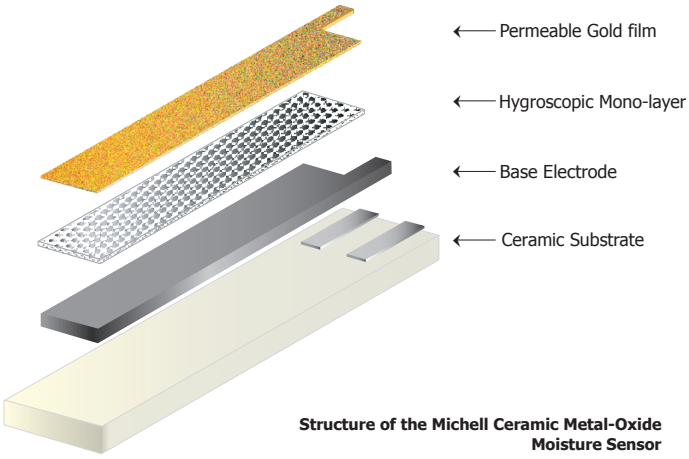
With Liquidew IS the amount of dissolved moisture dispersed throughout the immiscible process liquid is measured on-line in real time in units of ppm_W moisture content using Henry's Law:

$C\ (ppm_W) = C_S \times e/e_s$

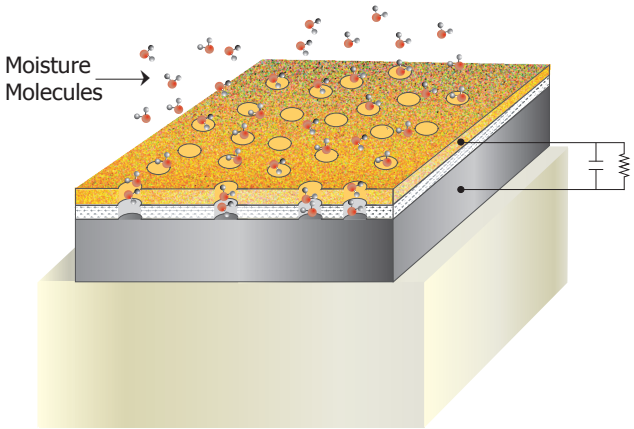
Where

C = Moisture concentration
C_S = Saturation concentration specific to the fluid at the measurement temperature
e = Actual water vapor pressure derived from the measurement dew-point temperature
e_s = Saturation water vapor at the measured temperature

The advanced firmware of Liquidew I.S. provides moisture measurements in ppm_W through the application of Henry's Law using pre-programmed saturation concentration (C_S) values for the most common hydrocarbon liquid applications. A proportional mixing setting can be used for mixtures of two solutes, such as the propane and butane in LPG. Two user programmable entry tables enable C_S values to be entered for other solutes or for complex fluid compositions where the user may wish to enter their own C_S values either from their own sources, or from laboratory analysis of their process samples or estimated values from proportional calculation based on the C_S values for each of the major components in the solute mix.



Structure of the Michell Ceramic Metal-Oxide Moisture Sensor



Operation of the Michell Ceramic Metal-Oxide Moisture Sensor

Technical Specifications

Sensors

Sensor technology	Michell Ceramic Metal-Oxide Moisture Sensor
Sensor version	Easidew PRO I.S.
Measurement range	0.001...1000 ppm_W; Higher range on request, actual range dependent on solubility of sample fluid
Calibration range	-100...+20 °Cdp
Accuracy Dew point:	±1 °C between -59.9 & +20 °Cdp (±1.8 °F between -75.9 & +68 °Fdp) ±2 °C between -60 & -100 °Cdp (±3.6 °F between -76 & -148 °Fdp)
Accuracy Moisture content:	±10 % of reading ±20 % of reading
Resolution	0.1 °C between +20 & -100 °Cdp
Temperature measurement	Pt100
Temperature measurement range	-20...+70 °C
Temperature measurement accuracy	Accuracy: ± 0.2 °C
Analysis pressure	Up to 5 MPa (50 barg)
Analysis temperature	0...+50 °C
Sample flow rate	Min 0.01 l/min, max 10 l/min 0.1...0.3 l/min recommended
Calibration	Traceable to British (NPL) and American (NIST) National Humidity Standards

Certifications

Hazardous area certification	**ATEX/UKCA** II 1 G Ex ia IIC T4 Ga (-20 °C...+70 °C) **IECEx** Ex ia IIC T4 Ga (-20 °C...+70 °C) **TR CU** 0Ex ia IIC T4 Ga (-20 °C...+70 °C) **cQPSus** IS, Class I, Division 1, Groups A, B, C & D, T4 Class I, Zone 0, AEx ia IIC T4 Gb, Ex ia IIC T4 Gb Tamb +70 °C
Pattern Approval	GOST-R, GOST-K

Control Unit

Display	Two line 6-digits LED, displaying moisture content / dew point (user toggle) and temperature
Analog output	Two 4...20 mA (max. load 500 Ω) - User configured for parameter, unit and range
Digital output	RS485 Modbus RTU
Display mode	Moisture content (ppm_W) Dew point (°C or °F) Temperature (°C or °F)
Display resolution	0.1 °Cdp, 0.1 °Fdp, 0.001 ppm_W, 0.1 °C temp
Alarms	Four alarm relays. Control action and setpoint are user programmable Two Form C contacts rated 10 A, 240 V AC or 8 A, 24 V DC. Non-inductive load Two Form A contacts rated 5 A, 240 V AC or 4A, 24 V DC. Non-inductive load
I.S. Barriers	Galvanic isolation type, integrated to Control Unit
Power supply	85...265 V AC 50/60Hz or 10...72 V DC 10 W max power consumption
Enclosure	19" sub rack unit Dimensions 132 x 483 x 375mm (h x w x d) (100mm minimum clearance depth for cables and vents)
Operating environment	Indoor, safe area, 0...+50 °C, < 90 %rh

Premium Sampling Systems

Enclosure	304 stainless steel (EN1.4301) enclosure. Option for complete enclosure in 316 stainless steel (EN1.4401); All fixtures stainless steel; Galvanized steel internal mounting plate; Open panel version available for indoor installation Dimensions 800 x 600 x 300mm (h x w x d)
Enclosure mounting	Stainless steel wall mounting brackets
Enclosure ingress protection	IP66
Enclosure temperature control	Heater/thermostat options for fixed set-point +20 °C or adjustable set-point range 0 to control +50 °C
Heater power supply	110/120 or 220/240/255 V AC, 50/60 Hz Power consumption 100 W max.
Operating environment	Shaded position, on or off shore, -20...+40 °C (-40...+60 °C max. transient) Enclosure cooling option recommended for climate ambient > +45 °C
Sample cooling option	Recommended for process fluid temperatures > +40 °C Plant water supply required, ≤ +30 °C

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