

# Pura

## Pure Gas Moisture Transmitter

This small pure gas transmitter is a rugged, self-contained hygrometer designed specifically for the measurement of trace moisture content in ultra high purity gases.

Simple to use and install, the Pura is available in two-wire, three-wire and hazardous area versions and is fully configurable to meet specific needs.



### Highlights

- Measurement range down to  $-120^{\circ}\text{C}$  ( $-184^{\circ}\text{F}$ ) dew point (1ppb<sub>v</sub>)
- Stable and repeatable measurement
- Analog and digital output
- Simple installation
- VCR process connections
- Optional display / alarm unit
- Compact design
- Fast response
- Optional hazardous area approval
- Service exchange program

### Applications

- Pure gases
- Semiconductor manufacture
- Fibre optic production
- Electronic component manufacture
- Optical coating processes
- Industrial gas production and distribution

# Pure Gas Dew-Point Transmitter

In many high purity gas applications, such as the semiconductor industry, the residual moisture content of the gas is critical to the satisfactory operation of a process.

Historically trace moisture measurement has been problematic, demanding the use of complex moisture analysers or expensive analytical techniques. Now Michell has brought to market a simple, economical and very effective solution for on-line measurement of dew-point temperatures down to -120°C (-184°F) (equivalent to less than 1 part per billion).

The Pura transmitter benefits from Michell's experience and expertise in the production and calibration of impedance dew-point sensors. Incorporation of industry standard materials and manufacturing processes gives the first low cost transmitter suitable for large-scale integration into a semiconductor fabrication plant or high purity gas line.

## Simple To Use

This self-contained transmitter module has been designed to fit seamlessly into your pure gas process and give you the measurement you need - continuously and reliably.

Pura's sensor housing is fabricated from cold drawn stainless steel with an internal 0.25 Ra µm electro-polished finish for minimal moisture adsorption and cleaned to oxygen standards.

The transmitter is delivered fully calibrated and ready to use. The calibrated 4-20 mA output can be connected to a Michell process indicator or centralised control system.

The unit is designed to have minimal internal volume. This ensures the fastest possible response speed in commissioning and also when a moisture event occurs. The sensor containment seal is rated to 10<sup>-9</sup> torr whilst the whole system will handle pressure right up to the VCR coupling rated maximum of 240 Barg (3480 psi).

## Customisable Information

While Pura 2-wire is shipped ready to use, calibrated at 10°C dew point intervals across its measurement range against transfer standards traceable to NIST and NPL, it is also user-customisable. The 4-20 mA output can be user set over any part of the operating range, with a minimum output span of 1°C. Also, the factory pre-set alarm signals, providing over-range, under-range and sensor fault conditions, can also be easily re-set to suit your own application and system needs. Adjustment of all these parameters is achieved through a simple PC-based user interface, available as a download at [www.michell.com](http://www.michell.com)

## Easy Installation and Operation

Pura is simple to install. The ¼" male VCR gas connection ports are set at a pitch of 120mm (4.72 in) to fit into a standard Mass Flow Controller footprint. The whole unit is only 150mm (5.9 in) in height and weighs less than 500g (1.1 lb). Pura is a two or three wire transmitter, providing ultimate flexibility in operation and powered by any regulated 12 to 28 V DC source (max 25 mA).

## Optional Monitor

If the application calls for the dew point or moisture content to be displayed then the Pura can be supplied as a hygrometer, with an Online (standard) or Advanced Online panel mounted display. Our range of monitors are simple to connect and also acts as a power supply for the Pura Transmitter.

## Service Exchange/Recalibration Program

Michell offers two services for customers who want minimum downtime and equipment traceability:

**Sensor Exchange** – customers place an order for a guaranteed, reconditioned sensor. When this arrives, they exchange it for the installed sensor which is returned to Michell, resulting in zero process downtime.

**Recalibration** – customers return their installed sensors to Michell, where they are inspected, checked and recalibrated before being returned. This provides on-going sensor traceability for the process.

## Other Options

### Mechanical options:

- Premium - Clean room cleaned, inert gas filled, double bagged, 1/4" VCR.
- OEM - Clean room cleaned, single bagged.
- Sensor - 1/2" VCR connections.

### Electrical Options:

- PUR-TX-2W - 2 wire 4 to 20mA
- PUR-TX-3W - 3 wire 4 to 20mA
- PUR-IS-2W - 2 wire hazardous area 4 to 20mA

### Display Options:

- Advanced Online - 5 digit display, user configurable
- Online - 4 Digit display

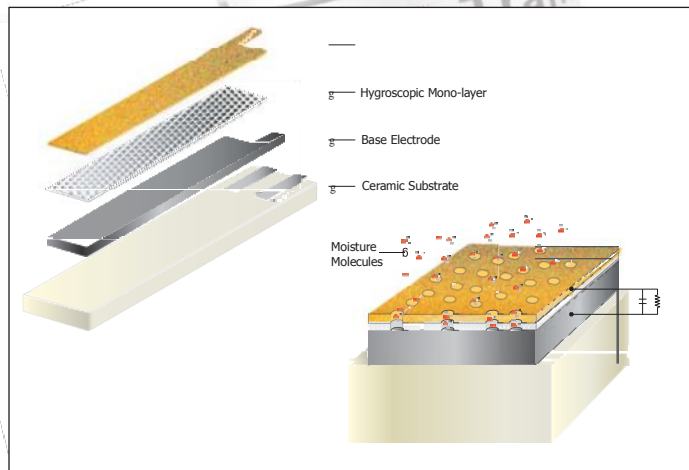
## Sensor Technology

### Ceramic Impedance Sensor

The Pura uses Impedance technology, based on Michell's advanced ceramic sensor. The operation of this sensor depends on the dielectric property of water molecules absorbing onto an active porous insulating layer sandwiched between two layers of conductive material deposited on a ceramic substrate.

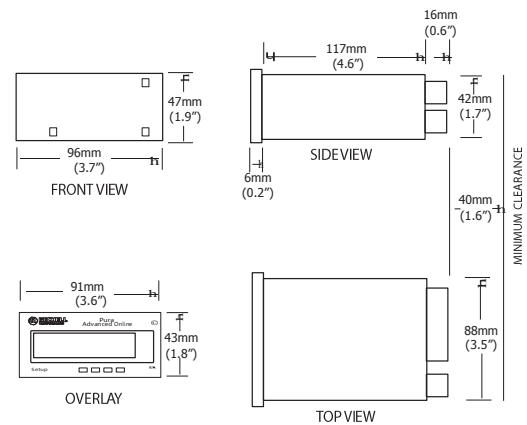
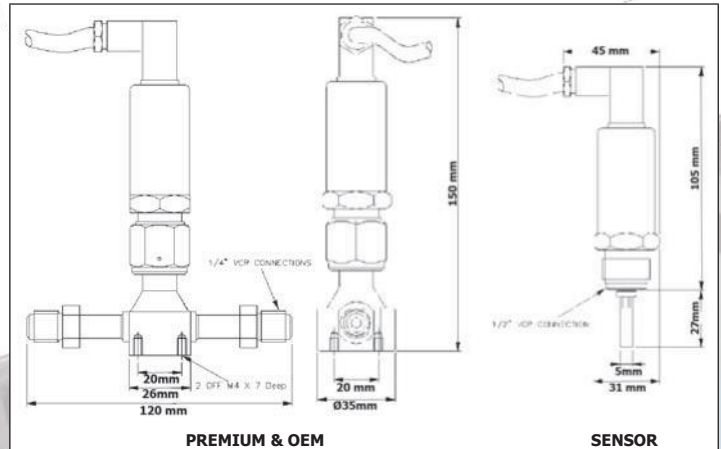
Water has a very high dielectric compared to the dielectric of the active layer and the background of the carrier gas so it can be detected easily.

The active layer is very thin – less than one micron and the porous top conductor that allows water molecules to penetrate into the active layer is less than 0.1 micron thick. This allows the sensor to respond very rapidly to changes in the moisture surrounding it both when moisture decreases (drying) and increases in the sensor environment.

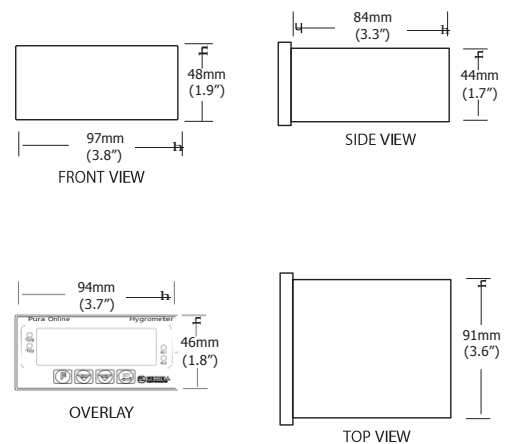


Michell ceramic sensor tile layers

## Dimensions



ADVANCED ONLINE (AOL)



ONLINE (OL)

# Technical Specifications

<b>Sensor</b>	
<b>Sensor Type</b>	Michell Advanced Ceramic Moisture Sensor
<b>Range</b>	-120 to -40°Cdp (calibrated from -100 to -40°C) (-184°F to -40°Fdp calibrated from -148 to -40°F)
<b>Accuracy</b>	±1°C from -40 up to -60°Cdp (-40 up to -76°Fdp) ±2°C from -60 up to -100°Cdp (-76 up to -148°Fdp) ±4°C from -100 to -120°Cdp (estimated) (-148 to -184°Fdp)
<b>Operating Pressure</b>	Minimum 10 <sup>-7</sup> Pa (10 <sup>-9</sup> torr); Maximum 24 MPa (240 barg/3481psi)
<b>Operating Temperature</b>	-40 to +60°C (-40 to +140°F)
<b>Flow Rate</b>	1 to 5 Nl/m (2.11-10.59 scfh)
<b>Electronics/Electrical</b>	
<b>Power</b>	Nominal 24 V DC, 10-28 V DC maximum current 25 mA 3- or 2-wire configuration
<b>Output</b>	PUR-TX-2W: 4 to 20mA 2 wire PUR-TX-3W: 4 to 20mA 3 wire PUR-AOL-SEN only: Digital String (RS485)
<b>Cable with Display</b>	PUR-OL & PUR-IS-OL: 2m (standard) (6.56 ft) optional 5 or 10m (16.4 or 32.8 ft) PUR-AOL: 2m (standard) (6.56 ft) optional 5 or 10m (16.4 or 32.8 ft)
<b>Mechanical</b>	
<b>Sensor Block (Premium &amp; OEM)</b>	Cold drawn stainless steel, 0.1 - 0.2 Ra µm electro-polished internal finish
<b>Pressure Connections</b>	<b>Premium and OEM versions:</b> ¼" male VCR connections <b>Pura Sensor version:</b> ½" male VCR connection
<b>Installation Profile</b>	<b>Premium and OEM versions:</b> 120mm pitch (4.72 in), drop in across gas port face seals. Zero pipe clearance required. 2 off M4 x 0.7, 7mm (0.03, 0.28 in) deep mounting holes in block, diagonally opposed at 20 x 20mm pitch (0.79 x 0.79 in) <b>Pura Sensor version:</b> fits into user's ½" VCR configured port
<b>Overall Dimensions</b>	<b>Premium and OEM versions:</b> 120 x 35 x 150mm (wxdxh) (4.72 x 1.38 x 5.9 in) Pura Sensor version: 132 x ø35mm (5.2 x ø1.38 in)
<b>Weight</b>	Premium and OEM versions: 450 g (0.99 lb) Pura Sensor version: 180 g (0.4 lb)
<b>Packaging</b>	<b>Pura Premium:</b> Double bagged and sealed in UHP inert gas <b>Pura OEM and Pura Sensor:</b> Single bagged in 1000 gauge polythene <b>All options:</b> shipped individually in profiled sponge protection and carton Sensor version supplied with protective guard over sensor surface for transportation and handling
<b>Service Exchange</b>	Available on the Pura Sensor (SEN) ½" VCR connection

<b>Monitors</b>	<b>Advanced Online Monitor: PUR-AOL</b>	<b>Online Monitor: PUR-OL</b>
<b>Measurement Units</b>	°F, °Cdp; ppm <sub>v</sub> and ppb <sub>v</sub> with user selectable range and resolution	Simple display defined by 2-wire sensor input
<b>Secondary measurement variable</b>	Pressure via external transducer 0-30 MPa (300 variable barg/4351 psi). Completely user configurable for any industry standard transducer. Automatic compensation for ppm <sub>v</sub> and ppb <sub>v</sub>	ppm <sub>v</sub> , with no line pressure correction input available with PUR-TX-2W & PUR-IS-2W
<b>Power Supply</b>	Universal 85 to 265 V AC; 95 to 370 V DC	100 to 240 V AC (+10, -15%) 50/60 Hz
<b>Ingress Protection</b>	IP54 (NEMA 12); IP66 (NEMA 4X) for front panel only with optional cover	IP65 front panel (IP20 rear panel)
<b>Operating Temperature</b>	0 to +50°C (-4 to +122°F)	0 to +50°C (+32 to +122°F)
<b>Relays</b>	2 off 10 A/240 V c/o fully user configurable: can accommodate full range for selected engineering unit + sensor fault alarm functions	Alarm 1 relay: single pole make contact, rating 3 A @ 250 V AC Alarm 2 relay: changeover contacts, rating 5 A @ 250 V AC
<b>Display Resolution</b>	5 Digit	4 Digit
<b>Outputs:</b>	<b>Analog</b> 4-20 mA fully user configurable and scaleable for range  <b>Digital</b> RS232: provides 2-way communication – full data access to user and total availability of all set-up options	0-20 or 4-20 mA fully user configurable and scaleable for range  RS232: provides 2-way communication – full data access to user and total availability of all set-up options
<b>Options</b>		
<b>Power Supply</b>	18 to 36 V AC; 9 to 60 V DC	24 V DC
<b>Relays</b>	1 or 2 further 5 A relays (max 4 in total) n/o type fully user configurable: can accommodate full range + full unit choice + sensor fault alarm functions	1 further optional relay - refer to factory
<b>Outputs:</b>	<b>Analog</b> 0-10 V fully user configurable and scaleable for range RS485  <b>Digital</b>	0 to 10 V output using 500 Ω shunt resistant

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