



# Promet EExd

## Process Moisture Analyzer



A complete moisture measurement package for critical process gas applications



Promet EExd Analyzer Complete with Premium Sampling System  
Code: PSI-AT-NI-A1-D1-F1-J

### Features

- EExd Flameproof ATEX and CSA certified
- Complete zone 1 or 2 installation
- Low wattage AC supply only utility requirement
- Single- or dual-channel measurement
- Calibration traceable to NPL(UK) and NIST(USA)
- Field calibration maintenance by user adjustment or unique sensor exchange service
- Range  $-120$  to  $+30$  °C Dew Point, 0.001 to 30,000 ppmV
- Moisture content units in ppmV,  $\text{mg}\cdot\text{Nm}^{-3}$ , LB/MMSCF
- Integrated electronic pressure measurement
- Modbus RTU and 4-20mA linear signals
- Process and instrument status volt-free alarm contacts
- Remote global access options

For the last thirty years, Michell Instruments has provided on-line moisture measurement solutions for the natural gas and petrochemical industries. All of that experience and expertise is encapsulated in PROMET EExd, where the highest priorities have been given to the needs of the customer in terms of simplicity of installation, total plant communications integration, moderate cost of ownership, and highest calibration integrity.

PROMET EExd offers single and dual channel moisture measurement, with integrated electronic pressure reading, within a single field-installed flameproof housing. User interface is provided through the bright vacuum fluorescent display and touch screen switches.

Comprehensive Sampling Systems of state-of-the-art design, with best practice sample filtration, pressure reduction and flow control, and a range of options are available to fulfil user specific installation and application requirements.

PROMET EExd is THE Moisture Analyzer for the modern process environment.

### Simple Flameproof Installation

Promet EExd is certified as flameproof for use in IEC Zone 1 and 2/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 gas sample and vent connections. A single, low power single-phase AC supply is required for both the analyzer and sampling system. No barrier units or safety earth are required, saving the user both cost and inconvenience.

### Advanced Sensor Technology

PROMET EExd utilises the Michell Ceramic Moisture Sensor, offering unrivalled reliability and performance with more than 1,000 installations in natural gas and petrochemical installations world-wide.

Thick- and thin-film semiconductor technologies with metallized ceramics produce an exceedingly durable sensor, with measurement sensitivity to 10 ppbV moisture content and high-pressure capability up to 300 barg.

Unlike older aluminium-oxide technologies, the inherent immunity to pressure shock of the Ceramic Sensor completely avoids any risk of sensor failure at commissioning or shut-down, whilst the unique inert nature of the sensor gives unrivalled long-term resistance to chemical attack, even in extremely sour gas with percentage level  $\text{H}_2\text{S}$  concentrations.

The Ceramic Sensor responds to the partial pressure of water vapour in the gas being measured, which is directly related to the dew point temperature. Every PROMET 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. Precise process moisture measurement with a class leading best accuracy of  $\pm 10\%$  of measured value is assured.

**MICHELL**  
Instruments



The Dew Point Specialists



PROMET EExd - Main Unit Only

### Comprehensive Measurement Units

PROMET EExd offers complete flexibility for the user to select the preferred hygrometric unit, be it dew-point temperature in °C or °F, or an exhaustive list of moisture content units. Integral pressure measurement enables unit conversions from dew point to moisture content, or dew point to dew point for different pressure conditions.

The firmware of PROMET EExd incorporates conversion data for ideal gases and also specific to natural gas, using either the long established IGT Research Bulletin No. 8 or the more recently published ISO 18453, to customer order preference.

### Calibration Maintenance made Easy

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 Promet EExd, true calibration maintenance is simple. The unique Michell Calibration Exchange Service offers fast delivery, world-wide, of newly calibrated replacement Ceramic Sensors certified traceable to NPL and NIST. As the calibration data for the PROMET EExd Sensor is 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. Calibration or exchange is recommended annually for sweet gases and six-monthly for sour gases.

Field calibration, using a portable dew point generator (ASTM D5454), against a calibrated reference hygrometer or against certified moisture-in-gas cylinders is also possible. PROMET EExd accommodates such needs within the operating firmware, providing user-friendly access to the calibration characterisation table to allow adjustments to be made at just one point (for example using a certified moisture in gas cylinder) or multiple points (using a field generator) across the measurement range.

### Temperature Controlled for Best Accuracy

To ensure continuous optimum performance the PROMET 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 de-sorption effects in the sampling system components and result in erroneous measurements during periods of temperature change.

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

### Communication Capability for Total Plant Integration

PROMET EExd offers digital and analogue communications as standard.

- Modbus RTU is provided with optional Active X controls for integration to site SCADA/DCS.
- Four non-isolated 4-20mA outputs are user configurable for unit and range of measurement.
- Process alarm contacts can be set by the user.
- Instrument status alarms provide a continuous 'health check' through to the site control room.
- Low sample flow alarms are available as an option. Such individual alarm states are identified through the Modbus instrument registers and appear locally on the display.
- Field cable connections are conventional instrumentation pairs for all signals and alarms.

### Remote Interface

For users that wish to have a dedicated host within their Control or Instrument Room, the optional Remote Interface (RI) provides advanced graphical display of measurement and status information, data logging and all programme configuration functions for up to 31 analyzers. Each analyzer communicates with the RI through the Modbus RTU, so transferring all the functionality of the Main Unit through into the comfort and convenience of an indoor safe area environment. Additionally, global access to all functionality is provided through any web browser into the embedded unique IP address of the RI.



Optional Remote Interface (RI)

## Premium Sampling Systems

Good sample conditioning and handling is particularly important in the field of moisture measurement. As the moisture sensor has to be exposed directly to the process gas stream in order to detect the water vapour present, then key sampling issues such as the avoidance of particulate and liquid contamination are imperative to successful operation. Our 30 years of expertise in on-line process gas analyzers are used to optimise the design of the PROMET EExd Premium Sampling Systems.

Two core configurations, both available in either single- or dual-channel version, are available for key applications:

### Natural Gas Processing and Transmission Sampling System:

The reliable solution for glycol dehydration processes offshore and onshore and for onward pipeline transmission of sales gas. The most advanced filtration techniques with micro-porous membrane and continuous by-pass flow remove and dispose of all liquid phase contaminants. A glycol adsorption cartridge removes residual vapour that may otherwise interfere with the moisture signal.

### Trace Moisture in Hydrocarbon Gas Sampling System:

An optimised design for continuous trace moisture measurement in low ppmV and ppbV ranges for molecular sieve dehydration of natural gas prior to cryogenic liquefaction. Also suitable for many other monitoring applications at trace moisture levels in refinery gases and critical petrochemical processes. A minimalist approach to the sampling system design is essential to ensure best dynamic response to process moisture variations. A particulate filter and isolation valve are the only components prior to the sensor. As measurements are made at pipeline conditions, no regulators or other complex upstream components are necessary so ensuring the PROMET EExd remains in continuous equilibrium with the process gas condition without any significant response lag.

### Options to Suit all Installations

- Both designs are available in intermediate and high-pressure version (rated 69 barg/1,000psig with single stage pressure reduction and 138 barg/2,000psig using two-stage reduction).
- All sample flow components are exclusively 316/316L (EN1.4401/1.4404) in conformance to NACE MR0175 (latest edition) for sour gas operation.
- In all systems the moisture content and dew point is measured at full line pressure, so avoiding any risk of error resulting from condensation occurring at sample pressure reduction.
- Therefore, the parameter stipulated in the majority of natural gas quality specifications at custody transfer is measured directly.

Extensive options are available to allow the PROMET EExd Premium Sampling Systems to be customised to individual user requirements. All versions of the sampling system are available as 'open panel' designs for wall mounting inside a field analyzer house.

However, for convenience and reduced installation cost, the PROMET EExd Main Unit and Sampling System may be supplied in a single high ingress protection enclosure, mounted close to the sample source point near the pipeline or process. Outdoor versions are available with either GRP or 316 enclosure and heater with fixed set-point thermostat to maintain constant analysis conditions. Options available include variable set-point heater thermostat and a vortex cooling system to ensure best performance even in extreme hot and cold climatic conditions.

Trace heated sample lines are recommended in all installations to avoid any risk of condensation in flowing sample pipes and to reduce the adsorption/de-sorption effects caused by diurnal temperature changes.

Custom design sampling systems are available for other specific applications such as higher pressure processes and hydrogen recycle gas moisture measurement in catalytic reformer refinery processes. Your Michell office or authorised distributor will be pleased to discuss your specific application/installation requirements.

## Order Code Description

### PROMET EExd Main Unit - ISO18453 calculation software:

PS1	Promet EExd Single channel
PS1F	Promet EExd Single channel with optional flowswitch
PS2	Promet EExd Two channel
PS2F	Promet EExd Two channel with optional flowswitch

### Alternative Version - IGT Bulletin No. 8 Calculation Software

Change PS1 and PS2 codes to PG1 and PG2 respectively

### Certification:

- ATEX	ATEX certified system
- CSA	cCSA <sub>US</sub> certified system

### Premium Sampling Systems - Base Versions (Panel mounted, intermediate pressure)

- N1	Natural Gas Single channel, 1,000 psig/69 barg rated
- N2	Natural Gas Two channel, 1,000 psig/69 barg rated
- T1	Trace Moisture Single Channel, 1,000 psig/69 barg rated
- T2	Trace Moisture Two Channel, 1,000 psig/69 barg rated

## Sampling System options

### Enclosure

A1	GRP enclosure, IP66/NEMA 4 - Single Channel
A2	GRP enclosure, IP66/NEMA 4 - Two Channel
B1	316 Stainless Steel enclosure, IP66/NEMA 4 - Single Channel
B2	316 Stainless Steel enclosure, IP66/NEMA 4 - Two Channel

### Higher Pressure Rating

D1	Natural Gas Higher Pressure, 2,000 psig/138 barg rated - Single Channel
D2	Natural Gas Higher Pressure, 2,000 psig/138 barg rated - Two Channel
E1	Trace Moisture Higher Pressure, 2,000 psig/138 barg rated - Single Channel
E2	Trace Moisture Higher Pressure, 2,000 psig/138 barg rated - Two Channel

### Heater/thermostat

Available only with enclosure

F1	Standard Heater/Fixed Thermostat 20 °C (68°F) - Single Channel
F2	Standard Heater/Fixed Thermostat 20 °C (68°F) - Two Channel
G1	Thermostatic Heater, adjustable 0 to 50 °C (32 to 122°F) - Single Channel
G2	Thermostatic Heater, adjustable 0 to 50 °C (32 to 122°F) - Two Channel

### Enclosure cooling for hot desert climate installation

Available only with enclosure

H	Enclosure Cooling - Instrument air supply required
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### Trace heated sample tubing

JXX	Trace Heated Sample Line Assembly - where XX is length in metres (min 3, max 15). Seamless 316L stainless steel, 6mm or 1/4" OD tube, fluoropolymer self-regulating heating cable, glass fibre insulation, with PVC outer sheath. Factory assembled, wired and terminated into Premium Sampling System enclosure.
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Note: Metric size tube and couplings are standard throughout ATEX certified systems, whereas fractional inch sizes are used for CSA systems. Vice versa configurations available to special order at no additional price.

### Ordering Examples

PS1-AT-N1-B1-D1-F1-\_-J05 PROMET EExd Single Channel Process Moisture Analyser, ISO18453 calculation software, ATEX certified, with Natural Gas Sampling System with optional 316 st enclosure, 20 °C (68°F) setpoint heater/thermostat, higher pressure rating, and 5 metre trace heated sample tube

PG2F-CS-T2-A2-\_-G1-H-\_-

PROMET EExd Two Channel Process Moisture Analyser, with flow alarms, IGT 8 calculation software, CSA certified, with Trace Moisture Sampling System with optional GRP enclosure, thermostatic heater (adjustable 0 to 50 °C), and enclosure cooling for hot desert climate.

Please note: Michell Instruments is continually improving its products and services. Therefore, by the time you read this datasheet, the details contained on it may have been superseded. Please call us to ensure that you have the latest version.

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## Technical Specifications

### PROMET EExd Main Unit

#### Measured and Calculated Values

Dew point °C & °F  
Automatic Pressure Compensated Conversions:  
ppm(v) for Natural Gas and Ideal Gas  
LBMMSCF and mgNm<sup>-3</sup> for Natural Gas  
Dew point at a pressure input by the User for Natural Gas and Ideal Gas  
Calculations for natural gas moisture content based on either **ISO 18453** or **IGT#8** to customer order preference.

#### Keypad/Display:

Capacitive touch-screen through glass.  
Display: Vacuum Fluorescent.

#### Data logging

A rolling maximum of 150 data logs is available. Each log records time, date, moisture and pressure values for each channel.  
5 minutes minimum and 60 minutes maximum logging intervals can be set by the user.

#### Communication & Outputs

Four non-isolated 4-20mA channels. 500 ohms maximum load. Range and value settable by the 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.

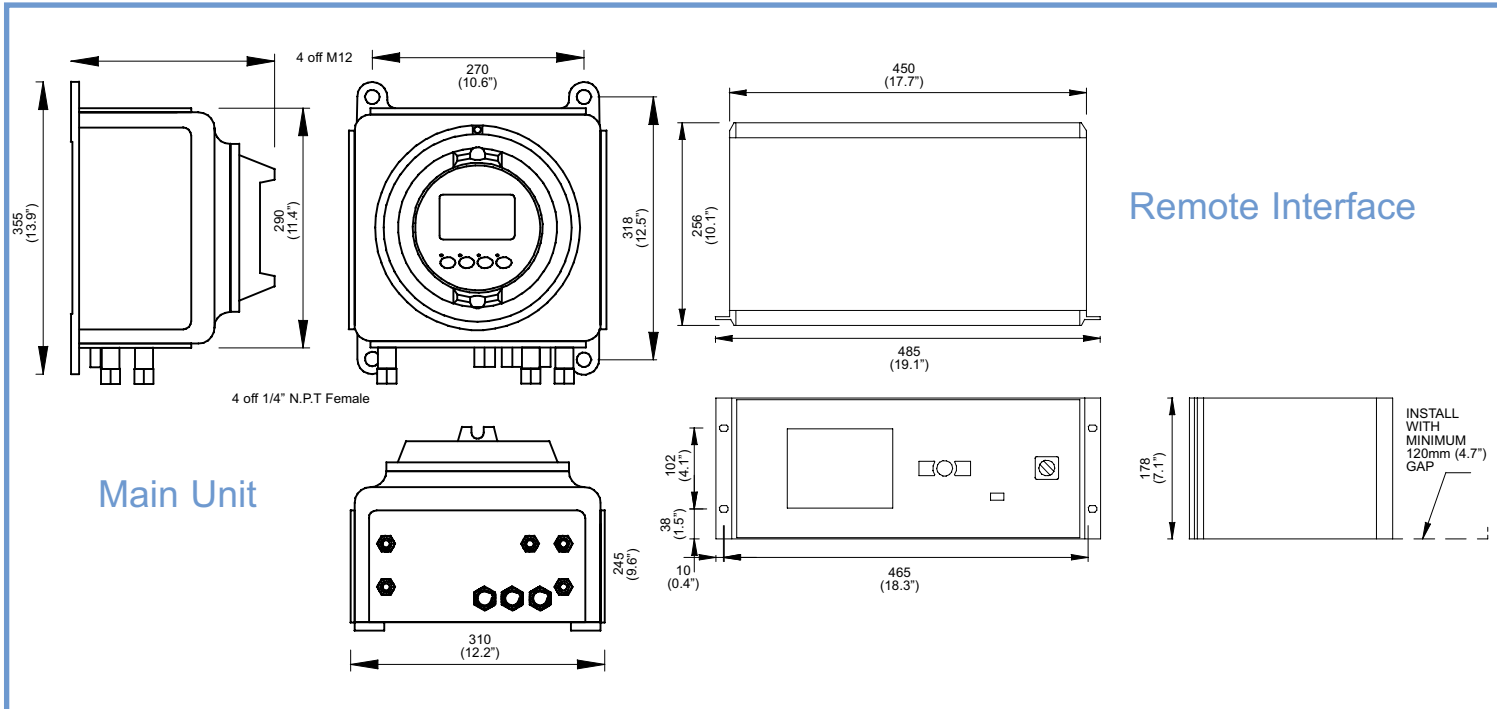
#### Main Unit Enclosure

Internal temperature control for condensation protection and stable analysis conditions.  
**Type:** Flameproof EExd.  
**Construction:** Body and lid cast Copper free Aluminum LM25(EN AC-42000). 15mm thick heat resistant glass window. M20 cable gland entries  
**Finish:** Chromate primer, Polyester P9010 powder coated (Black). Meets BS3900  
Electrical Connections: 2.5mm<sup>2</sup> two part terminals.  
**Hazardous Area Certification:** ATEX Certification Code: Group II, Category 2 G  
**Code:** EEx d IIB + H2 T4 Tamb -40 +60 °C (-40 +140 °F)  
**Ingress Protection:** IP66 (NEMA 4)  
**Certificate Number:** TRL06ATEX21092X  
**CSA approval PENDING :** Div. 1, Class 1, Group B, C, D

#### Measurement Technique: Michell Ceramic Moisture Sensor

**Measurement Range:** -120 °C dp to +30 °C dp. (-184 / +86 °F)  
1 ppbV to 30,000 ppmV  
**Calibration Range:** -100 °C dp to +20 °C dp. (-148 / +68 °F)  
10 ppbV to 23,000 ppmV  
**Accuracy:** Dew point: ±1 °C between -59.9 & +20 °Cdp  
(±1.8 °F: -75.9 to +68 °Fdp)  
Moisture content: ±10% of reading  
Dew point: ±2 °C between -60 & -100 °Cdp  
(±3.6 °F: -76 to -148 °Fdp)  
Moisture content: ±20% of reading  
Analysis Pressure: ±0.25%FS.  
**Measured Resolution:** 0.1 °C: -80 to +20 °C dp (0.2 °F: -112 to +68 °Fdp)  
1 °C: -100 to -80 °C dp (2 °F: -148 to -112 °Fdp)  
**Displayed Resolution:** Dew point: 0.1 °C (0.2 °F)  
LB/MMSCF: >999.9 = 0.1,  
<999.9 = 0.02  
ppm(v) & mg.Nm<sup>-3</sup>:  
< 100 = 0.001,  
> 100 < 1000 = 0.01  
> 1000 = 0.1  
MPa & Barg: 0.1  
Psig: 1.0  
**Temperature Coefficient:** Algorithm compensation.  
**Operating Pressure:** Max. 206 Barg, (2987 psig)  
**Sample Gas connections:** ¼" NPT (female)  
**Sample Flow Rate:** 0.0 - 0.4 m<sup>3</sup>/h (0-6.66 litres per min.)  
**Power Supply:** 90 - 264Vac 47 to 63Hz, 110 to 300 Vdc, 180W  
**Operating Environment:** Indoor/Outdoor -20 °C to +60 °C (-4 +140 °F).  
Max 95 % rh. Shaded location  
¼" NPT (female)  
**In/Out port connections:**  
**Remote Interface – Optional, for Indoor Safe Area Installation**  
**Host Capacity:** Up to 31 Michell EExd Process Instrumentation Range analyzers in any combination of models via Modbus  
**Display:** Backlit color 15cm/6" LCD  
**User Interface:** Integral mouse, on-screen keyboard  
**Functions:** View and modify analyser operating settings  
Record parameters to file and view virtual chart recorder  
Analyser diagnostics  
**Ports:** LAN, USB2  
**Data Download:** CSV (comma separated variable) format for easy import to Excel™  
**Remote Access:** OPC (OLE for Process Control) over a LAN  
Imbedded web page/unique IP address for PC access

## Dimensions



For specifications and dimensions of Premium Sampling Systems, refer to separate datasheet: PrometEExd - Ref - PEEExdSS-0506

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