

# Liquidew EExd

## Moisture in Liquids Analyzer

The Liquidew EExd offers complete trace moisture measurement, applying a robust sensor technology to provide direct, accurate, on-line measurements for moisture dissolved in process liquids. Purpose designed explosion-proof analyzer provides single or dual-channel measurements, convenient display interface and easy installation for new projects and retrofits to existing plants.



### Highlights

- EExd flameproof certified — IECEx, ATEX,  $CSA_{US}$  and TC TR Ex
- Complete hazardous area installation
- Single or dual-channel measurements
- Moisture content, dew point and temperature
- 0.001 ppm<sub>w</sub> to saturation range capacity
- Preprogrammed and user-entered saturation concentration values
- Remote global access options

### 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

## Liquidew EExd

### The Moisture in Liquids Analyzer for the Modern Process Environment

Liquidew EExd is a purpose designed, certified explosion proof solution to on-line continuous moisture measurement for petrochemical liquid applications.

The analyzer is installed directly in the hazardous area, simplifying site installation and retrofits. Moisture content is determined in parts per million by weight ( $\text{ppm}_w$ ) through Henry's Law from the measured water dew-point temperature and liquid temperature. The instrument uses an extensive list of saturation concentration data preprogrammed for a variety of petrochemical liquids, with provision for easy entry of 'custom' characteristics data by the user.

Experience in sample handling and conditioning is built into the Best Practice Sampling System that completes the comprehensive factory built analyzer package. The system is ready for installation next to the sample point or point of interest in the process.

#### Simple Explosion Proof Installation

Liquidew EExd is a self-contained, field-based moisture analyzer, certified as flameproof for use in IEC Zone 1 and 2 and explosion proof NEC Class 1 Div. 1 and 2 hazardous areas. The main unit (electronics and sensing) and associated sampling system may be mounted at a convenient location next to the pipeline or process, with liquid sample and process return connections.

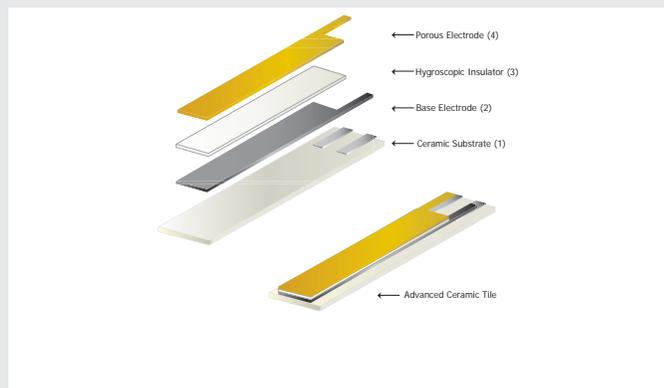
A single, low wattage single-phase AC supply is required for both the analyzer and sampling system. No barrier units or safety grounding are required, saving the user both cost and inconvenience.

#### Advanced Sensor Technology

Liquidew EExd utilizes the Michell Ceramic Moisture Sensor with integrated temperature measurement, offering unrivalled reliability and performance in natural gas and petrochemical installations world-wide.

Thick and thin-film semiconductor technologies with metallized ceramics produce an exceedingly durable sensor, with the physical resilience to provide long-term reliable service in liquid phase measurements.

Every Liquidew EExd 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.



Michell Ceramic Moisture Sensing Technology

#### Single and Dual Channel

Liquidew EExd is available in 1 and 2 channel versions to achieve best economy and installation convenience in fulfilling on-line moisture in liquid applications.

#### Temperature Controlled for Best Accuracy

To ensure continuous optimum performance the Liquidew EExd main unit is internally temperature controlled at the normal maximum local environmental temperature. This greatly reduces the effect of diurnal temperature variations that would otherwise introduce transitional adsorption and desorption effects in the sample handling components and result in erroneous measurements during periods of temperature change.

The Liquidew EExd features an advanced temperature compensation algorithm that automatically maintains the best possible measurement accuracy in the event of heater failure or, if the prevailing climate exceeds the set temperature level.

#### Easy Calibration Maintenance

Maintenance of traceable calibration is essential to the lifetime performance of all analyzers. Beware claims of 'automatic calibration' — this is a non-traceable, internal field-check and does not represent a true calibration of the analyzer.

For Liquidew EExd, true calibration maintenance is simple. Michell's unique Service Exchange Program offers fast delivery world-wide, of newly calibrated replacement Ceramic Sensors which are certified traceable to NIST and NPL standards. As the calibration data for the EExd Sensor is programmed into onboard non-volatile memory, the fitting of a Service 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 Service Exchange Program facilitates a professional, scheduled user QA program at a lower cost than a traditional 'return to manufacturer' recalibration service. Calibration or exchange is recommended annually for innocuous liquids and six months for 'aggressive' liquids.

#### Liquidew EExd Sampling Systems

Good sample conditioning and handling is particularly important in the field of moisture measurement in liquids. The moisture sensor is directly exposed to the liquid process stream in order to detect the dissolved moisture present. Key sampling issues such as preventing particulate contamination and temperature control are critical to reliable measurements. The design of the Liquidew EExd Sampling System is the result of over 40 years of experience in on-line process moisture analyzers to optimize accuracy and repeatability.

#### Comprehensive Integration

Liquidew EExd offers traditional linear analog measurement signals and user-configured alarm contacts (process moisture and analyzer status). ModBus RTU enables total integration with user's SCADA or DCS via ActiveX.

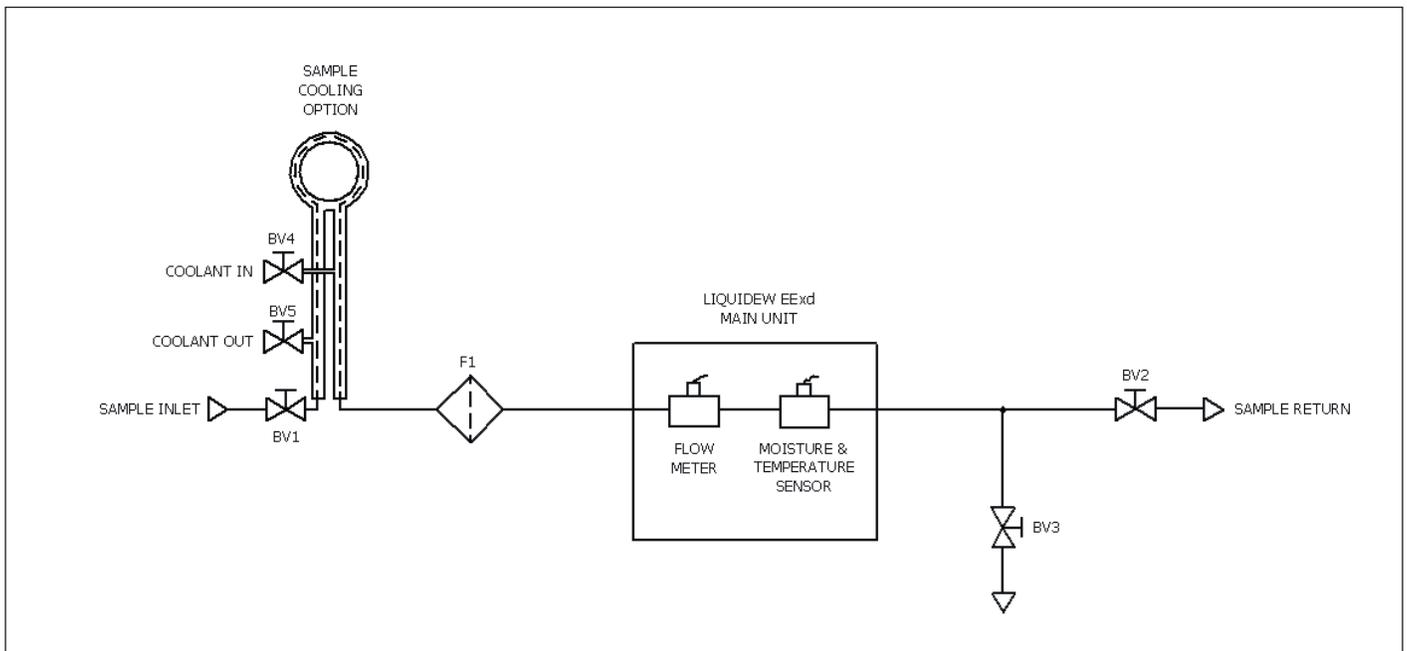
# Liquidew EExd Best Practice Sampling System



## Sampling System Features

- Certified explosion proof/EExd
- Houses analyzer main unit
- Remote global access options
- User-friendly display and 'touch glass' keyboard
- Outputs: alarms and analog digital communications
- $c$ CSA<sub>US</sub>, ATEX and GOST Ex approved
- Measurement Units: moisture content ppm<sub>w</sub>, dew point °C and °F, sample temperature °C and °F
- Heating/thermostat options
- One or two-stage sample filtration
- Optional sample cooling
- Complete hazardous area installation — indoor or outdoor
- Optional enclosure cooling
- Wide choice of standardized design options
- Non-standard customized solutions

## Liquidew EExd One Channel Flow Schematic





User-friendly Liquidew EExd main unit — 'touch glass' HMI alphanumeric display, menu configuration by user

## Application of Henry's Law

The measurement method utilized by Liquidew EExd relies on the fact that moisture dispersed within an immiscible nonpolar liquid, such as a hydrocarbon, acts as a gas exerting a partial pressure of water vapor and with a corresponding dew-point temperature.

With increased moisture concentration or reduced temperature, the level of saturation (saturation concentration,  $C_s$ ) can be reached specific to the fluid carrying the moisture and the prevailing temperature. Under such saturated conditions (so at a temperature below the dew point of the dispersed moisture vapor) free water globules will form within the carrying liquid.

With Liquidew EExd, the amount of dissolved moisture dispersed throughout such an immiscible process liquid is measured on-line in real time in units of  $\text{ppm}_w$  moisture content using Henry's Law:

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

Where

- $\text{ppm}_w$  = Parts per million by weight
- $C_s$  = Saturation concentration in  $\text{ppm}_w$  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

Liquidew EExd offers a complete measurement range capability from low trace moisture below 1  $\text{ppm}_w$  right up to the saturation concentration specific to the fluid being measured at the analysis temperature.

The advanced firmware of Liquidew EExd provides moisture measurements in  $\text{ppm}_w$  through the application of Henry's Law using preprogrammed saturation concentration ( $C_s$ ) values for the most common pure hydrocarbon liquid applications:

- |                       |               |
|-----------------------|---------------|
| • Hexane              | • n-Propane   |
| • Isopropylbenzene    | • Benzene     |
| • n-butane            | • i-butane    |
| • Propylene (propene) | • Cyclohexane |
| • 1-Butene            | • Octene      |

Four user-programmable tables enable Liquidew EExd to be applied to virtually any immiscible solute. For simple mixtures of solutes, a proportional combination of the  $C_s$  values for 2 or 3 individual substances can be applied.

For applications with complex mixture fluids, customers can enter their own  $C_s$  values from their own library sources or from actual laboratory titration analysis of the fluid concerned.

# Technical Specifications

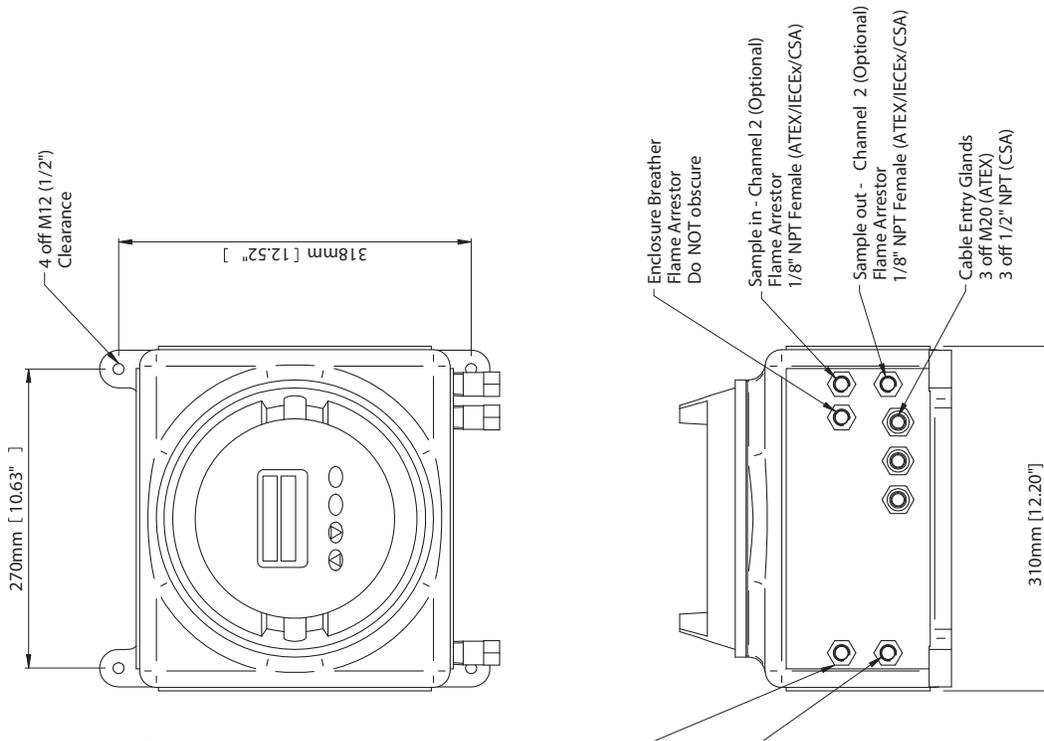
Main Unit — Measurement Parameters							
Channel configuration	Single and dual channel						
Moisture content	ppm <sub>w</sub>						
Temperature	°C and °F						
Water dew point	°C and °F						
Sample flow rate	Status indication: LOW-OK-HIGH (<0.1 to >0.3 NI/min)						
Sensor Technology							
Moisture sensor technology	Michell Ceramic Moisture Sensor						
Calibration range	-100 to +20°Cdp (-148 to +68°Fdp)						
Measurement range	-120 to +30°Cdp (-184 to +86°Fdp) (0.001 ppm <sub>w</sub> to saturation)						
Accuracy	<table border="0"> <tr> <td>Dew point</td> <td>±1°C (±1.8°F) between -59.9 &amp; +20°Cdp (-75.8 &amp; +68°Fdp); ±2°C (±3.6°F) between -60 &amp; -100°Cdp (-76 &amp; -148°Fdp)</td> </tr> <tr> <td>Moisture content</td> <td>±10% of reading ±20% of reading</td> </tr> <tr> <td>Analysis temperature</td> <td>Accuracy ±0.2°C (±0.36°C)</td> </tr> </table>	Dew point	±1°C (±1.8°F) between -59.9 & +20°Cdp (-75.8 & +68°Fdp); ±2°C (±3.6°F) between -60 & -100°Cdp (-76 & -148°Fdp)	Moisture content	±10% of reading ±20% of reading	Analysis temperature	Accuracy ±0.2°C (±0.36°C)
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Moisture content	±10% of reading ±20% of reading						
Analysis temperature	Accuracy ±0.2°C (±0.36°C)						
Resolution	0.1°C (0.18°F) between +20 and -80°Cdp (+68 and -112°Fdp) 1°C (1.8°F) between -80°Cdp and -100°Cdp (-112 and -148°Fdp)						
Temperature coefficient	Algorithm compensation (-20 to +50°C)						
Operating pressure	Max. 80 barg / 1160 psig						
Sample flow	Up to 1 l/min (0.1 to 0.2) recommended						
HMI							
Keypad/interface	Capacitive touch-screen through glass						
Display	Vacuum fluorescent						
Datalogging	A rolling maximum of 150 data logs is available; Each log records time, date, moisture and temperature values for each channel; 5 minutes minimum and 60 minutes maximum logging intervals can be set by the user						
Communications and output	Two non-isolated 4–20 mA per measurement channel; 500 Ω maximum load; range and parameter settable by user; Modbus RTU @ 9600 baud-rate; alarms: Two volt free contacts per channel; one process value and one instrument status; also available via Modbus communications						
Enclosure							
Type	Flameproof EExd						
Construction	Cast copper-free aluminium (IP66/NEMA 4)						
Finish	Chromate primer, polyester P9010 powder coated (black) — meets BS3900						
General							
Sample connections	1/8" NPT (ATEX / IECEx) or 1/4" NPT (CSA) (female)						
Weight	21kg (46.3lbs)						
Operating supply voltage	90 to 260 V AC, 47/63 Hz, 180 W — main unit						
Operating environment	Indoor/outdoor -20 to +60°C (-4 to +140°F); max 95% RH						

Certification	
Hazardous area certification	ATEX II 2G Ex d IIB + H2 Gb T5 (-40°C to 44°C) T4 (-40°C to +60°C)  IECEX Ex d IIB + H2 Gb T5 (-40°C to +44°C) T4 (-40°C to +60°C)  cCSAus Class I, Division 1, Group B, C, D, T4 Tamb -40°C to +60°C  TC TR Ex 1Ex d IIB + H2 T4, T3 Gb (-40°C to +60°C)
Pattern Approval	GOST-R, GOST-K

\*Available to customer specific order — consult Michell Instruments.

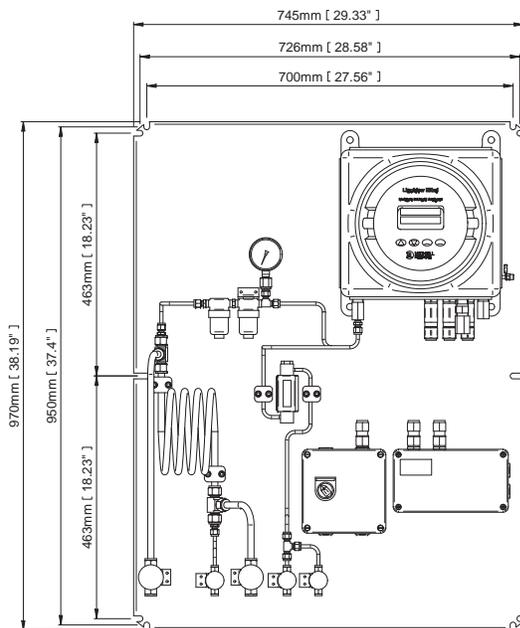
For details of configurations and options, please refer to the **Liquidew EExd Order Codes** list. If not appended to the end of this datasheet, copies are available from the Michell Instruments website or from your local Michell Instruments office.

## Main Unit



## Sampling Systems

### Indoor Single Channel Galvanized Steel Panel

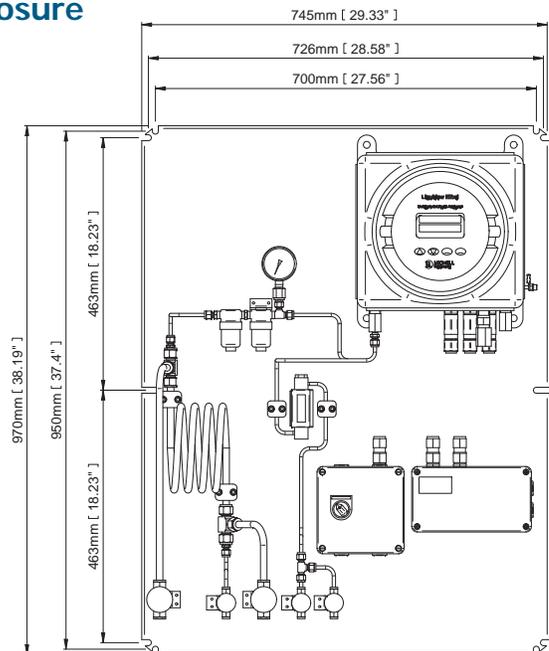


#### Two channel versions

Indoor panel: 950 x 970 x 260 mm (W x H x D)

Outdoor enclosure: 1000 x 1050 x 312 mm (W x H x D)

### Outdoor Single Channel Stainless Steel Enclosure



Enclosure depth: 300 mm

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

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