Promet

Process Moisture Analyser

From the Process Range

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

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Features

- Total analyser system tailored to specific customer requirements
- Fully field interchangeable sensors
- Pressure compensation of conversions to moisture content
- Wide dew point measurement range with display in any hygrometric unit
- Analysis pressure up to 30MPa
- Sensor protected against glycol and other process borne liquid contaminants
- Immune to chemical attack from H_2S, mercaptans and other sulphides
- ATEX certified operation in Zone 1 or 2 EExd option available

Background

Promet Moisture Analysers are heavy duty, industrial hygrometer systems for the measurement of high pressure process gases and vaporised liquids on natural gas platforms and terminals, petrochemical plants and industrial gas manufacturing facilities. Promet combines best practise sample conditioning system design with highly reliable moisture sensing technology to provide a rugged on-line instrument tailored to customers' specific application and technical requirements. Measurements can be made across the range -100 to +20 °C dew point with an accuracy of ±1 °C dew point and at pressures up to a maximum of 30 MPa.

Sensor Technology

The Promet Moisture Analyser is based on Michell's proven Ceramic Moisture Sensor technology, giving unrivalled performance and reliability in process conditions. The Ceramic Moisture Sensor is applicable for use in high pressure gas environments and, with suitable protection from contaminants such as particulates and entrained hydrocarbon condensates, can operate even in corrosive atmospheres bearing high concentrations of acid components such as hydrogen sulphide. Providing 1 °C dew point accuracy and a wide measurement range from ppb levels to saturation, Promet analysers can be configured to suit almost any process application.

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Performance and Ease of Use

At the heart of the Promet Moisture Analyser is the Transmet IS Dewpoint Transmitter. This self-contained unit consists of a Ceramic Moisture Sensor and microprocessor electronics unit that stores the sensor calibration data and provides a linear 4-20 mA output in terms of °C dew point. The Transmet IS Transmitter is fully calibrated, therefore ensuring the highest level of callibration integrity and easy interchangeability for servicing in order to maintain traceability to national standards, and to achieve minimal downtime. 24 V power for the Transmet IS is derived from the Promet Monitor and its output can be transmitted up to 500 m to the Promet monitor unit located in a safe area (or hazardous area with optional EExd housing), via the safety barrier system. For further details please refer to our Transmet IS datasheet.

Transmet IS Dewpoint Transmitter

Comprehensive Measurement

The standard Promet Monitor is provided in a panel-mounting 3U 19" sub-rack system with all the interfacing and interconnection required to allow on-line monitoring of process gas moisture under your preferred conditions. The Promet monitor provides a clear LED display of the process moisture content in °C or °F dew point or parts per million by volume. Alternatively, pounds per million standard cubic feet or milligrams per normal cubic metre are available, specifically enhanced for natural gas. All units are selectable from the front panel. Connection of a pressure transducer output to the Promet Monitor provides active pressure compensation of the measured moisture content, if required.

Alternatively, if no external pressure transducer is available, a pre-set pressure value can be input to the monitor via the front panel to enable passive pressure correction. Up to four individually settable alarms can be provided (two as standard) and the Promet Monitor gives current and voltage outputs as well as a digital RS232 output for connection to external devices.

The Promet Monitor is configured and delivered complete with input/output connections and a 24 V excitation source to drive the Transmet IS transmitter located in the field. We even supply a ready assembled, wired and configured IS barrier assembly on-board the Promet Monitor if required. All you need do is mount the monitor, sampling system and make the interconnections and the system is ready to operate.

Sample Conditioning Systems

Process moisture measurement is application critical and, as such, great care and attention must be paid to the design and construction of the analyser sampling system. That's why we employ experienced engineers with real World experience to design each and every Promet Sampling System to suit your specific requirements. Below are detailed four of the most common sampling arrangements, but each one of these can be customised to your needs in any way, giving you complete integration with your process.

Each sampling system provides pressure reduction, flow control and in-line sample filtration, together with the sensor itself in a weatherproof, temperature-controlled enclosure certified for Zone 1 or 2 hazardous area operation. This enables the complete system to be located as close as possible to the sampling point thus reducing sample line response lags to an absolute minimum. The gas wetted system components are manufactured to the highest standards and materials are selected to suit the specific process gas composition (including compliance with NACE MR01-75).

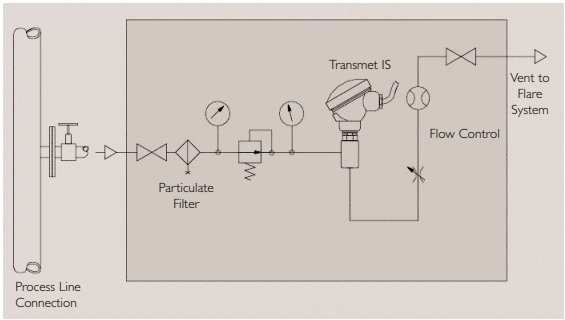
The design of the Sample Conditioning System is configured to suit the environmental conditions and characteristics of the gas being analysed in each individual application. Examples of sample conditioning system configurations are shown below.

Promet Configurations

Configuration 1: LNG Production

Trace moisture analysis in natural gas prior to cryogenic liquefaction process.

Natural gas is dried to less than 1 ppm_V moisture content by desiccant columns. This is critical in order to avoid freeze up inside the cryogenic process that operates below -161 °C, the boiling point of LNG. Under normal operation, the moisture content for this process is usually 0.1 ppm_V with alarm at 0.25 ppm_V.



Configuration 1: LNG Production

For this application, the Transmet IS transmitter measures dew-point temperature at fixed analysis pressure of typically 0.1 MPa, set by a pressure reduction regulator from a line pressure usually in the 6 MPa region. The Promet Monitor provides automatic real time conversion to give display, output and alarm functions in the users required measurement unit of ppm_V. By making full use of the certified calibration of the Transmet IS down to -100 °C dew point and the analysis pressure programming function of the Promet Monitor, accurate readings are provided down to 0.01 ppm_V.

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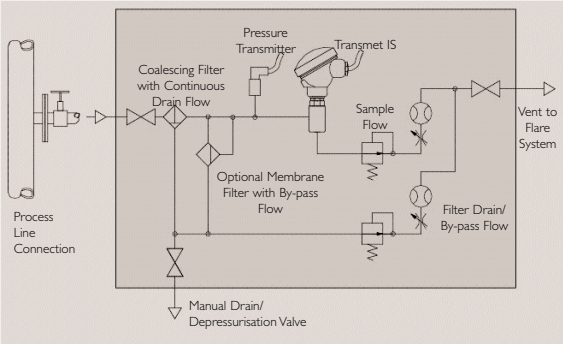
Configuration 2: Glycol Dehydration of Natural Gas

Monitoring the efficiency of glycol dehydration process during natural gas production.

Natural gas dried to below 3 Lb/mmscf (50 mgm^{-3}) moisture content to avoid hydrate formation and limit pipeline corrosion during onward transmission and distribution of the gas produced.



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For this application, effective filtration of the sample flow to remove all traces of glycol mist droplets, carried through for the process, is essential to ensure reliable, accurate operation of a moisture measurement system. To achieve this, Michell Instruments use conventional fibre coalescing filtration with a continuous drain flow to remove all collected liquids away from the sample flow path to avoid any adverse effect on the response of the analyser to process moisture changes. For installations where glycol carry-through is considered to be a particularly severe problem, advanced membrane technologies are utilised to provide the very highest level of protection.

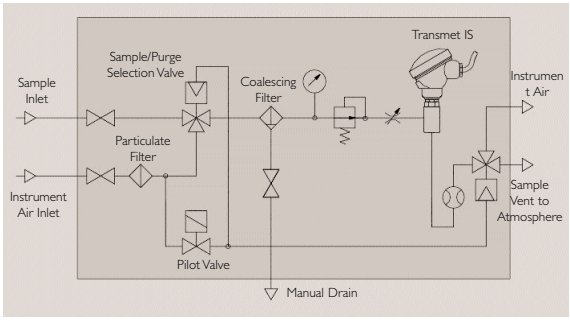
In this configuration the Transmet IS is operated at full line pressure with a pressure transmitter providing a direct input to a Promet Monitor to enable the dynamic pressure compensation function. The units mgm^{-3} or Lb/mmscf, programmed specifically for natural gas with enhancement factors applied to compensate for the non-ideal behaviour of natural gas at elevated pressures, can be selected with a scaling to suit the needs of each installation.

Configuration 3: Export/Sales Natural Gas

Monitoring conformance to gas quality specification for water dew point during pipeline transmission.

In order to prevent pipeline corrosion, contractual agreements require the water dew point of sales gas to be below a specified limit, to be measured at full line conditions, where the highest water dew point will prevail for the gas being monitored.

For this reason in this application, Transmet IS is positioned at the front end of the sampling system, straight after the filter. As export gas pipeline pressures may be as high as 20 MPa or more, then one or two stages of directly or indirectly heated pressure regulators will be selected to suit the pressure let-down requirements of the application.



Configuration 4: Hydrogen Re-cycle Gas in Refinery Catalytic Reformers

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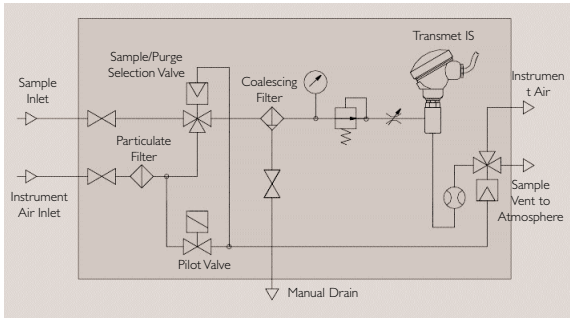
Maintaining a moisture level of 20 to 30 ppm$_V$ in the re-cycle hydrogen is critical. Less moisture would result in less efficient chemical reactions whilst higher moisture levels would risk poisoning of the precious metal catalyst - both problems having serious cost repercussions.



Configuration 4: Hydrogen Re-cycle Gas in Refinery Catalytic Reformers

For this application, where the sample handling requirements are relatively straight forward, the most important aspect is to protect the moisture sensor during catalyst regeneration whereby hydrochloric acid vapour is periodically introduced as a cleaning agent. For this reason the sampling system incorporates selection valves to isolate the sample flow path from the process gas during the generation period. At this time, instrument air is used as a dry, inert gas to maintain the sensor in good condition ready to return into service as soon as the concentrations of HCl have returned to normal.

The Promet Monitor provides data and all monitoring functions in the unit of ppm$_V$ moisture content.

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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 superceded. Please call us to ensure that you have the latest version.

From the Process Range

Technical Specifications

Process Moisture Analyser

Sensor	*Transmet IS**
Measurement range	*-100 to +20 °C dew point*
Accuracy	*±1 °C from +20 to -60 °C dew point; ±2 °C from -60 to -100 °C dewpoint*
Hygrometric units	*Digital processing linearisation with pressure compensation from measured dew point with pressure compensation to any other preferred unit - dew point, Lb/mmscf and mg/Nm³ (for natural gas), ppm_V*
Pressure input	*Fixed value (user programmed) or dynamic measurement (4-20 mA pressure transmitter, optional)*
Resolution	*0.1 °C dp, 0.1 °F dp, 0.01 ppm_V, 0.1 mg/m³, 0.01 Lb/mmscf*
Analogue output	*4-20 mA isolated (max load 600W)*
Sensor calibration	*Traceable to British (NPL) and American (NIST) National Humidity Standards*
Alarms	*Two user adjustable for set points and operating configurations (4 optional)*
Mounting panel	*19" anodised aluminium, '3U' high 132 x 200 mm clearance depth*

Sample Conditioning Systems

Enclosure	*Glass fibre reinforced polyester (flame retarding, anti-static). All fixtures stainless steel. Option for complete enclosure in AISI 316 stainless steel. Dimensions 775H x 612W x 329D mm*
Enclosure mounting	*Stainless steel wall mounting brackets*
Ingress protection	*IP65 / IP66 optional (NEMA 4)*
Cable/pipework	*All through base of enclosure. Pre-machined M20 entries clearance holes for sensor field cable and heater power supply cable entries. 6 mm bulkhead compression couplings for process gas supply and exhaust*
Flow rate	*5 $Nlmin^{-1}$ (add 10 $Nlmin^{-1}$ for configuration with 'continuous drain' arrangement)*
Analysis pressure	*Up to 30 MPa*
Enclosure temp	*Heater/thermostat sdjustable set-point range 0 to control 50 °C. Optional vortex cooling option for desert conditions*
Heater power supply	*110/120 or 220/240/255 V ac, 50/60 Hz. Power consumption 100 or 200 Watts max. Add 40 Watts for single stage electricity heated pressure regulation where used (80 Watts for two stage)*
Operating environment	*Shaded position, on or off shore, -40 to +40 °C (+60 °C max transient)*

Interconnecting Sensor Cable

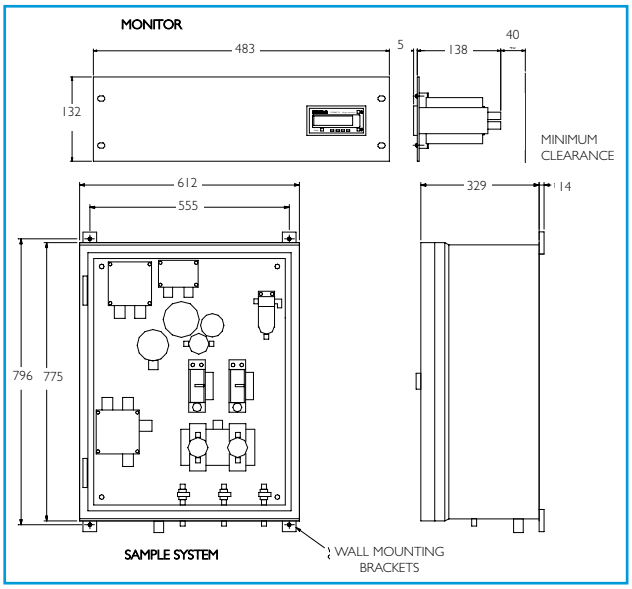
Field cable spec	*Polyethylene insulated instrumentation cable to BS5308 Part 1 - two collectively screened dual conductors 0.5 mm². Polyethylene bedding, galvanised steel wire armour, and PVC flame retardant outer sheath in blue. Low smoke and fume or halogen free outer sheath options available*
Max length	*250 m (greater dependent upon cable spec)*
Terminating link	*Medium duty, grey PVC sheathed, braided cables cables provided for safe area termination to Promet Monitor and hazardous area termination inside the sample conditioning system enclosure*

Safety Aspects

The complete Promet package meets the requirements of BS5345: Part 1: 1989 and other European codes of practice for Zone 1 potentially hazardous area operation of the sensor and sample conditioning system to analyse gases of all gas groupings inclusive of IIC. The Promet Monitor must be located in a designated non-hazardous area (or in an optional EExd housing).

All relevant components in the potentially hazardous area are themselves individually certified to ATEX standards. Transmet IS is ATEX certified by EECS for use in hazardous areas to to Ex II 1G EEx ia IIC T4 when used with a pair of isolation or shunt diode barriers for signal and power supply connections. Transmet IS has been FM listed (USA) CL1, Div1, Gp A, B, C & D, T4 and CSA (Canada) certified to Ex ia (Class 1, Groups A, B, C & D). The standard sampling system enclosue is constructed in anti-static, flame retardant GRP to EN50 014.6.3. The sample conditioning system heater and thermostat are certified EEx d IIC T5 and EEx ed IIC T6 respectively through PTB. Electrically heated pressure regulators (where required) are certified EEx d IIC T3 through ISSeP.

Dimensions



Dimensions mm

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