

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

- Petrochemical process liquids
- Catalyst protection
- Polymer production protection
- Process reactor protection
- Preventative maintenance in lubricant oils

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.

Features

Reliable

Michell's Thick- and Thin-film Ceramic 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

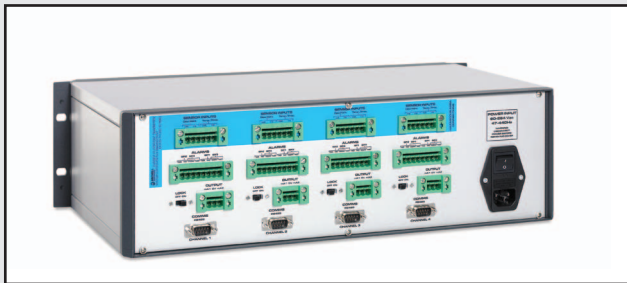
Michell's Calibration Laboratories are world recognized through the UKAS accreditation scheme under the auspices of EAL (European co-operation for the Accreditation of Laboratories). Each sensor is calibrated and certified traceable to the humidity standards of leading international metrology institutes, 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 flammable and non-flammable liquid within hazardous areas. ATEX certified by EECS for use in hazardous areas to II 1G EEx ia IIC T4. Complete packages conforming to NEC Class 1 Div 1 or IECEx certifications are also available.

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.



Channel connectors on back of MCU

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 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:

$$C (\text{ppm}_w) = C_s \times e/e_s$$

Where

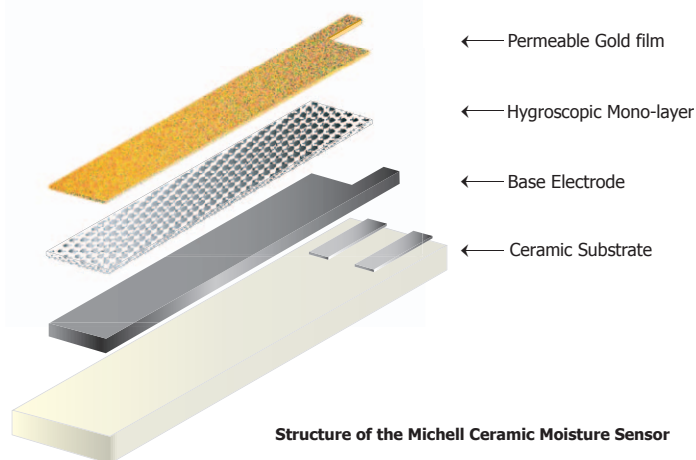
C = Moisture concentration

C_s = Saturation concentration specific to the fluid at the measurement temperature

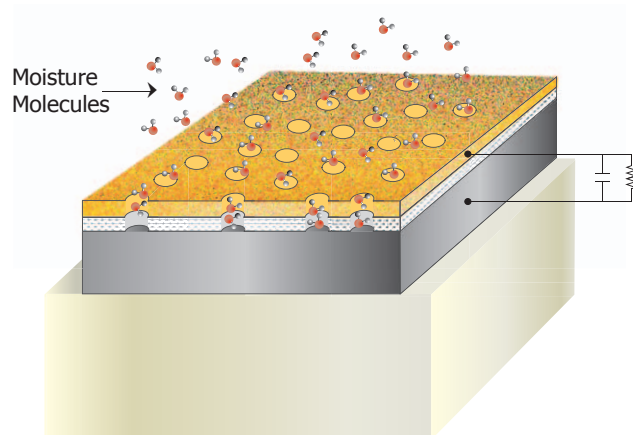
e = Actual water vapor pressure derived from the measurement dew-point temperature

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 Moisture Sensor



Operation of the Michell Ceramic Moisture Sensor

Technical Specifications

Sensors	
Sensor technology	Michell Ceramic Moisture Sensor
Sensor version	Easidew PRO I.S
Measurement range	0.001 to 1000 ppm _w Higher range on request, actual range dependent on solubility of sample fluid
Calibration range	-100 to +20°Cdp
Accuracy	Dew point: ±1°C between -60 and +20°Cdp Moisture content: ±10% of reading Dew point: ±2°C between -60.1 and -100°Cdp
Resolution	0.1°C between +20 and -100°Cdp
Temperature measurement	Pt100
Temperature measurement range	-20 to +70°C
Temperature measurement accuracy	±0.3°C @ 0°C
Analysis pressure	Up to 45 MPa
Operating temperature	-20 to +60°C
Sample flow rate	Min 0.01 l/min, max. 10 l/min 0.1 to 0.3 l/min recommended
Calibration	Traceable to British (NPL) and American (NIST) National Humidity Standards
I.S. 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 Ta=+60°C – Ex90385; Entity; IP66
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 4 A, 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 256mm (h x w x d) (100mm minimum clearance depth for cables and vents)
Operating environment	Indoor, safe area, 0 to +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; Galvanised 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 to +40°C (-40 to +60°C max. transient) Enclosure cooling option recommended for climate ambient > +50°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 specification changes without notice.
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Liquidew I.S. Process Moisture Analyzer

Order Codes

Control unit and sensor

Order code	Product description	
LDI-{1}-{2}	Intrinsically Safe moisture analyser for liquids, comprising Control Unit, moisture and temperature transmitters and dual sensor sampling block.	
{1} – Power supply	1	85-265 VAC 50/60HZ
	2	10-72 VDC
{2} – Hazardous Area Certificate Configuration	AT	ATEX certified system
	CS	CSA certified system
	IE	IECEx certified system

Note: for more than one channel measurement, see multi-channel process moisture analyzer

Multi-channel control unit and sensors

Order code	Product description	
MCU-{1}{2}{3}{4}{5}{6}{7}{8}	Multi-channel Process moisture analyzer. - Up to 4 channels, with any combination of Promet I.S. channels (moisture in gas) and Liquidew I.S. channels (moisture in liquid). - Each channel comprise independent measurement electronics, moisture sensors and sampling block	
{1} – Base unit	1	AC version. 85-265 VAC 50/60HZ
	2	DC version. 10-72 VDC
{2} – Hazardous area certificate configuration	AT	ATEX certified system
	CS	CSA certified system
	IE	IECEx certified system
{3} – Number of channels	2	2 Channels
	3	3 Channels
	4	4 Channels
{4} – {7} – Channel and sensor configuration (per channel)	G	Gas measurement (Promet I.S.)
	P1	Gas measurement (Promet I.S.) With dynamic pressure compensation (pressure transmitter included, range 0 - 1000 psig)*
	P2	Gas measurement (Promet I.S.) With dynamic pressure compensation (pressure transmitter included, range 0 - 2000 psig)*
	L	Liquid measurement (Liquidew I.S.)
	X	Blank channel for future expansion, with front cover, connectors and internal wiring loom
	0	Channel not required
{8} – Moisture content units calculation method for natural gas (applicable to gas measurement G/P1/P2 only)	ISO	ISO 18453
	IGT	IGT Research Bulletin No. 8

* for other ranges consult Michell

Liquidew I.S. Process Moisture Analyzer

Order Codes – Continued

Premium sampling system

Order code	Product description	
SAM-PDI-{1}-{2}-{3}-{4}-{5}-{6}	Premium Sample Handling System for Liquidew IS	
{1} – Installation configuration	A3	304 stainless steel enclosure, IP66/NEMA 4
	B3	316 stainless steel enclosure, IP66/NEMA 4
	C3	Panel mounted, 316 stainless steel (for indoor installations)
{2} – Pressure configuration	E3	Process Liquid, 300 psig/20 barg
	E4	Process Liquid, 1885 psig/130 barg
{3} – Heater configuration	F1	Standard Heater/Fixed Thermostat +20°C 100-120 VAC
	F2	Standard Heater/Fixed Thermostat +20°C 220-240 VAC
	G1	Thermostatic Heater, adjustable 0 to 50°C 100-120 VAC
	G2	Thermostatic Heater, adjustable 0 to 50°C 220-240 VAC
{4} – Sample cooling	K1	Water/Sample Heat Exchanger for sample temperature ≥ 40°C. For panel mounted version C3
	K3	Water/Sample Heat Exchanger for sample temperature ≥ 40°C. For outdoor enclosure versions A3 or B3
{5} – Two-stage sample filtration	L1	Pre-filter, 75 micron mesh (in addition to standard 5 micron filter)
{6} – Further options	H	Enclosure cooling for ambient temperature ≥ 45°C – instrument air supply required
	JXX	Trace heated sample line assembly – 6mm or ¼"OD. where XX is length in metres

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