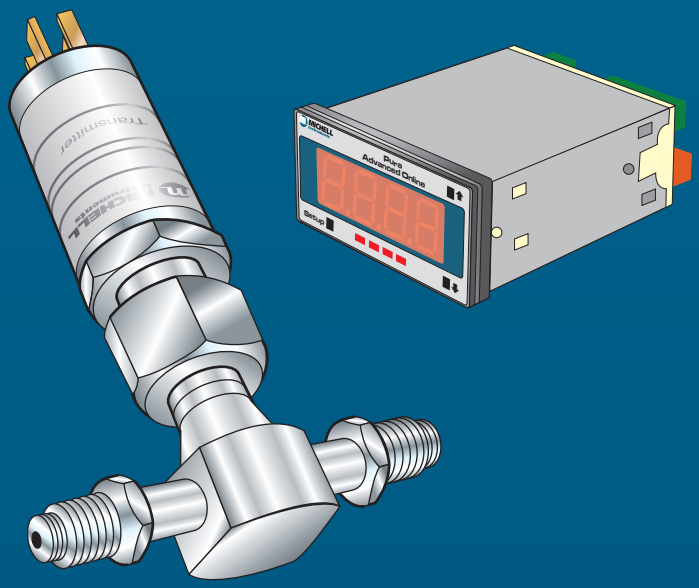
MICHELL Instruments

Pura
Advanced Online Hygrometer
User's Manual



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Please fill out the form(s) below for each instrument that has been purchased.

Use this information when contacting Michell Instruments for service purposes.

Instrument	
Code	
Serial Number	
Invoice Date	
Location of Instrument	
Tag No	

Instrument	
Code	
Serial Number	
Invoice Date	
Location of Instrument	
Tag No	

Instrument	
Code	
Serial Number	
Invoice Date	
Location of Instrument	
Tag No	

Pura Advanced Online Hygrometer

For Michell Instruments' contact information please go to
www.michell.com

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Safety

The manufacturer has designed this equipment to be safe when operated using the procedures detailed in this manual. The user must not use this equipment for any other purpose than that stated. Do not apply values greater than the maximum value stated.

This manual contains operating and safety instructions, which must be followed to ensure the safe operation and to maintain the equipment in a safe condition. The safety instructions are either warnings or cautions issued to protect the user and the equipment from injury or damage. Use competent personnel using good engineering practice for all procedures in this manual.

Electrical Safety

The instrument is designed to be completely safe when used with options and accessories supplied by the manufacturer for use with the instrument.

Pressure Safety

DO NOT permit pressures greater than the safe working pressure to be applied to the instrument. The specified safe working pressure is 24 MPa (240 barg / 3480 psig).

Toxic Materials

The use of hazardous materials in the construction of this instrument has been minimized. During normal operation it is not possible for the user to come into contact with any hazardous substance which might be employed in the construction of the instrument. Care should, however, be exercised during maintenance and the disposal of certain parts.

Repair and Maintenance

The instrument must be maintained either by the manufacturer or an accredited service agent. For contact information visit the website at www.michell.com

Calibration

Periodic re-calibration is recommended in order to maintain the highest quality of measurement in your application. Michell Instruments recommends that you have your Pura transmitter re-calibrated annually unless it is used in a mission-critical application or in a contaminated environment, in which case the calibration interval should be reduced accordingly.

Michell Instruments can offer a variety of re-calibration and exchange transmitter schemes to suit your specific needs. A local representative will be pleased to provide detailed, custom advice.

Safety Conformity

This product meets the essential protection requirements of the relevant EU directives. Further details of applied standards may be found in Appendix D.

Abbreviations

The following abbreviations are used in this manual:

barg	bar gauge
°C	degrees Celsius
°F	degrees Fahrenheit
dp	dew point
DC	direct current
µm	micro-meter
lbf-ft	pound foot
l/min	liters per minute
mA	milliampere
Mpa	megapascal
m/sec	meters per second
mW	milliwatts
nF	nano-Farad
Nm	Newton meter
ppm_v	parts per million by volume
RH	relative humidity
scfh	standard cubic feet per hour
scfs	standard cubic feet per second
V	volts
Ω	ohms

Warnings

The following general warning is applicable to this instrument. It is repeated in the text in the appropriate locations.

Where this hazard warning symbol appears in the following sections it is used to indicate areas where potentially hazardous operations need to be carried out.

Where this symbol appears in the following sections it is used to indicate areas of potential risk of electric shock.

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1 INTRODUCTION

The Pura Advanced Online dew-point hygrometer is an instrument designed for the continuous online measurement of moisture content in non-corrosive gases, over an operational range of -120 to -40°C (-184 to -40°F) dew point and equivalent units (see Technical Specifications, Appendix A).

The system comprises a programmable monitor configured to accept a unique Michell data string from the Pura transmitter. The zero and span of the monitor are set to cover the dew-point range -120 to -40°Cdp (-184 to -40°Fdp) at operating pressures up to 24 MPa (240 barg / 3480 psig).

Two alarm outputs are provided for connection to external systems which are user-configurable both in terms of setpoint and operating mode. Current output is standard and factory set at 4-20 mA (or optionally set at 0-20 mA or 0-10 V).

The monitor has a pressure input channel for any industry standard 2-wire pressure transmitter. In addition to providing a pressure measurement, the pressure signal can be used to provide real-time pressure compensation on the primary channel when displaying ppm values. The customer can also set a fixed pressure compensation value. The pressure input only affects the ppm_V or ppb_V units. For dew point, the displayed value is a pressure dew point.

1.1 Features

The Pura Advanced Online Hygrometer is simple to use and install, and can be configured to meet specific needs.

- ¼" male VCR process connections for PRM and OEM version

  ½" male VCR process connection for Pura SEN version
- Dew-point, ppm_V or ppb_V moisture content
- 4-wire connection - digital string signal
- Sensor block compliant with clean room standards
- Measurement range -120 to -40°C (-184 to -40°Fdp)
- Up to ±1°C dp accuracy
- Calibration certificate (NPL, NIST)

2 INSTALLATION

It is essential that the connection of electrical and gas supplies to this instrument be undertaken by competent personnel.

2.1 Unpacking the Instrument

2.1.1 Unpacking Pura Advanced Online Hygrometer

The Pura Advanced Hygrometer instrument and accessories are packed in a box and the method of unpacking is shown as follows:

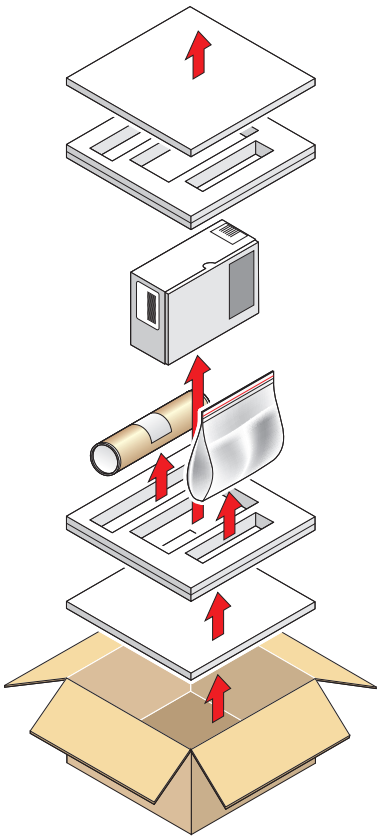


Figure 1 *Unpacking - Monitor and Pura SEN, no block version*

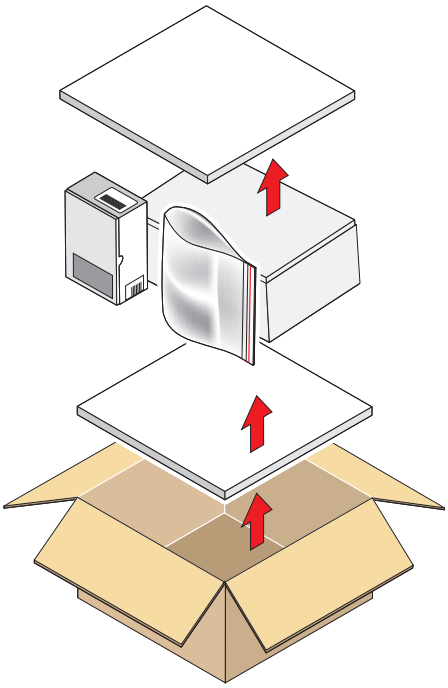


Figure 2 *Unpacking - Monitor and Pura OEM / PRM*

2.1.2 Unpacking Pura SEN (transmitter, no block version)

Unpack the dew-point transmitter box as follows:

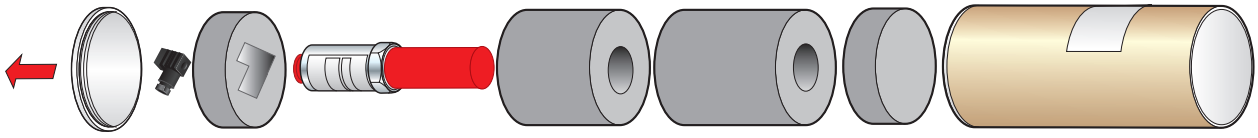


Figure 3 *Unpacking - Pura SEN - Transmitter, No Block*

NOTE: The transmitter sensing element is protected while in transit by a red cover containing a small desiccant capsule. The connection pins are protected by a red plastic cap. None of these plastic items are required for the operation of the transmitter.

NOTE: Keep the connector in a safe place until the transmitter is ready for wiring.

2.1.3 Unpacking Pura OEM-single bag, PRM-double bag versions

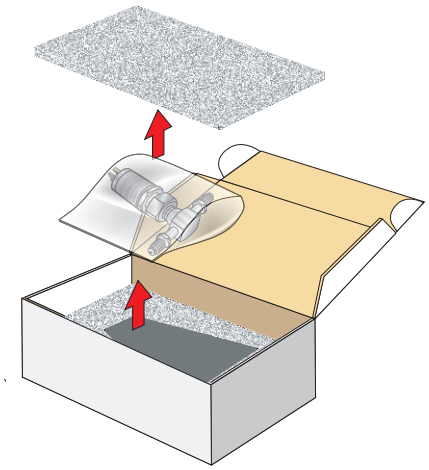


Figure 4 *Unpacking - Pura OEM & PRM - Single / Double Bag*

2.1.4 Unpacking Monitor

The monitor (2) is packed, together with its fixing clamps (1) as shown below.

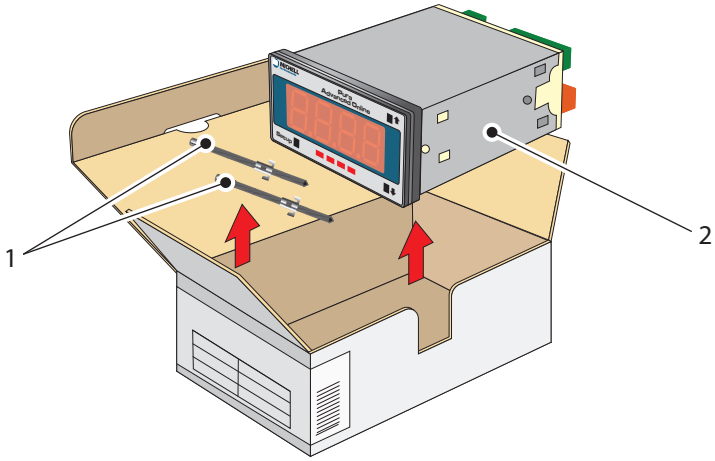


Figure 5 *Unpacking - Monitor*

2.1.5 Accessories Pack (Pura SEN, OEM, PRM)

The accessories pack is shown below:

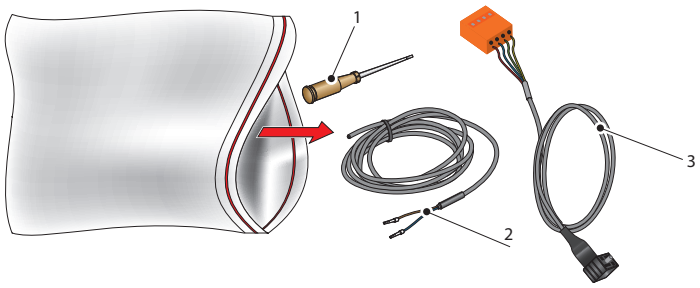


Figure 6 *Unpacking - Accessories Pack*

2.2 Pura Advanced Online Components

On delivery, please check that all the following standard components are present in the packing box. Report any shortages immediately.

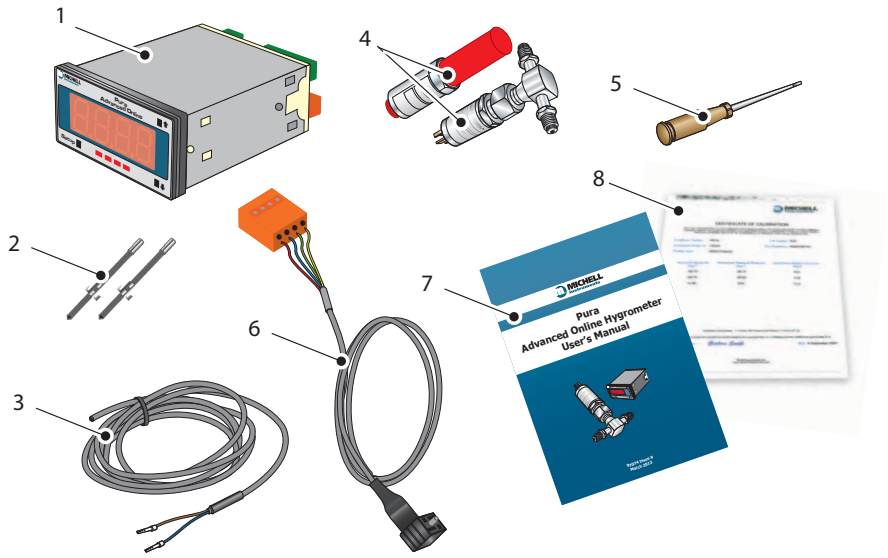


Figure 7 *Components*

1. PURA Monitor
2. Clamps
3. Sensor cable assembly
4. Pura Transmitter (SEN) OR

   Pura Transmitter (OEM) or (PRM)

   Leak test certificate included
5. Screwdriver
6. Power cable
7. User's manual
8. Calibration certificate

2.3 Pura SEN

NOTE: For environmental and operating conditions, refer to Appendix A, Technical Specifications.

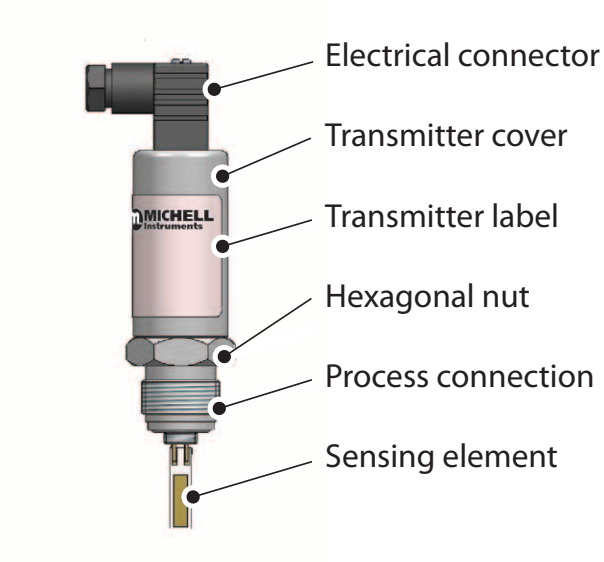
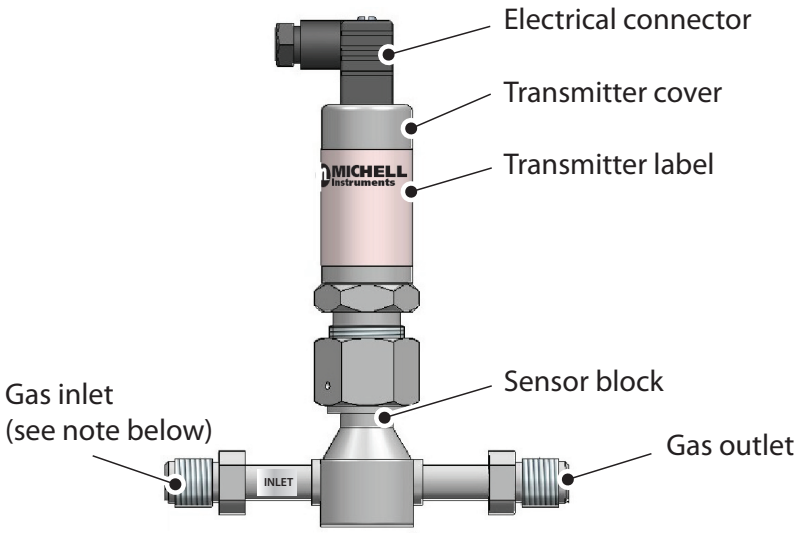


Figure 8 *Pura SEN*

2.4 Pura OEM, PRM

NOTE: For environmental and operating conditions, refer to Appendix A, Technical Specifications.

NOTE: OEM and PRM version transmitters are protected in transit by putting in a plastic bag filled with nitrogen. Pura OEM transmitter has single bag protection, Pura PRM transmitter has double bag protection.



NOTE: The Pura has a uni-directional connection and must be connected so the upstream flow is connected to the inlet port of the Pura block (marked with a silver label).

Figure 9 *Pura OEM, PRM*

2.5 Monitor

The instrument has a 5-digit display, set-up on delivery to display a dew-point temperature range of -120° to -40°Cdp (-40° to -184°Fdp).

Dew-point temperature units are displayed by the last LED located to the far right of the display. On delivery, °Cdp is set-up. If required, the units can be changed to °F. The method of configuring the unit for °F is described in Section 3.1.1.

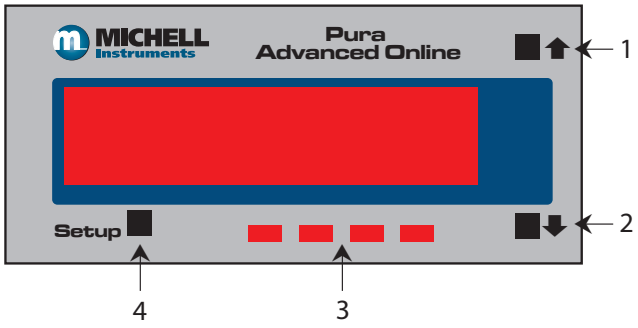
Optionally, the instrument can be set-up to read dew point in parts per million ppm_V or parts per billion ppb_V. This option requires the hygrometer to be set-up for ppm_V or ppb_V (see Section 3.1.1).

Four dew-point temperature alarm indications are provided by four LEDs located on the bottom of the display. These are marked SP1, SP2, SP3, SP4. Access to the alarm relay contacts is provided on the rear panel. The connection for these alarm relay contacts is shown in *Figure 18*. **NOTE: Every display is factory fitted with 2 alarm relays as standard.**

The operating temperature at which these alarm outputs operate is set-up as shown in Section 3.1.2.

2.6 Monitor Panel Layout

Figure 10 shows the layout of these controls and their respective operational functions.



1	Increases the value of the displayed parameter; moves through each displayed parameter
2	Increases the value of the displayed parameter; moves through each displayed parameter
3	LED annunciations for Setpoints 1 - 4
4	Saves programming settings, moves between programming steps

Figure 10 *Control Layout and Functions*

2.7 Transmitter Mounting

2.7.1 Direct Pipeline Connection

The transmitter may be directly mounted into a pipe or duct.

CAUTION: Do not mount the transmitter too close to the bottom of a bend where any condensate in the pipeline might collect and saturate the probe.

The pipe or duct will require a 1/2" VCR male process connection thread to match the transmitter body thread. For circular pipework, to ensure the integrity of a gas tight seal, a mounting flange will be required on the pipework in order to provide a flat surface to seal against.

Procedure

The following procedure must be carried out by competent personnel.

1. Ensure that the red protective cover has been removed from the tip of the transmitter.

WARNING: Under no circumstances should the filter guard be handled with the fingers.

2. After first checking that the pipeline has a wide enough bore to accept the transmitter's process connection screw the transmitter into the pipe. Tighten enough to obtain a gas tight seal. (Torque will depend upon the pipeline material.)

Michell Instruments recommends the use of Swagelok® retained gasket assemblies, containing silver plated, stainless steel 1/2" VCR gaskets, when connecting the Pura into a gas line.

NOTE: Do not overtighten or the thread on the pipework may be stripped.

2.7.2 Sensor Block Connection

The following procedure must be carried out by a qualified installation engineer.

To mount the transmitter into the sensor block (preferred method), proceed as follows, refer to *Figure 11.*

1. Remove the red protective cover (2) from the tip of the transmitter (1).
2. Fit the 1/2" VCR gasket (3) over the threaded part of the transmitter body.

WARNING: Under no circumstances should the filter guard be handled with the fingers.

3. Screw the transmitter (1) into the sensor block (4) and tighten the gas line nut 1/8 (one eighth) of a turn using a second spanner/ wrench. **NOTE: Use the flats of the hexagonal nut and not the sensor body.**
4. Fit the transmitter cable/connector assembly to the plug located on the base of the transmitter and tighten the fixing screw (see *Figure 14).*

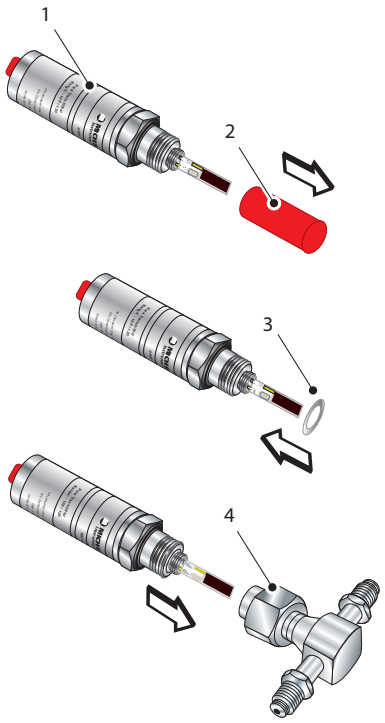


Figure 11 *Sensor Block Connection*

2.7.3 Pura OEM & PRM Connection

The Pura OEM and PRM have been assembled and packaged within a Class 100 clean-room environment. To maintain this level of cleanliness the packaging should only be breached within the same, or cleaner, environment.

Michell Instruments recommends the use of Swagelok® retained gasket assemblies, containing silver plated, stainless steel ¼" VCR gaskets, when connecting the Pura into a gas line. The distance between the inlet and outlet gas connection ports is set at a pitch of 120mm (4.7").

1. Install the sealing gasket onto the VCR connections on either the Pura or the connecting gas lines. Ensure that the Pura is offered into the gas line with reference to the gas flow direction and the inlet port, as indicated on the Pura body.
2. Tighten the female nut firmly, finger tight.
3. Hold the Pura transmitter stationary with a spanner/wrench and tighten the gas line nut 1/8 of a turn using a second spanner/wrench.
4. Repeat this operation on the remaining gas connection port.

CAUTION: Over tightening the nuts can cause irrecoverable damage to the seals and seatings.

2.8 Preparation of the Cable

The sensor cable is supplied as standard. Replacement of additional cables can be obtained by contacting your local distributor or Michell Instruments (see www.michell.com for details).

The cable is pre-wired so no user wiring is required. If the cable needs to be re-wired, see below:

Cable connection to the Pura transmitter is made via the removable connector. Removing the central screw enables the connector terminal block to be removed from the outer housing by using a small screwdriver to prise it clear.

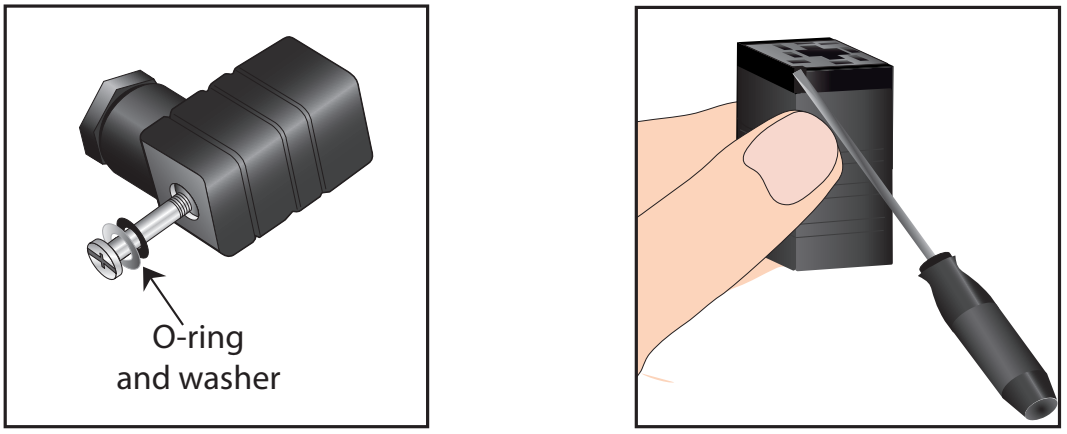


Figure 12 *Connector Terminal Block Removal*

Caution: When removing the central screw ensure that the small sealing O-ring and the washer are retained on the screw and are present during re-installation.

For the transmitter to work properly, and to achieve maximum performance, the sensor cable must be connected to the electrical connector as shown in the drawing below.

2.8.1 Wiring Connection Between the Transmitter and the Monitor

The diagram below shows the identity of the connector terminals.

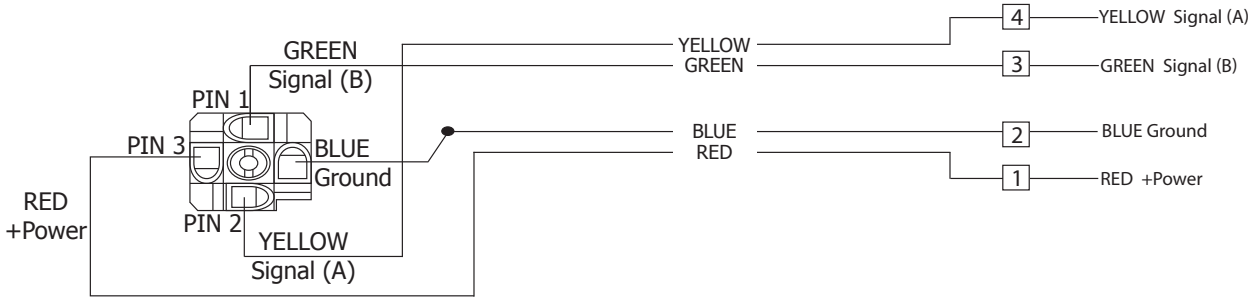


Figure 13 *Cable Connections*

The sensor cable connections are shown in the table below and in the figure above.

Connection	Red wire	Blue wire	Green wire	Yellow wire
Monitor	Pin 1	Pin 2	Pin 3	Pin 4
Transmitter	Pin 3	GND	Pin 1	Pin 2

Table 1 Cable Connections

When installing the connector, and to ensure that full ingress protection is achieved, the securing screw (with the O-ring and washer) must be tightened to a minimum torque setting of 3.4 Nm (2.5 ft-lbs). The sensor cable used must be a minimum diameter of 4.6mm (0.2").

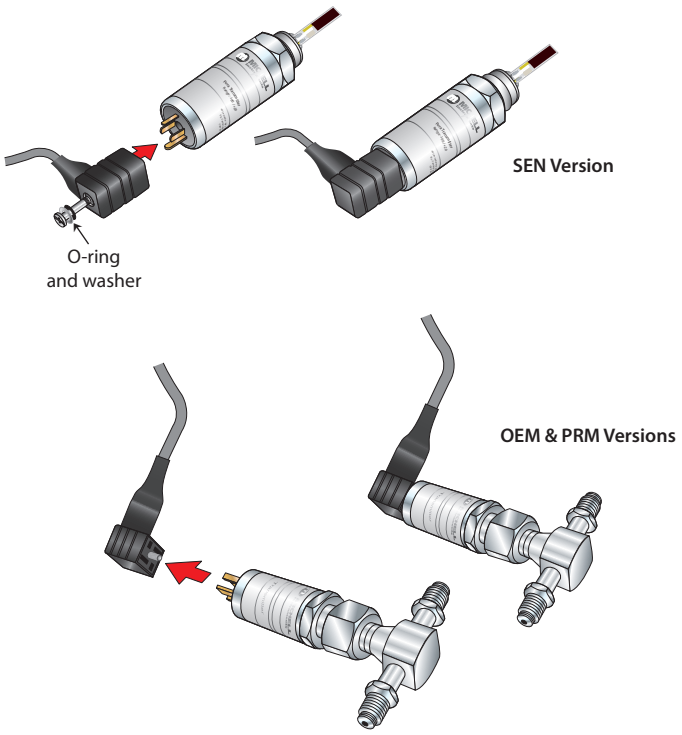


Figure 14 *Connector Installation*

2.9 Mounting the Monitor

The monitor is designed for panel mounting and requires a panel cut-out of 46 x 92mm (1.8 x 3.6"). The recommended panel thickness is 2 to 5mm (0.08 to 0.2").

To mount the unit, proceed as follows:

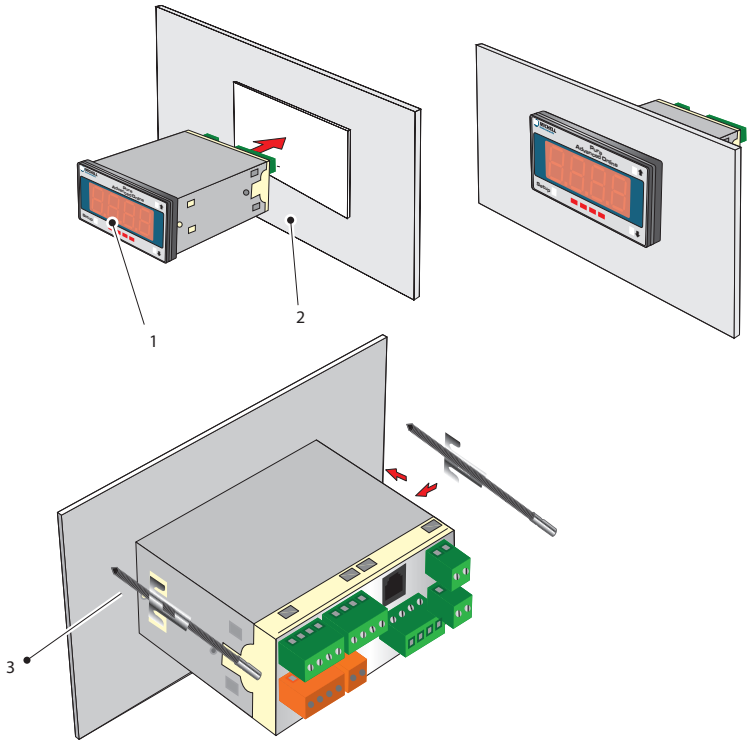


Figure 15 *Mounting the Monitor*

1. Pass the monitor (1) through the front of the panel (2).
2. Support the monitor and attach mounting fixing brackets onto the side of the monitor.
3. Tighten the fixing screw (3) finger tight, against the back of the panel.
4. Ensure that the monitor is sitting flush to the front of the panel (2) and tighten the fixing screws evenly against the back of the panel.

Caution: Do not overtighten the screws as this could cause the case to crack.

2.10 Electrical Connections

The power supply voltage is indicated on the connection detail label located on the monitor. As the monitor is provided for continuous operation it does not have an ON/OFF switch.

The power supply to the monitor may be one of the following, dependant on the type ordered.

2.10.1 High Voltage Power Supply Input

For high voltage powered display

- 85 to 265 V AC 50/60 Hz and 95 to 370 V DC

It is essential that the connection of electrical supplies to this instrument be undertaken by competent personnel.

Connect the power supply to the monitor (1) as shown in *Figure 16.*

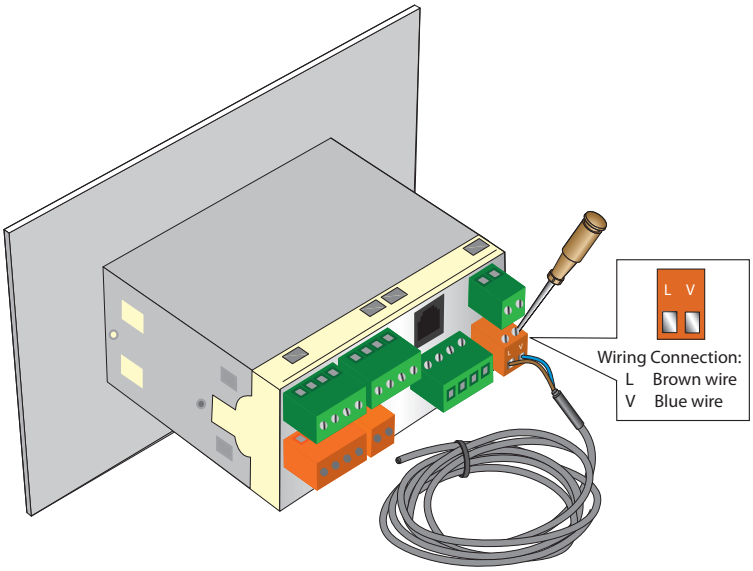


Figure 16 *High Voltage Power Supply Connections*

2.10.2 Low Voltage Power Supply Input (Optional)

For low voltage powered display

- 18 to 36 V AC and 9 to 60 V DC

Connect the power supply to the monitor (1) as shown in *Figure 17.*

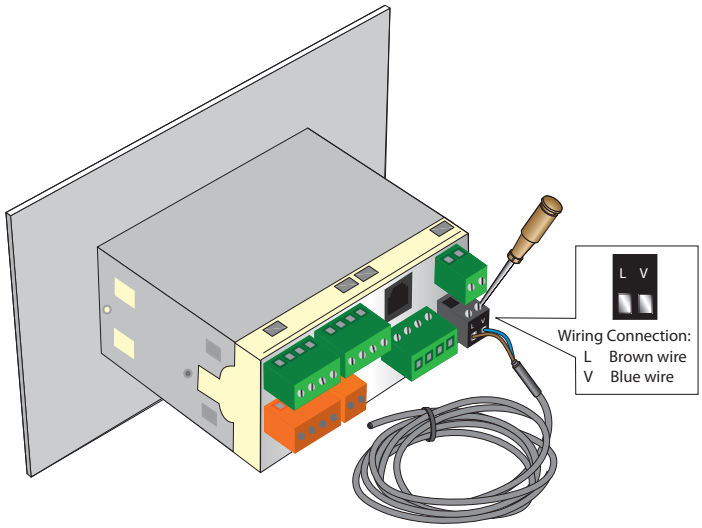


Figure 17 *Low Voltage Power Supply Connections*

2.11 Pressure Transducer Connection (Optional)

The monitor provides excitation voltage (24 V DC @ 20 mA) for an auxiliary 2-wire transmitter used in the dual channel configuration. Connect (+) of the pressure transmitter to pin 6 of the monitor and (-) of the pressure transmitter to pin 5 of the monitor. Refer to *Figure 18* for details.

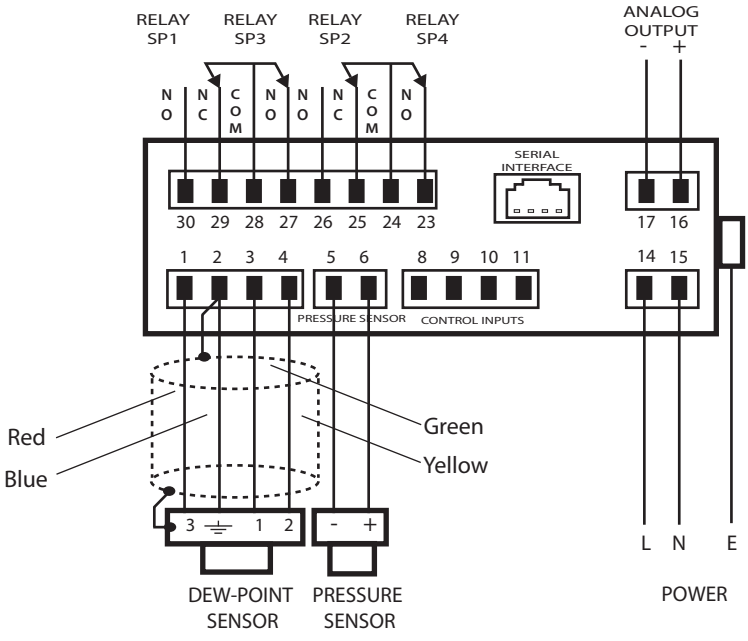


Figure 18 *Electrical Connection Detail*

2.12 Transmitter Connections

Connect the transmitter cable to the monitor as shown below.

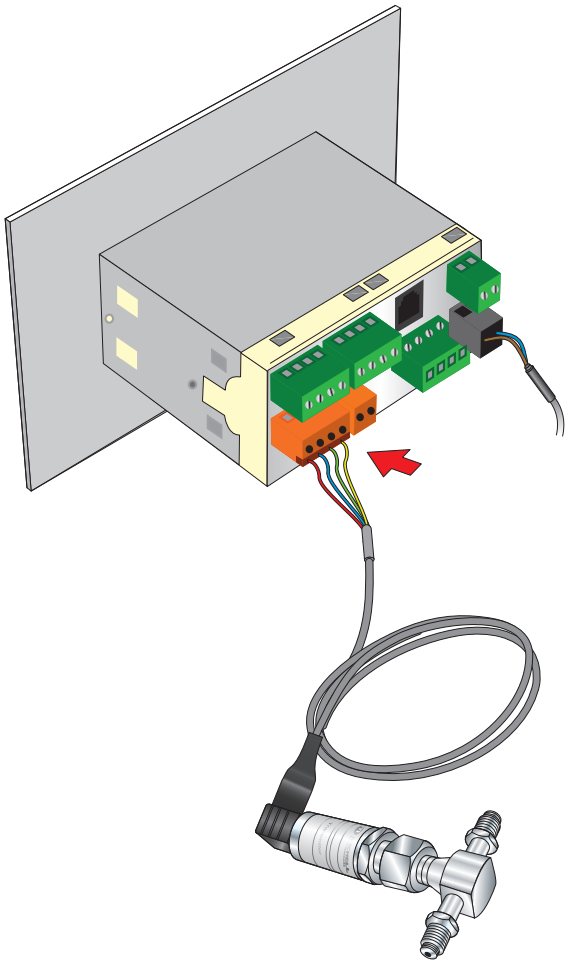


Figure 19 *Transmitter Connections*

2.13 Transmitter Installation

The effective operation of the Pura Transmitter, in a flowing gas environment, relies on the transmitter being installed directly into the gas stream or by having a fully representative gas sample directed over the sensor measurement surface. Where possible, avoid installing the transmitter in a 'dead' or unswept volume.

3 OPERATION

When the instrument is first powered-up the display may show a zero value for about 1 second, followed by a flashing OPEN **for approximately 5 seconds, before showing a dew-point value.**

This is normal and does not indicate a problem with the instrument.

There are two levels of operation:

User (No access to programming codes)	Advanced (Access to programming codes)
Changing display brightness	Advanced setpoint programming
Monitoring setpoint values	Analog output calibration and scaling
	Auxiliary (optional) channel set-up
	Setting the engineering units
	Transmitter connection fault relay set-up
	Other related advanced functions

Table 2 Operation Access Levels

3.1 Set-Up Security Feature

To prevent unauthorized access, the monitor has two DIP-switches that can be accessed by removal of the faceplate (refer to *Figure 20)*.

The **ON** position protects that mode, **OFF** makes alterations possible.

- The **SETPOINT LOCKOUT** switch (**SW1**) enables or disables Setpoint Programming mode.
- The **PROGRAM LOCKOUT** switch (**SW2**) enables or disables Code Programming mode.

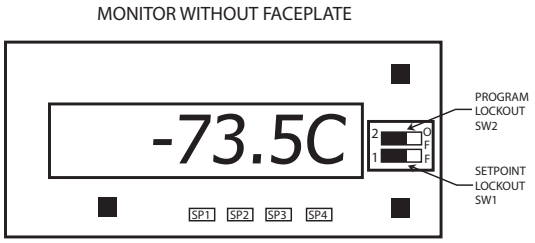


Figure 20 *Location of the Lockout switches*

3.1.1 Selecting the Engineering Units

1. Enter the **PROGRAM UNLOCK** mode (Section 3.1).
2. While pressing **SETUP**, press ⬆ once. Release both buttons and keep pressing **SETUP** until **CODE 7** is displayed.

The monitor can display dew point in °C (C),°F (F), or ppb_V / ppm_V (P). The selection of these units is achieved by setting **CODE 4** and **CODE 7** as shown below.

To set the range and resolution for ppb_V and ppm_V , set digit 3 of **CODE 7** to:-

Required Display Unit	CODE 4	CODE 7	Range
Dew point in °C	207	000	
Dew point in °F	217	000	
ppm_V	-	100	1 - 9999 ppm_V
ppm_V	-	101	0.1 - 999.9 ppm_V
ppm_V	-	102	0.01 - 99.99 ppm_V
ppm_V	-	103	0.001 - 9.999 ppm_V
ppb_V		104	0.01 - 99.99 ppb_V

Table 3 Engineering Unit Selection

For example: setting **CODE 7** to 104, displays ppb_V with a resolution of 0.01 to a maximum of 99.99. Should the measured value exceed 100 ppb_V with this setting, **oVEr** will be displayed.

3.1.2 Changing the Setpoint Values

Before amending the setpoint values, make sure that the monitor is in the **SETPOINT UNLOCK** mode (see Section 3.1).

Press **SETUP** and ⬇ simultaneously to gain access to the setpoint codes.

The setpoints of the relays are set by setting **SP_n** (where n = 1 to 4 and represent SP1 to 4), to the required level. The units of the setpoints, change according to the source of the setpoints, i.e. if the indicator is displaying ppm_V, then the setpoints are set in ppm_V.

For the relays to be energized above the setpoint **SPC_n = 0xx**

For the relays to be energized below the setpoint **SPC_n = 1xx**

The source of relay setpoints are set by setting digit 2 of **SPC_n,** i.e. **xnx** as shown below:

0 Displayed value (DEFAULT)
1 Dew Point only
2 Pressure
3 Open transmitter connection
4 Open / short circuit transmitter
5 Open / short circuit thermistor
6 All transmitter faults

For example; if you wish the relay to trip at a certain dew-point value whilst the indicator is displaying ppm_v, then **SPC_n = x1x.**

The secondary relay function is set by digit 3 of **SPC_n** i.e. **xxn** as shown below:

0 No function (DEFAULT)
1 Relay latched
2 De-energize relay
3 No function
4 Relay OFF for open transmitter connection
5 Relay ON for open transmitter connection
6 Relay toggles at 1 Hz for transmitter fault
7 Setup for hysteresis, delay type and make \ break delay times

For example, if you wish the relay to trip above the setpoint using the displayed value, but to remain latched, then **SPC_n = 001**. It will then remain latched until the supply to the indicator is removed or **SPC_n = 002**.

The function of the relay annunciators is set by digit 1 of **CODE 1** i.e. **nxx**. As shown below:

0 LED annunciators always OFF
1 LED annunciators ON when relays are de-energized
2 LED annunciators ON when relays are energized (DEFAULT)

3.1.3 Hysteresis, Make/Break Delay & Delay Type

Associated with each setpoint is a Hysteresis Value, Make delay time, Break delay time and a Delay type. To gain access to these parameters, set **SPC_n** = xx7, and scroll to the features by pressing the ⬆ or ⬇ buttons.

The hysteresis value is the value above and below the nominal setpoint at which the relay trips.

The Make delay time is the time delay between the setpoint being reached and the relay energizing. The Break delay time is the time delay between the relay being energized and it de-energizing. The maximum make and break delay time is 9 hours, 6 minutes, 6 seconds, in increments of 1 second.

The setpoint can have four different Delay types:

- **NorM** (normal)
- **rEPt** (repeat)
- **1Shot**
- **PuLSE**

If Delay = **NorM**	The relay will function normally with the inclusion of the time delays
If Delay = **rEPt**	The make and break delays will repeat continually until the setpoint source returns to a level that deactivates the setpoint
If Delay = **1Shot**	The relay will energize after the entered delay period and remain energized
If Delay = **PuLSE**	The relay will energize, de-energize after the period entered and thereafter will remain de-energized

3.1.4 Analog Output Scaling

1. Enter the **PROGRAM UNLOCK** mode (see Section 3.1).
2. Press **SETUP,** followed by the ⬆ button, then **SETUP** again.
3. Press the ⬆ or ⬇ buttons to scroll through to the **CAL** menu. The analog output can be scaled by setting **CAL** to 061 and setting the zero value to the required output at 4 mA (or 0 V) and the full scale value to the output required at 20 mA (or 10 V).
4. To exit the **CAL** menu press **SETUP**, set **CAL** to 000 and use the ⬆ button to scroll through the menus.

See Appendix B - Setup Codes for more information on output scaling options.

3.1.5 Display Brightness Adjustment

1. To adjust the display brightness press the **SETUP** and ⬆ buttons simultaneously.
2. The display toggles between [**bri**] and [**5**], where 5 is the default setting.
3. Adjust the display brightness required (from 0 to 7) by pressing the ⬆ or ⬇ buttons.
4. Press **SETUP** seven times to exit the programming mode.

3.2 Pressure Compensation

Enter the **PROGRAM UNLOCK** mode (see Section 3.1).

The monitor has the ability to measure pressure in order to provide a pressure compensated value for ppm_V.

3.3 Using a Pressure Transducer

In order to enable the use of a pressure transducer set **CODE 4** to 307 (dual channel mode), and while pressing **SETUP**, press ⬆ once. Release both buttons and keep pressing **SETUP** until **CODE 4** is displayed.

- To display dew point whilst measuring pressure, set **CODE 4** to 307 to show dew point in °C; or 317 for dew point in °F.
- To display pressure in psig set **CODE 6** to 000; or to display pressure in barg set **CODE 6** to 100.

3.3.1 Manual Pressure Input Calibration

The pressure input channel must be configured to the range of the pressure transducer. This is achieved by setting **CAL** to 012 and entering values for offset **OFF_2** and scale **SCA_2**.

SCA_2 = 0.0062 per 100 psig
OFF_2 = pressure range – ((20,000 x (pressure range\1000))\16)

For example, for a pressure transducer with a range of 0 to 1000 psig:

SCA_2 = 0.0062 x 10 = 0.0620
OFF_2 = 1000 – ((20,000 x (1000\1000))\16) = -250

If you are using a pressure transducer in barg, convert the value to psig using a multiplier of 14.5. For example, for a pressure transducer with a range of 0 to 100 barg:

SCA_2 = 0.0062 x 14.5 = 0.0899
OFF_2 = 1450 – ((20,000 x (1450\1000))\16 = -362

To exit the **CAL** menu, set **CAL** to 000 and press the **SETUP** button six times to return to the main screen.

3.3.2 Automatic Pressure Input Calibration

Alternatively, the pressure input can be calibrated using a 4 - 20 mA source.

1. Connect the current source between pin 2 (-ve) and pin 5 (+ve).
2. Set **CAL** to 022 and press **SETUP**. The monitor will then display **ZEro** and flash **0**.
3. Set the mA source to 4.0 mA and press **SETUP** to set 0 at 4 mA.
4. Press **SETUP** and the monitor will display **SPAn** and flash the full scale pressure value.
5. Set the mA source to 20.0 mA and use the ⬆ or ⬇ buttons to set the required pressure range.
6. Press **SETUP** to set the required pressure for 20.0 mA.
7. Set **CAL** to 000 and press the ⬆ button to leave the menu.

3.4 Using a Fixed Pressure Input in Single Channel Mode

In order to display pressure compensated values of ppm_V and ppb_V without the use of a pressure transducer, enter the pressure value manually.

1. Enter the **PROGRAM UNLOCK** mode (see Section 3.1).
2. Press **SETUP** and the ⬆ button to scroll through the menus and select **CODE 7.**
3. Select the required pressure compensated value, i.e. **CODE 7** = 10X for ppm_V / ppb_V and **CAL** = 052 (see Table 3).
4. Exit the menus (see Section 3.1) and exit the **PROGRAM UNLOCK** mode.
5. Press **SETUP** for two seconds. The display will show the set pressure. To change the pressure, use the ⬆ or ⬇ buttons and then press **SETUP** to confirm.

4 MAINTENANCE

Routine maintenance of the Pura Transmitter is confined to regular re-calibration. This work can only be done by exposure of the Pura Transmitter to sample gases of known moisture content. Calibration services traceable to the National Physical Laboratory (UK) and the National Institute of Standards and Technology (USA) are provided by Michell Instruments.

In most applications, annual re-calibration ensures that the stated accuracy of the Pura Transmitter is maintained.

Pura transmitters are fully interchangeable and interchangeability is not affected by cable length; therefore, this method of maintaining calibration can be used for all Pura transmitter installations.

For applications where it is not required for continuous operation, re-calibration of the Pura Transmitter can be achieved through our Service Exchange scheme.

- Remove the old Pura Transmitter, by unscrewing the hexagonal nut (A/F=27mm) on the ½" VCR-male process connection, and lifting it out carefully without damaging the sensor tile.
- Remove and discard the ½" nonretained VCR seal from the sensor block.

For installation instructions please refer to Section 2.7.2.

4.1 Fault Conditions

Display	Cause	Action
OPEN	Transmitter failure	Check power supply to transmitter. Check sensor cable for continuity/ damage. Rectify/replace cable
	Instrument failure	Refer to Michell or local representative for repair
FAIL	Transmitter failure	Replace transmitter
0.0	Gas is wetter than -40°C (-40°F) dew point	Check gas source supply
	Transmitter contaminated	Replace/re-calibrate transmitter

Appendix A

Technical Specifications

Appendix A Technical Specifications

Monitor	
Display	5 digit LED
Measurement Ranges	-120 to -40°C (-184 to -40°F) dew point 0 to 9999 ppm_V, 0 to 99.99 ppb_V
Pressure Input Channel	4-20 mA input scaleable to any engineering units
Electronic Accuracy	Dew point ±0.5°C, ±1.0°F ppm_V ±1% of reading secondary channel ±0.5% FS
Outputs	4-20 mA as standard or 0-20 mA optional (max load 500 Ω) or 0 to 10 V optional (min load 5 K Ω), scaleable by user
Alarm Relays	**Standard**: Two relays SP1 and SP2, fully user-programmable Form C contacts rated 10 A, 240 V AC or 8 A 24 V DC Non-inductive load **Optional**: Extra relays, SP3 and SP4, fully user programmable Form A contacts rated 5 A, 240 V AC or 5 A, 30 V DC Non-inductive load
Operating Environment	0 to +50°C (+32 to +122°F), 0 to 90% RH
Power Supply	**Standard**: 82 to 265 V AC, 50/60 Hz or 95 to 370 V DC **Optional**: 18 to 36 V AC or 9 to 60 V DC
Power Consumption	Max 10 W
Power Connection	2m (6.6ft), 3 wire
Weight	0.6kg (1.3lbs)
Sensor Cable	Copper braid screened cable; 4 core 7/0.2 (0.22mm²), stranded, tinned copper conductors, PVC, insulated, Melinex taped, black PVC outer. Standard 2m (6.6') length (max length 1000m (3280ft))
Environmental Protection	IP54 / NEMA 12 Optional protection cover to IP66 / NEMA 4
Transmitter	
Type	Michell Ceramic Transmitter
Calibration Range	-100 to -40°C (-148 to -40°F) dew point
Measurement Range	-120 to -40°C (-184 to -40°F) dew point
Power Supply	12 to 28 V DC (25 mA max)
Dew-point Accuracy	±1.0°C from -40 to -60 ±2.0°C from -61 to -100 ±4.0°C estimated from -101 to -120
Gas Temperature	-40 to +60°C (-40 to +140°F)
Operating Environment	-20 to +50°C (-4 to +122°F)
Storage Temperature	-40 to +75°C (-40 to +167°F)
Gas Wetted Surfaces	316 cold drawn stainless steel, 0.1 - 0.2 Ra µm
Gas Connection Ports	Pura SEN- 1/2" VCR female process connection Pura OEM & PRM 2 x 1/4" VCR male process connection
Installation Profile	Pura PRM & Pura OEM: 120mm between inlet and outlet sealing face

Temperature Coefficients	Temperature compensated		
Operating Pressure	10-9 torr to 24 MPa (240 barg / 3480 psig)		
Flow Rate	1 to 5 l/min		
Traceable Certification	-90 to +82°C dew point traceable to the National Physical Laboratory -75 to +20°C dew point traceable to NIST (USA) (For dew points < -90°C: Direct reference to a fundamental chilled mirror dewpointmeter)		
Environmental Protection	IP65		
Weight	Pura PRM & OEM - 450g (15.8oz)		
Fault Conditions	**Condition**	**Output**	
	Transmitter fault	FAIL	Factory Programmed
	Over range dew point	0.0	

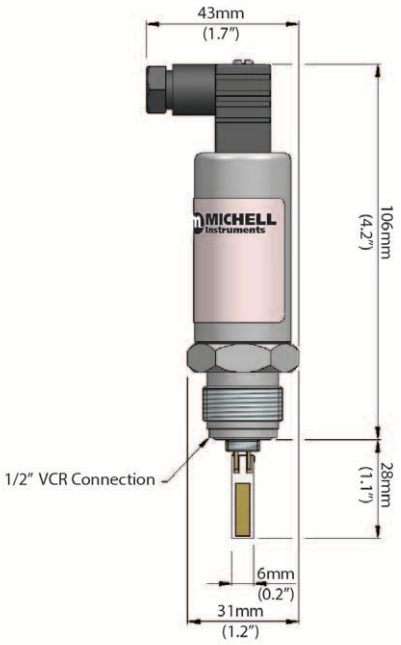


Figure 21 *Pura SEN*

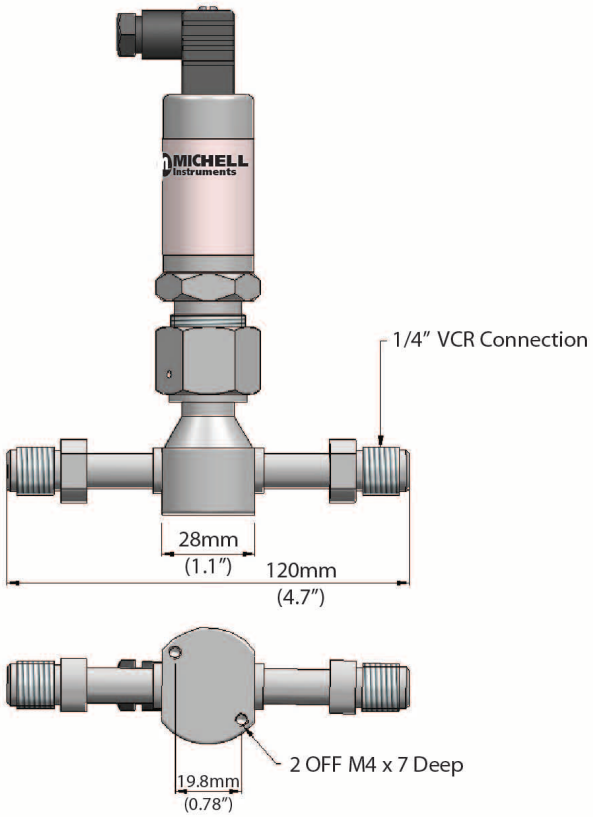


Figure 22 *Pura PRM & OEM*

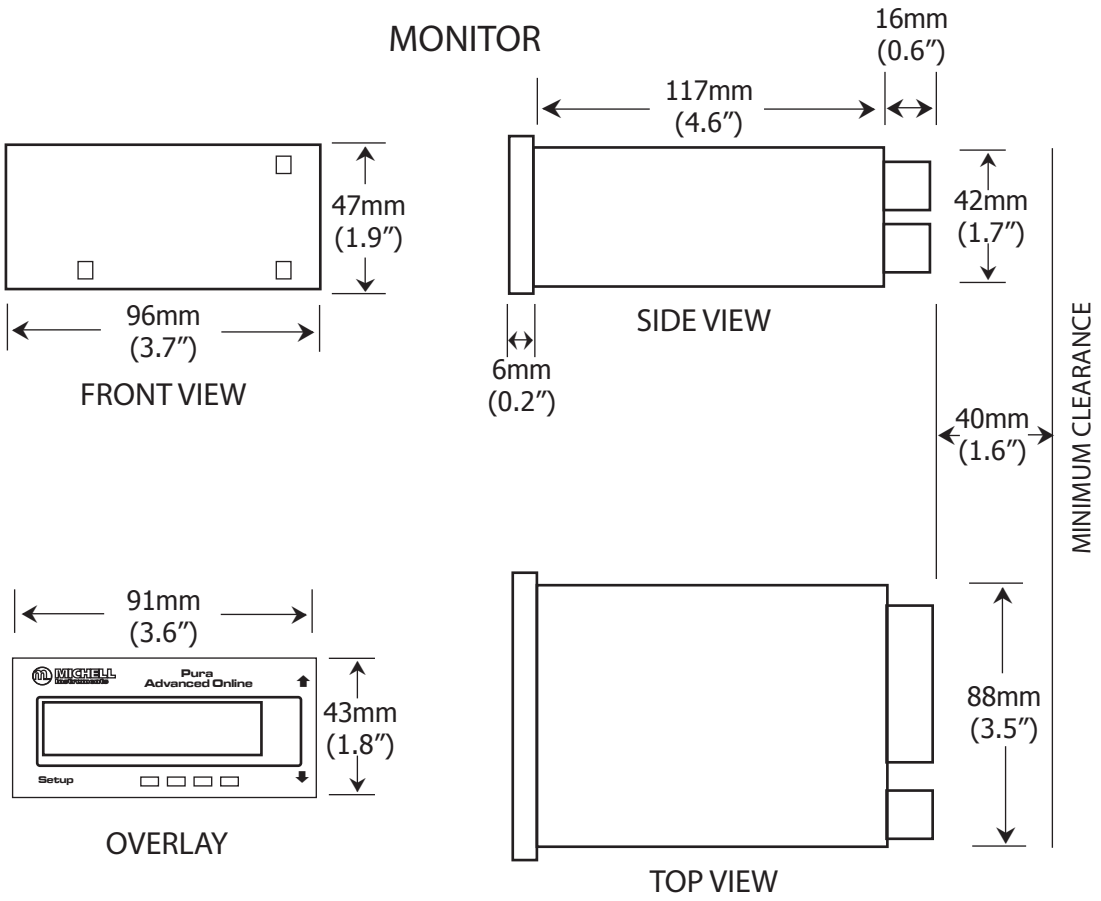


Figure 23 *Monitor Dimensions*

Appendix B

Setup Codes

Appendix B Setup Codes

CAL **Calibration modes for input and output**
DEFAULT VALUE = 052

Digit	1st digit (left most) Calibration Mode	2nd digit Calibration Function	3rd digit Object for Calibration
0	Calibration functions as per 2nd and 3rd digit	No function	No function
1	Set baud rate, parity and serial address	Manual calibration (channel as per 3rd digit)	Processed result (dew point, ppm_V and ppb_V)
2	N/A	N/A	Pressure input
3	N/A	N/A	N/A
4	N/A	N/A	N/A
5	N/A	Manual adjust	N/A
6	N/A	Analog output scaling (analog channel as per 3rd digit)	N/A

CODE 1 **Tendency Indication, Additional LED's, Display data source, Flashing, Decimal points, Rounding**
DEFAULT VALUE = 200

Digit	1st digit (left most) Additional LED's	2nd digit Display Data Source	3rd digit 0 only (No Function)
0	LED annunciators are always off	Processed data - result (dew point, ppm_V, ppb_V)	N/A
1	LED annunciators are on when relays are de-energized	Processed data - channel 1 (dew point only)	N/A
2	LED annunciators are on when relays are energized	Processed data - pressure	N/A

CODE 3 **Serial mode and Analog output source**
DEFAULT VALUE = 000

Digit	1st digit (left most) Serial Mode	2nd digit Analog Output 1 Source	3rd digit 0 only (No Function)
0	ASCII mode	Analog output 1 from processed result data (dew point, ppm_V, ppb_V)	N/A
1	N/A	Analog output 1 from processed data (dew point only)	N/A
2	N/A	Analog output 1 from processed data (pressure)	N/A

CODE 4 Channel 1 Measurement task, Sampling rate
DEFAULT VALUE = 207

Digit	1st digit (left most) Analog Sample Rate	2nd digit Analog Output 1 Source	3rd digit 0 only (No Function)
0	N/A	Dew point in degrees C	N/A
1	N/A	Dew point in degrees F	N/A
2	Single channel (50 Hz)	N/A	N/A
3	Dual channel (50 Hz)	N/A	N/A

CODE 6 Channel 2 Measurement task
DEFAULT VALUE = 000

Digit	1st digit (left most) Measurement Task	2nd digit 0 only (No Function)	3rd digit 0 only (No Function)
0	Pressure in psig	N/A	N/A
1	Pressure in barg	N/A	N/A

CODE 7 Result processing
DEFAULT VALUE = 000

Digit	1st digit (left most) Measurement Task	2nd digit Calibration Function	3rd digit Range for Result
0	Dew point	N/A	1 – 9999
1	ppm_V	N/A	1 – 999.9
2	N/A	N/A	0.01 – 99.99
3	N/A	N/A	0.001 – 9.999
4	ppb_V		0.01 – 99.99

Setpoint control 1 – 6 Relay latching, relay setup, source
DEFAULT VALUE = 000 (Prog/Down menu after setpoints)

Digit	1st digit (left most) Relay Sense	2nd digit Setpoint Source	3rd digit Setpoint Function SP1 – SP4
0	Relay energized above setpoint value	Processed result data (dew point, ppm_V, ppb_V)	No function
1	Relay energized below setpoint value	Dew point only	Relay latched
2	N/A	Pressure	De-energized relay
3	N/A	Open transmitter connection	N/A
4	N/A	Open / short circuit transmitter	Relay off for open transmitter connection
5	N/A	Open / short circuit thermistor	Relay on for open transmitter connection
6	N/A	All transmitter faults	Relay toggles at 1 Hz for transmitter connection fault
7	N/A	N/A	Set-up hysteresis, make/ break delay and delay type

Appendix C

EC Declaration of Conformity

Appendix C EC Declaration of Conformity

We, Michell Instruments Limited
48 Lancaster Way Business Park
Ely, Cambridgeshire
CB6 3NW. UK.

declare under our sole responsibility that the product

PURA Premium, PURA OEM and PURA Transmitter

to which this declaration relates is in conformity with the following standards or other normative document(s)

EN61326-1:2006	**Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 1: General requirements.**

following the provisions of

2004/108/EC	**EMC Directive**

Andrew M.V. Stokes, Technical Director

Date of Issue: 20 July 2009

Appendix D

Quality, Recycling & Warranty Information

Appendix D Quality, Recycling & Warranty Information

D.1 Recycling Policy

Michell Instruments is concerned with the protection of the environment. It is our commitment to reduce and eliminate from our operations, wherever possible, the use of substances which may be harmful to the environment. Similarly, we are increasingly using recyclable and/or recycled material in our business and products wherever it is practical to do so.

To protect natural resources and to promote material reuse, please separate batteries from other types of waste and recycle responsibly. If batteries are not properly disposed of, these substances can cause harm to human health and the environment.

The product that you have purchased may contain recyclable and/or recycled parts and we will be happy to provide you with information on these components if required.

D.2 WEEE And RoHS Compliance

The Waste Electronic and Electrical Equipment (WEEE) Directive, and the Restriction of Hazardous Substances (RoHS) Directive place rules upon European manufacturers of electrical and electronic equipment. The directives' aim is to reduce the impact that electronic devices have on the environment.

Michell products are currently exempt from the RoHS directive, however all future products will be developed entirely using compliant materials. Furthermore, Michell is taking active steps to remove non-compliant materials and components from existing products wherever possible.

Michell is in full compliance with the WEEE Directive (Registration No. WEE/JB0235YW). Customers may be required to return certain instruments for treatment at the end of their working life.

June 2010

D.3 Manufacturing Quality

Michell Instruments Ltd is registered with the British Standards Institute for Quality Assurance to:

BS EN ISO 9001: 2008

Rigorous procedures are performed at every stage of production to ensure that the materials of construction, manufacturing, calibration and final test procedures meet the requirements laid down by our BSI approved Quality System.

Please contact Michell Instruments (www.michell.com) if the product does not arrive in perfect working order.

D.4 Calibration Facilities

Michell Instruments' calibration facilities are among the most sophisticated in the world and have been recognized for their excellence.

Traceability to the National Physical Laboratory (NPL) UK is achieved through our UKAS Accreditation (Number 0179). This covers dew point over the range -90 to +90°C (-130 to +194°F) and also Relative Humidity.

Dew-point calibrations are also traceable to the National Institute for Standards & Technology (NIST) USA over the range -75 to +20°C (-103 to +68°F).

NOTE: Standard traceable calibration certificates for instruments and transmitters are not issued under our UKAS accreditation. UKAS certificates are usually to special order and are clearly identified.

D.5 Return Policy

If a Michell Instruments' product malfunctions within the warranty period, the following procedure must be completed:

1. Notify a Michell Instruments' distributor, giving full details of the problem, the model variant and the serial number of the product.
2. If the nature of the problem indicates the need for factory service then the instrument should be returned to Michell Instruments, carriage prepaid, preferably in the original packaging, with a full description of the fault and the customer contact information.
3. Upon receipt, Michell Instruments will evaluate the product to determine the cause of the malfunction. Then, one of the following courses of action will be taken:
    - If the fault is covered under the terms of the warranty, the instrument will be repaired at no cost to the owner and returned.
    - If Michell Instruments determines that the fault is not covered under the terms of the warranty, or if the warranty has expired, an estimate for the cost of the repairs, at standard rates, will be provided. Upon receipt of the owner's approval to proceed, the product will be repaired and returned.

D.6 Warranty

Unless otherwise agreed, the Supplier warrants that as from the date of delivery for a period of 12 months the goods and all their component parts, where applicable, are free from any defects in design, workmanship, construction or materials.

The Supplier warrants that the services undertaken shall be performed using reasonable skill and care, and of a quality conforming to generally accepted industry standards and practices.

Except as expressly stated all warranties whether express or implied, by operation of law or otherwise, are hereby excluded in relation to the goods and services to be provided by the Supplier.

All warranty services are provided on a return to base basis. Any transportation costs for the return of a warranty claim shall reside with the Customer.

Appendix E

Return Document & Decontamination Declaration

Appendix E Return Document & Decontamination Declaration

Decontamination Certificate

IMPORTANT NOTE: Please complete this form prior to this instrument, or any components, leaving your site and being returned to us, or, where applicable, prior to any work being carried out by a Michell engineer at your site.

Instrument			Serial Number	
Warranty Repair?	YES	NO	Original PO #	
Company Name			Contact Name	
Address				
Telephone #			E-mail address	
Reason for Return /Description of Fault:				
Has this equipment been exposed (internally or externally) to any of the following? Please circle (YES/NO) as applicable and provide details below				
Biohazards	YES	NO		
Biological agents	YES	NO		
Hazardous chemicals	YES	NO		
Radioactive substances	YES	NO		
Other hazards	YES	NO		
Please provide details of any hazardous materials used with this equipment as indicated above (use continuation sheet if necessary)				
Your method of cleaning/decontamination				
Has the equipment been cleaned and decontaminated?	YES	NOT NECESSARY		
Michell Instruments will not accept instruments that have been exposed to toxins, radio-activity or bio-hazardous materials. For most applications involving solvents, acidic, basic, flammable or toxic gases a simple purge with dry gas (dew point <-30°C) over 24 hours should be sufficient to decontaminate the unit prior to return. **Work will not be carried out on any unit that does not have a completed decontamination declaration.**				
Decontamination Declaration				
I declare that the information above is true and complete to the best of my knowledge, and it is safe for Michell personnel to service or repair the returned instrument.				
Name (Print)		Position		
Signature		Date		

MICHELL Instruments

F0121, Issue 2, December 2011

http://www.michell.com