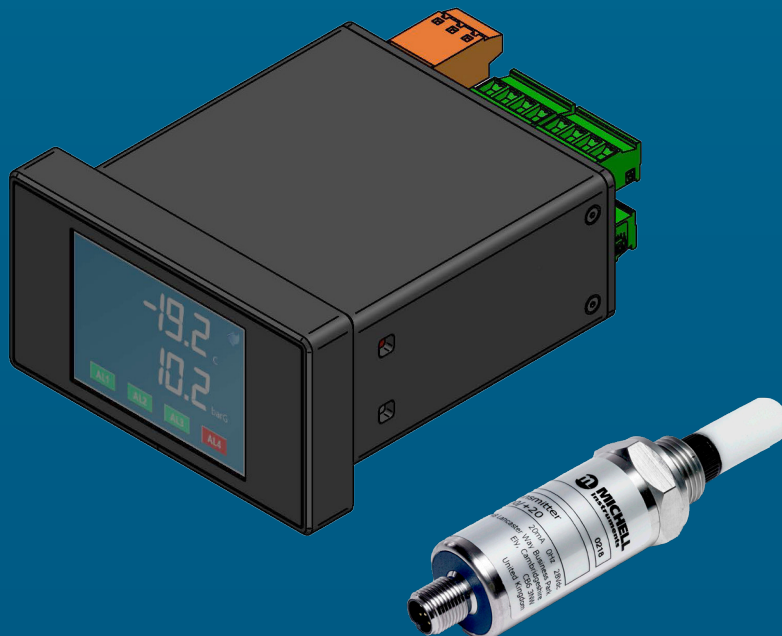


Easidew Advanced Online Hygrometer User Manual



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

Use this information when contacting Michell Instruments for service purposes.

Product Name	
Order Code	
Serial Number	
Invoice Date	
Installation Location	
Tag Number	

Product Name	
Order Code	
Serial Number	
Invoice Date	
Installation Location	
Tag Number	

Product Name	
Order Code	
Serial Number	
Invoice Date	
Installation Location	
Tag Number	



Easidew Advanced Online Hygrometer

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

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Contents

Safety	vi
Electrical Safety	vii
Pressure Safety	vii
Hazardous Materials (WEEE, RoHS & REACH)	vii
Repair and Maintenance	vii
Calibration	vii
Safety Conformity	vii
Abbreviations	viii
1 INTRODUCTION	1
1.1 Features	1
2 INSTALLATION	2
2.1 Unpacking the Instrument	2
2.2 Easidew Advanced Online Components	3
2.3 Process Monitor Display	4
2.3.1 Process Monitor Display Layout	4
2.3.1.1 Process Monitor Display Resolution	4
2.3.2 Electrical Connections	5
2.3.2.1 High-Voltage Power Supply Input	5
2.3.2.2 Low-Voltage Power Supply Input (Alternative)	6
2.3.2.3 Dew-Point Sensor Modbus RTU over RS485 Digital Input (Required)	7
2.3.2.4 Pressure Sensor Input (Optional)	7
2.3.2.5 Analog Outputs	7
2.3.2.6 Modbus RTU Output	7
2.3.2.7 Relay Outputs	8
2.3.2.8 Transmitter Connections	8
2.4 Mounting the Process Monitor	8
2.5 Easidew Transmitter	9
2.5.1 Easidew M12 Connector Version	9
2.5.1.1 Electrical Connections	10
2.5.1.2 Easidew M12 Cables	11
2.5.2 Cable Selection for Self-Assembled Cables	11
2.6 Transmitter Mounting	12
2.6.1 5/8" 18 UNF Version	12
2.6.2 3/4" - 16 UNF Version	12
2.6.3 G1/2" BSPP Version	12
2.6.4 Transmitter Mounting – Sample Block	13
2.6.5 Transmitter Mounting – Direct Pipeline Connection	14
2.6.6 Transmitter Mounting – With Additional Process Connection Adapter	15
2.7 Mounting the Sample Block and Transmitter	16
2.7.1 Sample Block Gas Connections	16
3 OPERATION	18
3.1 Process Monitor Configuration	18
3.2 Front Panel Configuration Menu Access	18
3.3 Configuration Menu Explained	20
3.4 Setting Up the Process Monitor Configuration	21
3.4.1 Alarms Configuration	21
3.4.2 Analog Outputs Configuration	24
3.4.3 Display Configuration	26
3.4.4 Input Configuration	27
3.4.5 Pressure Configuration	29
3.4.6 About Menu	30

4	MAINTENANCE	31
4.1	Maintenance and Calibration	31
4.2	Fault Conditions	31
5	MEASUREMENT GUIDE	32
5.1	Sampling Considerations	32
5.2	Sampling Hints	35

Figures

Figure 1	Easidew Advanced Online Components	3
Figure 2	Monitor Display in Normal Operation	4
Figure 3	Electrical Wiring Schematic	5
Figure 4	Easidew Transmitter	9
Figure 5	Sensor Connector Installation	10
Figure 6	Transmitter Mounting – Sensor Block	13
Figure 7	Transmitter Mounting – Pipe or Duct	14
Figure 8	Transmitter Mounting with Adapter	15
Figure 9	Sample Block Gas Connections	16
Figure 10	Electrical Wiring Schematic	21
Figure 11	Alarm Configuration Screen Explained	21
Figure 12	Analog Outputs Configuration Screen Explained	24
Figure 13	Display Configuration Screen Explained	26
Figure 14	Input Configuration Screen Explained	27
Figure 15	Installation Location	33
Figure 16	Installation Location	33
Figure 17	Material Permeability Comparison	35
Figure 18	Dead volume	36

Appendices

Appendix A	Technical Specifications	39
Appendix B	Process Monitor Register Map	43
Appendix C	Quality, Recycling & Warranty Information	53
Appendix D	Return Document & Decontamination Declaration	55

Safety

The instrument is designed to be completely safe when installed and operated correctly in accordance with the information provided in this manual.

This manual contains all the required information to install, operate and maintain this product. Prior to installation and use of this product, this entire manual should be read and understood. Installation and operation of this product should be carried out by suitably competent personnel only. The installation and operation of this product must be in accordance with the instructions provided and according to the terms of any associated safety certificates. Incorrect installation and use of this product other than those described in this manual and other than its intended purpose will render all warranties void.

This product meets the essential protection requirements of the relevant EU & UK directives. Further details of applied directives may be found in the product specification.

Electricity and pressurized gas can be dangerous. This product must be installed and operated only by suitable trained personnel.



No user serviceable parts inside



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 and where particular attention to personal and personnel safety must be observed.



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

This product is intended for use only under the following conditions:

- a. indoor use
- b. altitude up to 2 000 m
- c. temperature 5 °C...40 °C
- d. maximum relative humidity 80 % for temperatures up to 31 °C decreasing linearly to 50 %, relative humidity at 40 °C
- e. MAINS supply voltage fluctuations up to ± 10 % of the nominal voltage
- f. TRANSIENT OVERVOLTAGES up to the levels of OVERVOLTAGE CATEGORY II
- g. TEMPORARY OVERVOLTAGES occurring on the MAINS supply
- h. applicable POLLUTION DEGREE 2 of the intended environment

Electrical Safety

Ensure electrical safety is complied with by following the directions provided here and observing all local operation & installation requirements at the intended location of use.

This product is completely safe when using any options and accessories supplied by the manufacturer of this product for use with it. Refer to Section 2 (Installation) of this manual for further details.

Pressure Safety

For this product to operate satisfactorily, pressurized gas must be connected to it. Observe all the information contained within this manual and all local operation & installation requirements at the intended location of use. Refer to Section 2 (Installation) of this manual for further details.

Hazardous Materials (WEEE, RoHS & REACH)

This product does not contain or release any prohibited chemicals listed on the SVHC (Substances of Very High Concern) Candidate List. During the intended normal operation of this product it is not possible for the user to come into contact with any hazardous materials. This product is designed to be recyclable except where indicated.

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.ProcessSensing.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 Easidew M12 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 & UK directives. Further details of applied standards may be found in Appendix C.

Abbreviations

The following abbreviations are used in this manual:

AC	alternating current
atm	pressure unit (atmosphere)
barg	pressure unit (=100 kP or 0.987 atm)
°C	degrees Celsius
°F	degrees Fahrenheit
DC	direct current
dp	dew point
ft	foot (feet)
g	gram(s)
Hz	Hertz
"	inch(es)
lb	pound
l/min	liters per minute
m	meter(s)
µm	micro-meter
mA	milliampere
max	maximum
min	minute(s)
MPa	megapascal (Pascals x10 ⁶)
NI/min	normal liters per minute
Nm	Newton meter
ppm _v	parts per million (by volume)
rh	relative humidity
scfh	standard cubic feet per hour
V	Volts
Ω	Ohms

1 INTRODUCTION

The Easidew Advanced Online Hygrometer is easy to install and configure; this versatile touch screen hygrometer can measure and display dew point and moisture content and indicate pressure. This display provides analog, digital and 4 programmable relay alarm outputs with front screen or software app display configuration.

It has been developed as a premium-performance hygrometer system for use in a wide variety of applications.

It can display data in °C or °F dew point, ppm_v, lb/mm³scf or g/m³, from -110 up to +20 °C (-166 up to +68 °F), at pressures up to 525 bar (7614 psi).

To calculate moisture content from dew point, it is necessary to know the system pressure. This hygrometer can either compensate for pressure change by using a live pressure sensor input, or accept a fixed pressure input value.

1.1 Features

The Easidew Advanced Online Hygrometer offers customers the following features:

- Measurement range -110...+20 °C (-166...+68 °F) dew point
- Dew point or moisture content output
- Accuracy ±1 °C (±1.8 °F) dew point
- Pressure indication and compensation
- Touch screen display configuration
- 3 x 4...20 mA output and 4 relay outputs
- Modbus RTU over RS485 output
- Choice of AC or DC Power Supply
- Sample block and cable included
- Traceable 13-point calibration certificate

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

The Easidew instruments and accessories are packed into one box which should be unpacked carefully. Save all the packing materials for the purpose of returning the instrument for recalibration or any warranty claims.

When unpacking the Easidew M12 Dew-Point Transmitter from its individual packaging, take care not to handle the sensor guard.

The Process Monitor is packed in a cardboard box, together with its fixing clamps.

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

NOTE: Packaging specifications are subject to continuous improvement, as we reduce our use of plastics and move to cardboard packing systems.

2.2 Easidew Advanced Online Components

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

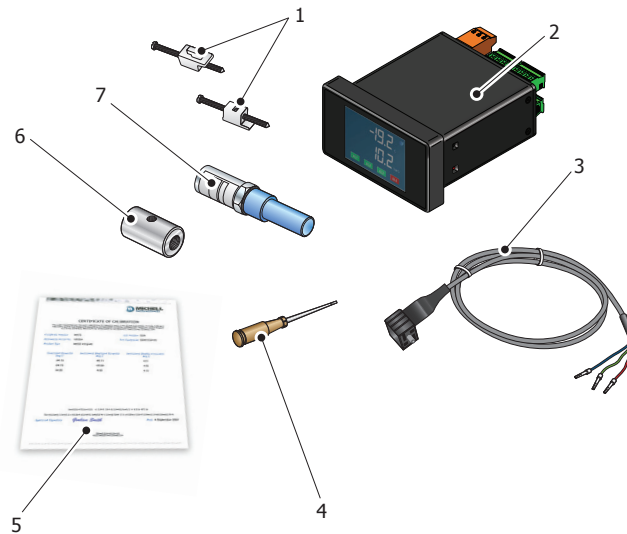


Figure 1 *Easidew Advanced Online Components*

1. Monitor clamps (2 off)
2. Easidew Advanced Online Hygrometer
3. Transmitter cable assembly
4. Screwdriver
5. Calibration certificate
6. Sample block
7. Easidew M12 Transmitter

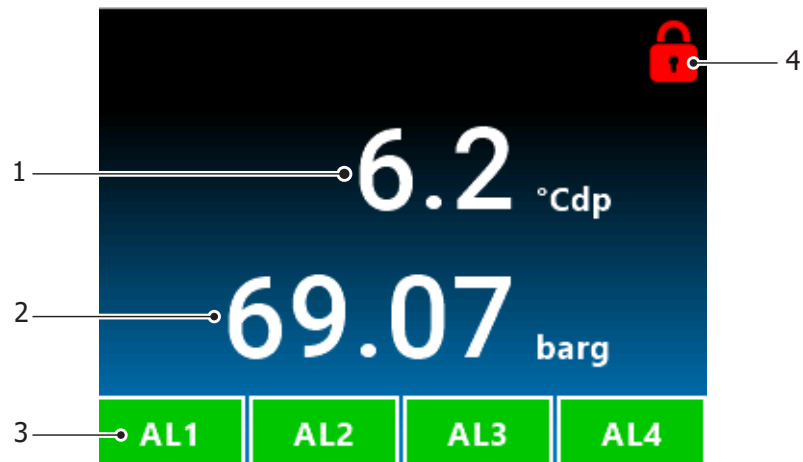
2.3 Process Monitor Display

The display within the Process Monitor is an LCD 320 x 240 pixel software driven, touch screen color display.

2.3.1 Process Monitor Display Layout

In normal operation, the display screen will appear as below.

The display shows a moisture or pressure value, the status of four alarms and a display locked/unlocked symbol, which is all explained in detail in *Figure 2* below.



1	Dew Point or Moisture Content value referenced to its configured scale
2	Pressure Indication value or ppm _v referenced to its configured pressure scale
3	Alarm Status of the 4 relay outputs
4	Security code protected Unlock button to access the configuration menu

Figure 2 Monitor Display in Normal Operation

2.3.1.1 Process Monitor Display Resolution

Display Resolution	Decimal Places
-110...+20 °C dew point	1
1,000...10,000 ppm _v	1
100...1,000 ppm _v	2
Below 100 ppm _v	3
Llbmmscf	2
mgm ³	2

2.3.2 Electrical Connections

Electrical connections to the Easidew Online system are as follows:

- AC power supply input, 85...265 V AC (7.8 VA)
- Alternative low-voltage DC input is also available: 18...30 V DC (170 mA @24 V DC)
- Dew-Point Sensor Modbus RTU over RS485 digital input (24 V DC loop power provided by monitor)
- Pressure Sensor 2-wire 4...20 mA current loop (24 V DC loop power provided by monitor) input (optional)
- Modbus RTU over RS485 digital communications interface
- 3 x programmable 4...20 mA analog outputs for assigning to dew point, moisture content and pressure parameters
- 2 x Form A, 2 x Form C Namur compliant programmable relay outputs for process and fault conditions

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

The power supply to the Process Monitor may be one of the following, dependent on the type ordered.

NOTE: Connect 0 V to local or remote Earth depending upon installation.

2.3.2.1 High-Voltage Power Supply Input

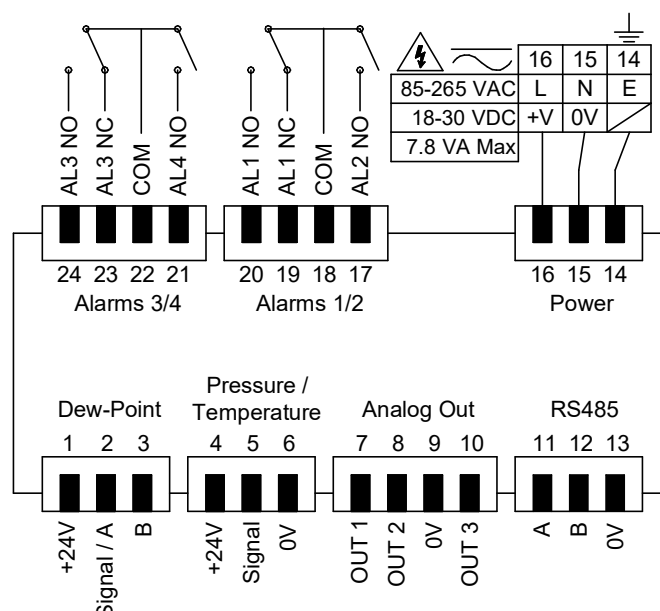


Figure 3 Electrical Wiring Schematic

For high-voltage powered display

- 85...265 V AC 50/60 Hz



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

Connect the power supply to the monitor as shown in *Figure 3* above.

PIN 14 – Earth
PIN 15 – Neutral
PIN 16 – Live

2.3.2.2 Low-Voltage Power Supply Input (Alternative)

For low-voltage DC powered display

- 18...30 V DC

Connect the power supply to the DC version Process Monitor as shown in *Figure 3* above.

PIN 15 – 0V DC
PIN 16 – 18...30 V DC

2.3.2.3 Dew-Point Sensor Modbus RTU over RS485 Digital Input (Required)

For AC or DC voltage powered display version

Connect the Dew-Point Sensor to the Process Monitor as shown in *Figure 3*.

PIN 1 – +24 V DC Power
PIN 2 – RS485 A digital comms
PIN 3 – RS485 B digital comms
PIN 6 – 0 V DC Power

2.3.2.4 Pressure Sensor Input (Optional)

For AC or DC voltage powered display version

Connect the Pressure Sensor to the monitor as shown in *Figure 3*.

PIN 4 – +24 V DC Power
PIN 5 – 4...20 mA signal return
PIN 6 – 0 V DC Power

2.3.2.5 Analog Outputs

For AC or DC voltage powered display version

PIN 7 – 4...20 mA Current Source Output 1
PIN 8 – 4...20 mA Current Source Output 2
PIN 9 – Common
PIN 10 – 4...20 mA Current Source Output 3

2.3.2.6 Modbus RTU Output

For AC or DC voltage powered display versions

PIN 11 – RS485A digital comms
PIN 12 – RS485B digital comms
PIN 13 – 0 V DC Power

2.3.2.7 Relay Outputs

For AC or DC voltage powered display versions, the relay outputs are as shown in *Figure 3*.

Alarms 1/2

PIN 17 – AL2 normally open

PIN 18 – Common

PIN 19 – AL1 normally closed

PIN 20 – AL1 normally open

Alarms 3/4

PIN 21 – AL4 normally open

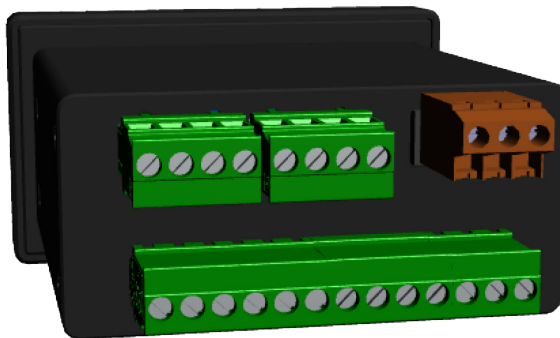
PIN 22 – Common

PIN 23 – AL3 normally closed

PIN 24 – AL3 normally open

2.3.2.8 Transmitter Connections

Connect the Easidew M12 dew-point sensor as shown in the table in *Figure 3*.



2.4 Mounting the Process Monitor

The Process Monitor is designed for panel mounting and requires a panel cut-out of 44 x 92 mm (1.73 x 3.62"). The recommended panel thickness is 2...5 mm (0.08...0.2").

To mount the unit, proceed as follows:

1. Pass the Process Monitor through the front of the panel.
2. Support the Process Monitor and attach mounting fixing brackets onto the side of the monitor.
3. Tighten the fixing screw finger tight, against the back of the panel. Recommended maximum torque is 30 cNm using a 1.5 mm Allen key.
4. Ensure the Process Monitor is sitting flush to the front of the panel 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.

2.5 Easidew Transmitter

NOTE: The transmitter's sensing element is shown for illustration purposes only. Please keep the guard fitted at all times, if possible.

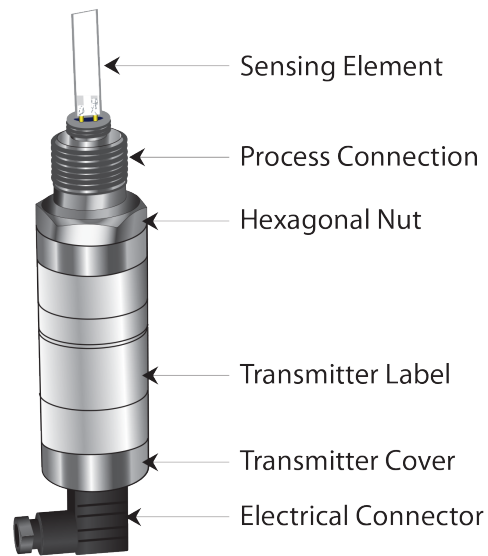


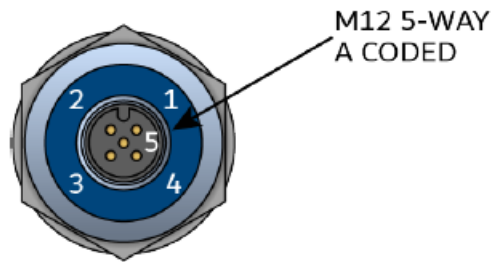
Figure 4 *Easidew Transmitter*

2.5.1 Easidew M12 Connector Version

The following sections apply to the M12 connector version of the transmitter shown below.



2.5.1.1 Electrical Connections



Sensor Connector Pin	Michell Standard Conductor Color	Function	Process Monitor Connection Pin No.
1	Brown	Modbus A	2
2	White	Modbus B	3
3	Blue	4...20 mA Signal Return (Power Supply -ve) (not used – see note)	6
4	Black	Power Supply +ve	1
M12 connector sensor housing	Grey	Ground, Cable Screen Connection This wire directly connects to the metal casing of the transmitter, but not to the transmitter electronics, and is intended for cable screening only.	Selected ground connection point

Figure 5 Sensor Connector Installation

NOTE: The sensor cable is supplied as standard. Replacement pre-wired cables can be obtained by contacting your local Michell Instruments representative or assembled by the user according to instructions in the following section.

NOTE: The sensor transmits its output to the Process Monitor via the RS485 Modbus RTU Communications signal on Pins 1 and 2.

2.5.1.2 Easidew M12 Cables

The cable connector should be installed by aligning the locating pin on the transmitter with the slot on the cable. The connector can then be pushed into place and rotated until finger tight.

Cables with moulded M12 connectors are available from Michell Instruments in the following lengths:

- 2 m
- 5 m
- 10 m

The other end of the sensor cable is unterminated, for straightforward connection into the Process Monitor.

If longer cable runs are required, off-the-shelf 5-pin M12 cables can be connected between the Easidew M12 Transmitter and the Process Monitor.

2.5.2 Cable Selection for Self-Assembled Cables

It is recommended to use 4-core screened cable. For short runs, a cable with individual conductor sizes of 24 AWG / 0.21mm² would be a typical choice.

2.6 Transmitter Mounting

2.6.1 5/8" 18 UNF Version

1. Remove the protective cover and desiccant capsule from the transmitter and retain for future use
2. Prevent any contamination of the sensor before installation by handling the transmitter by the main body only, avoiding contact with the sensor guard.
3. Pass the bonded seal over the 5/8"- 18 UNF mounting thread.
4. Screw the transmitter into the sampling location or sample block by hand using the wrench flats only. **DO NOT grip and twist the sensor cover when installing the sensor.**
5. When installed, fully tighten using a wrench to a torque setting of 30.5 Nm (22.5 ft-lbs)

2.6.2 3/4" - 16 UNF Version

1. Remove the protective cover and desiccant capsule from the transmitter and retain for future use.
2. Prevent any contamination of the sensor before installation by handling the transmitter by the main body only, avoiding contact with the sensor guard.
3. Ensure that the O-ring is seated in the recess at the top of the transmitter body.
4. Screw the transmitter into the sampling location or sample block by hand using the wrench flats only. **DO NOT grip and twist the sensor cover when installing the sensor.**
5. When installed, fully tighten using a wrench to a torque setting of 40 Nm (29.5 ft-lbs).

2.6.3 G1/2" BSPP Version

1. Remove the protective cover and desiccant capsule from the transmitter and retain for future use
2. Prevent any contamination of the sensor before installation by handling the transmitter by the main body only, avoiding contact with the sensor guard.
3. Pass the bonded seal over the G1/2" mounting thread.
4. Screw the transmitter into the sampling location or sample block by hand using the wrench flats only. **DO NOT grip and twist the sensor cover when installing the sensor.**
5. When installed, fully tighten using a wrench to a torque setting of 30.5 Nm (22.5 ft-lbs)

2.6.4 Transmitter Mounting – Sample Block



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, referring to *Figure 6*.

1. Ensure that the protective cover (2), and its desiccant capsule (2a), have been removed from the tip of the transmitter.
2. Fit the bonded seal (4) over the threaded part of the transmitter body.



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

3. Screw the transmitter (1) into the sample block (3) and tighten to the recommended torque setting. **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 Section 2.5).

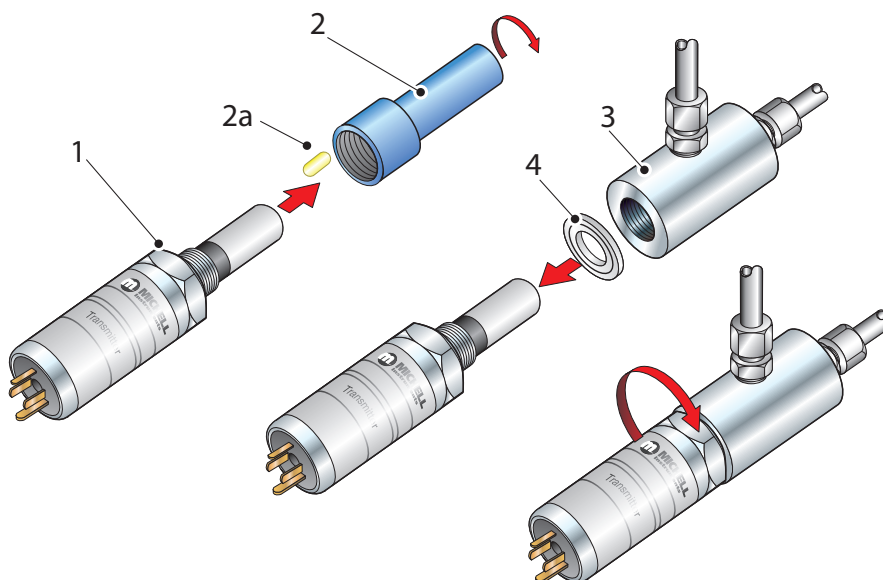


Figure 6 Transmitter Mounting – Sensor Block

2.6.5 Transmitter Mounting – Direct Pipeline Connection

The transmitter may be directly mounted into a pipe or duct, as shown in *Figure 7*.



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 thread to match the transmitter body thread. Fixing dimensions are shown in *Figure 7*. 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.



The following procedure must be carried out by competent personnel.

1. Ensure that the blue protective cover (and its desiccant capsule) has been removed from the tip of the transmitter.



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

2. Fit a bonded seal (2) over the threaded part of the transmitter body.
3. Screw the transmitter (3) into the pipe (1). Tighten enough to obtain a gas tight seal. (Torque will depend upon the pipeline material.) **NOTE: Do not overtighten or the thread on the pipework may be stripped.**

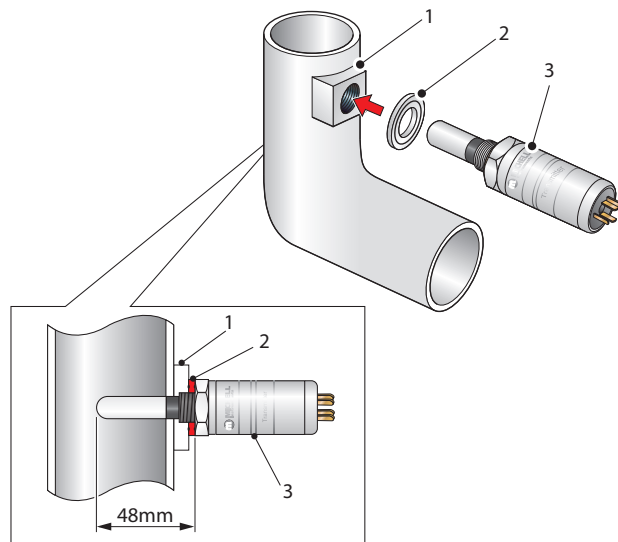


Figure 7 Transmitter Mounting – Pipe or Duct

2.6.6 Transmitter Mounting – With Additional Process Connection Adapter



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

To mount the adapter into the transmitter, proceed as follows (see *Figure 8*):

1. Ensure that the protective cover (2), and its desiccant capsule (2a), have been removed from the tip of the transmitter.
2. Fit the bonded seal (3) over the threaded part of the transmitter body.
3. Screw the adapter (4) onto the threaded part of the transmitter and tighten to torque settings recommended in Sections 2.6.1...2.6.3. **NOTE: Use the flats of the hexagonal nut and not the sensor body.**



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

4. Screw the transmitter (1) with its seal (3) and adapter (4) into the sample block (see Section 2.6.4) or pipeline (see Section 2.6.5) and fully tighten using a wrench until the seal is fully compressed and to the following torque settings:

G 1/2" BSP 56 Nm (41.3 ft-lbs)

3/4" - 16 UNF 40 Nm (29.5 ft-lbs)

1/2" NPT Use a suitable sealant e.g. PTFE tape using the correct taping procedures

NOTE: Use the flats of the hexagonal nut and not the sensor body.

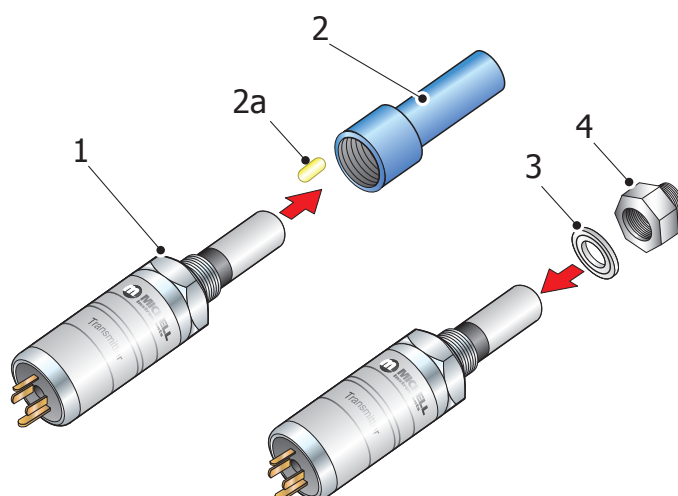


Figure 8 *Transmitter Mounting with Adapter*

2.7 Mounting the Sample Block and Transmitter

2.7.1 Sample Block Gas Connections

Sample gas connections are made to the Gas In and Gas Out ports on the sample block (see *Figure 9*). Either port on the sample block may be used as the Gas Input port (i.e. for connection purposes the ports are interchangeable).

Normally, connections are made via stainless steel pipework, in which case the sensor block/transmitter assembly will be self supporting. If Teflon tubing is used it may be necessary to support the assembly with a body clip.

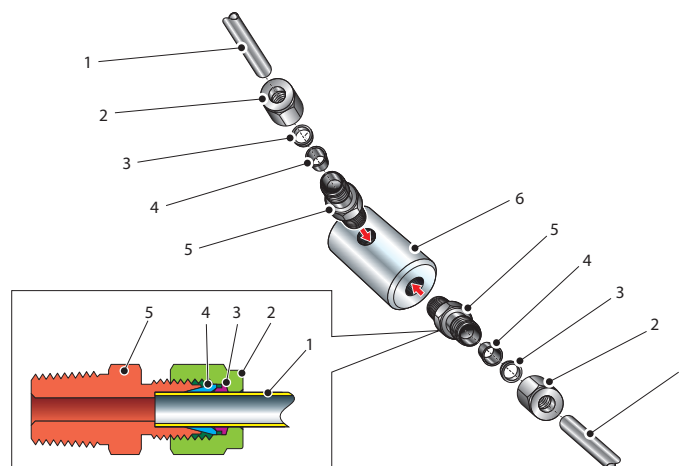


Figure 9 Sample Block Gas Connections

Both the Input and Output gas connections are $\frac{1}{8}$ " NPT. It is recommended that both the Gas Input and Output connections are made via $\frac{1}{8}$ " NPT to 6mm or $\frac{1}{8}$ " NPT to $\frac{1}{4}$ " stainless steel tube adaptors (2...5 – *Figure 9*). The method of connection to the sensor block (6) is as follows:

NOTE: The following description relates to 6mm tube fixings. The sample block ports are both $\frac{1}{8}$ " NPT female process connections. Tube adaptors are not supplied with the equipment but can be obtained by contacting your local distributor or Michell Instruments (see www.ProcessSensing.com for details).

1. Cut a suitable length of 6mm ($\frac{1}{4}$ " U.S.) stainless steel tubing (1) to the correct length and, if necessary, bend to shape to suit the location of the sensor block assembly. **NOTE: To facilitate ease of connection to the port, at least 75 mm (3") of the tubing coming out of the Gas In port must be straight.**
2. Clean off any burrs or metal shavings adhering to the tubing.
3. Screw the $\frac{1}{8}$ " NPT ($\frac{1}{4}$ " U.S.) NPT Swagelok adaptor (5) into the $\frac{1}{8}$ " NPT ($\frac{1}{4}$ " U.S.) NPT inlet port in the sensor block (6) and tighten to a torque setting of 35 Nm (25 lbf-ft).
4. Pass the stainless steel tubing (1) through the locking nut (2). **NOTE: Threads towards the gas port.**

5. Fit the back ferrule (3) over the stainless steel tubing (1) with the bevelled end facing the back of the front ferrule (4).
6. Place the front ferrule (4) over the stainless steel tubing (1), bevelled end towards the adaptor (5).
7. Push the stainless steel tubing (1) as far as it will go into the adaptor (5) and tighten up the locking nut (2) finger tight.
8. Hold the adaptor (5) flats with a spanner and tighten up the locking nut (2) to a torque setting of 35 Nm (25 lbf-ft) (1¼ turns). This action compresses the front ferrule (4) and back ferrule (3) onto the tubing to form a gas tight seal.
9. Connect up the other gas port as described in steps 1...8 above.

3 OPERATION

3.1 Process Monitor Configuration

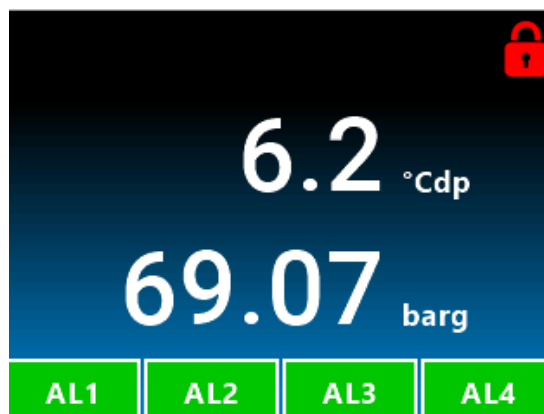
When you receive your Easidew Advanced Online Hygrometer system it will be configured to match your ordered dew-point range, with all other settings at a factory default. You will then need to configure the Process Monitor to meet your own requirements.

Set-up can easily be undertaken in less than 10 minutes, using either of the following two methods:

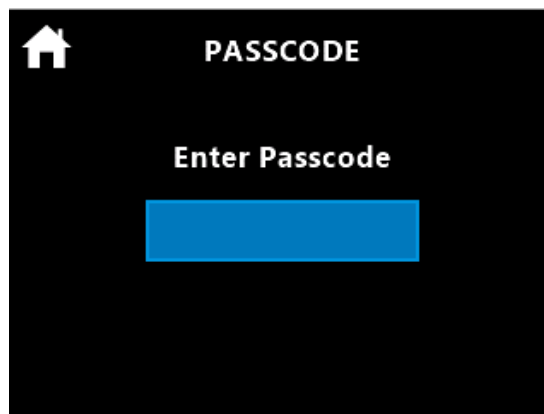
- Front-panel touch screen configuration
- Set-up via the RS485 monitor interface, using the Process Monitor Application Software, available on the product page for the Easidew Advanced Online Hygrometer (visit www.processsensing.com), and a standard RS485-to-USB interface (RS485 convertor specified in spares list if required).

3.2 Front Panel Configuration Menu Access

1. Press the red **Lock** icon on the top right-hand side of the display, to access the security code entry screen.



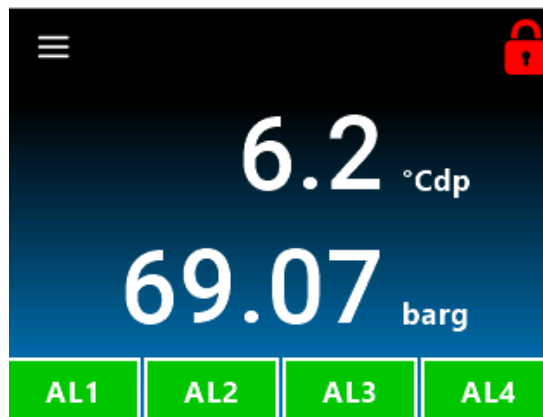
2. The security code entry screen will appear.



3. Enter the fixed security code 5618 to access the configuration menu.



4. Click on the **Menu** icon on the top left-hand side of the display.

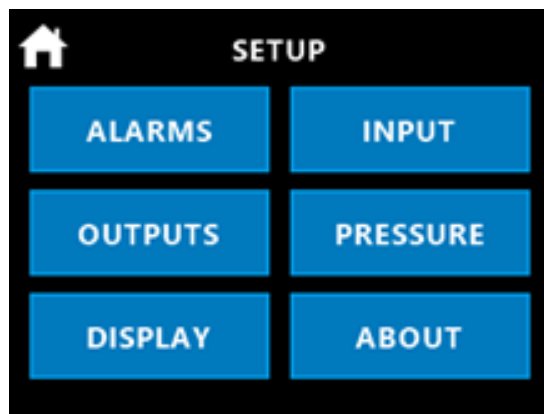


3.3 Configuration Menu Explained

Clicking on the **Menu** icon will give you access to the Process Monitor configuration menu. For most customers, you will only have to set this up once and your configuration will be saved and will not then need to be reconfigured.

WARNING: If the output signals from the Process Monitor are used within your own control system, you need to ensure good instrumentation practice is followed and no unauthorized reconfiguration is undertaken which could impact your own control system operation.

The **Configuration Menu** screen will appear:



Alarms There are 4 programmable alarm outputs, which can be assigned to dew point, moisture content and pressure parameters.

Outputs There are 3 programmable 4...20 mA analog outputs, which can be assigned to dew point, moisture content and pressure parameters.

Display Access to selection of temperature scales, Modbus address setting, pressure scales, moisture content tables, display and brightness is via this menu.

Input On the Easidew Advanced Online Process Monitor, this menu is fixed and no variables can be entered.

Pressure Access to selection of a live pressure sensor or a fixed pressure value can be entered.

About Confirms the installed Process Monitor Firmware and Monitor product type.

3.4 Setting Up the Process Monitor Configuration

This section looks at each menu configuration and explains, simply, how to set them up. Please note, if there are multiple identical set-ups within one menu (e.g. 4 programmable relay outputs), these are explained using one example.

3.4.1 Alarms Configuration

The Process Monitor incorporates dual relays, each with 2 outputs, providing 4 alarm outputs. In *Figure 17*, the relay outputs confirm this arrangement.

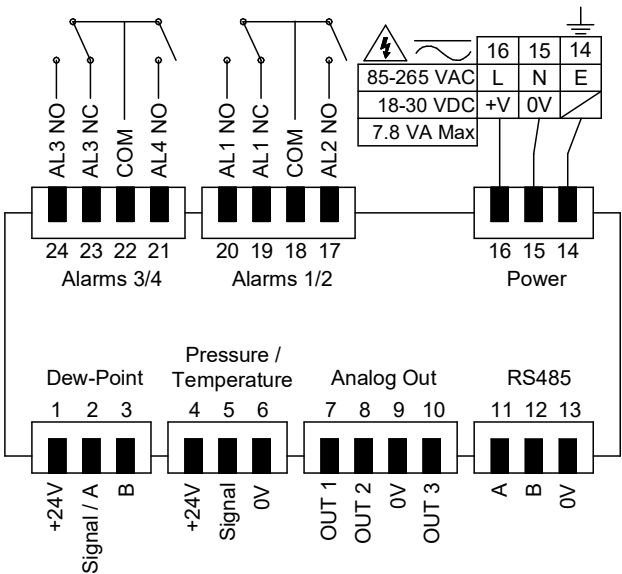
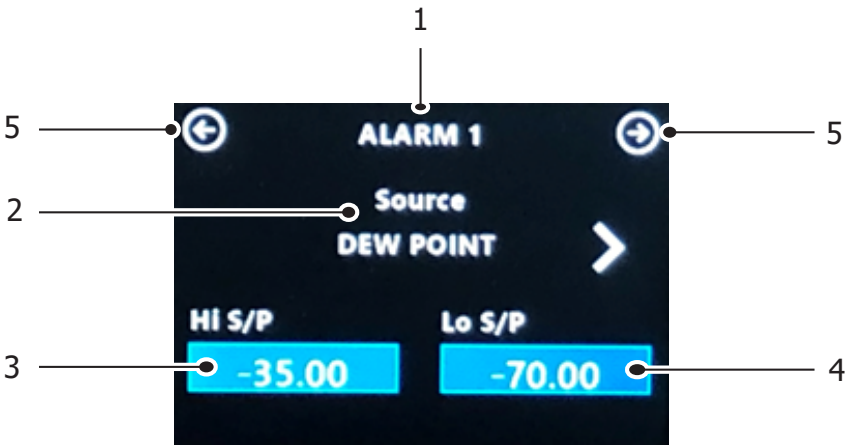


Figure 10 *Electrical Wiring Schematic*

Clicking on the **Alarms** button will take you to the screen shown below in *Figure 18*.



1	Confirms which alarm output is being set
2	Selects the parameter signal for control of the relay output: dew point, moisture, pressure, fault condition
3	Sets the energizing changeover point of the relay
4	Sets the de-energizing changeover point of the relay
5	Toggles forward or back in the menu structure

Figure 11 *Alarm Configuration Screen Explained*

Each set point (e.g. **Hi S/P** or **Lo S/P**) has a built-in fixed % hysteresis value to create a small dead band below the set-point value, to ensure the relay does not constantly energize and de-energize when the measured or calculated value oscillates around the set-point value. This is standard practice when using relays in control systems.

The hysteresis dead-band calculation is 0.5 % of the set-point value, as shown in the below example:

An alarm is **ON** when the **measured value** is $> \text{Hi_alarm_setpoint}$ or the **measured value** is $< \text{Lo_alarm_setpoint}$.

An Alarm is **OFF** when the **measured value** is $> \text{Lo_alarm_setpoint} + \text{Lo Hysteresis}$ AND the **measured value** is $< \text{Hi_alarm_setpoint} - \text{Hi Hysteresis}$.

Say, for example, Lo_alarm_setpoint is 1.0 and Hi_alarm_setpoint is 15.0.

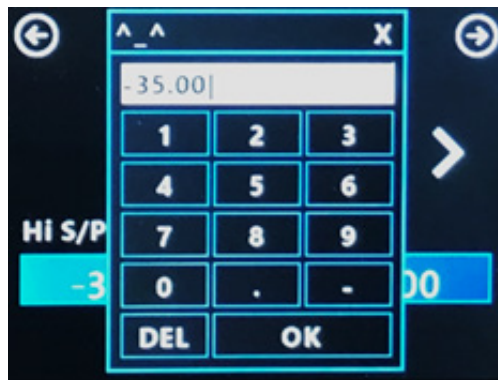
$\text{Lo Hysteresis value} = \text{Lo_alarm_setpoint} * (0.5/100.0) = 1 * 0.005 = 0.005$

$\text{Hi Hysteresis value} = \text{Hi_alarm_setpoint} * (0.5/100.0) = 15 * 0.005 = 0.075$

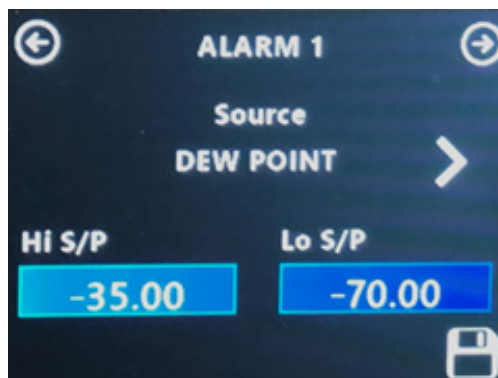
The alarm will trigger when **measured value** reaches or exceeds 15.0 or when the **measured value** is less than **1.0**.

The alarm will switch off when the **measured value** is $> 1.0 + 0.005$ AND **measured value** is $< 15.0 - 0.075$, so as you decrease the input below 15.0, the alarm will switch off again around **14.925**.

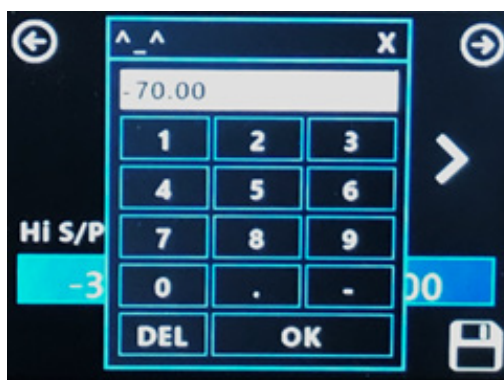
1. Click on **Hi S/P**, then enter your required relay switch set point and press **OK**.



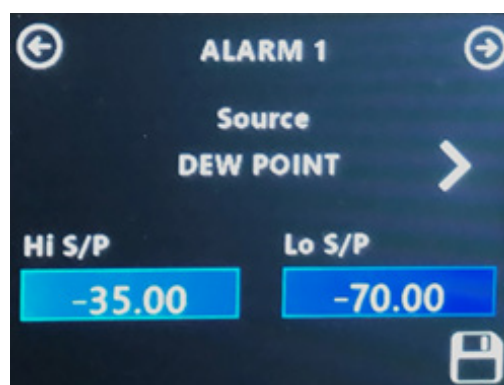
2. Click on the **Save** icon and the programmed value will be stored.



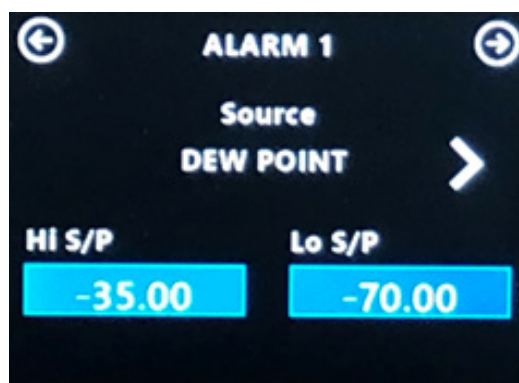
- Click on **Lo S/P**, then enter your required relay switch set point and press **OK**.



- Click on the **Save** icon and the programmed value will be stored.



- You are now back on the **Alarm 1** screen, which confirms your entered configuration.



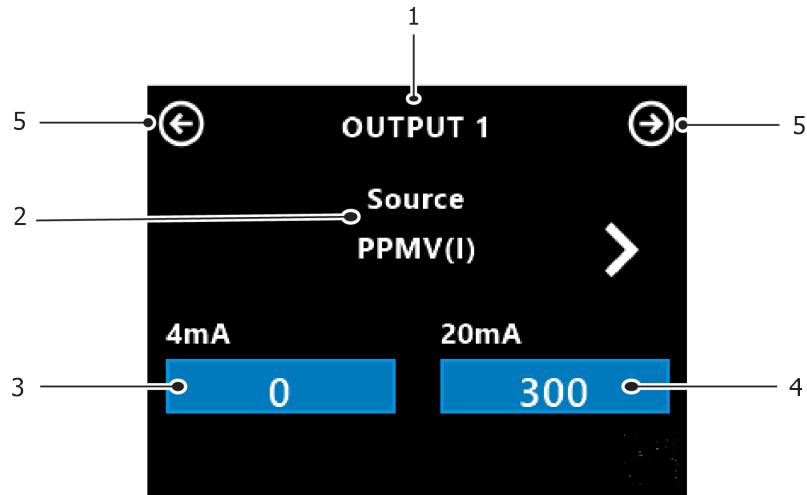
Using the top right-hand scroll button, you can now set up the other three alarm outputs to any required configuration, using the method described above.

3.4.2 Analog Outputs Configuration

There are three analog 4...20 mA outputs that can be configured to any measured or calculated parameter within the Process Monitor.

Selecting the **Outputs** button will take you to the screen shown below in *Figure 19*.

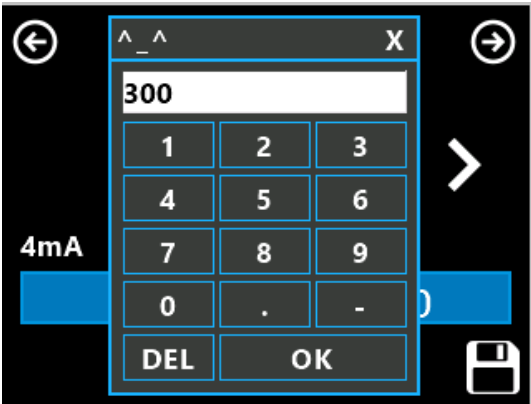
The following explains how to set up Analog Output Channel 1.



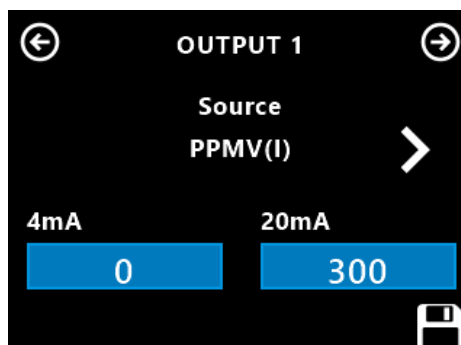
1	Confirms which 4...20 mA output is being set
2	Selects the parameter signal for analog outputting: dew point, moisture, pressure
3	Sets the 20 mA full-scale parameter value
4	Sets the 4 mA zero parameter value
5	Toggles forward or back in the menu structure

Figure 12 *Analog Outputs Configuration Screen Explained*

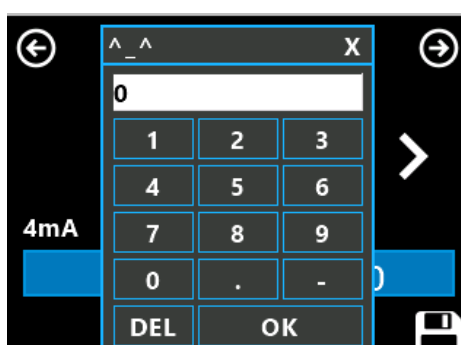
1. Click on the **20 mA** box and the **Enter** box will appear. Enter your required full scale value, then press **OK**.



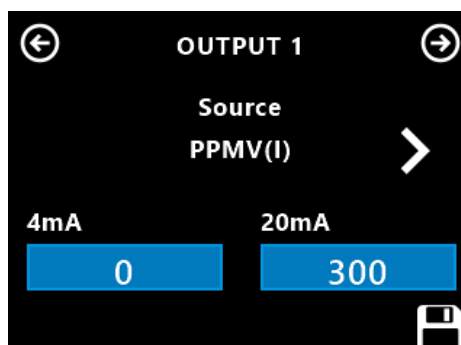
- Click on the **Save** icon and the programmed value will be stored.



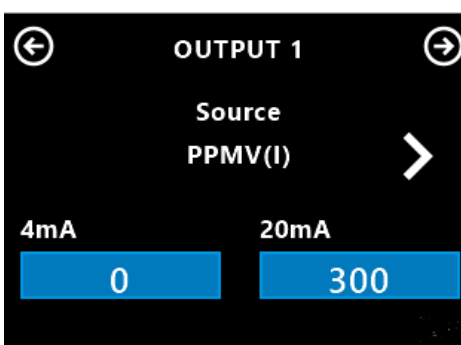
- Click on the **4 mA** box and the **Enter** box will appear. Enter your required zero value, then press **OK**.



- Click on the **Save** icon and the programmed value will be stored.



- You are now back on the **Output 1** screen, which confirms your entered configuration.



Using the top right-hand scroll button, you can now set up the other two analog outputs to any required configuration, using the method described above.

3.4.3 Display Configuration

This is a simple menu screen that allows you to configure basic monitor settings and scalings as shown in *Figure 20* below.

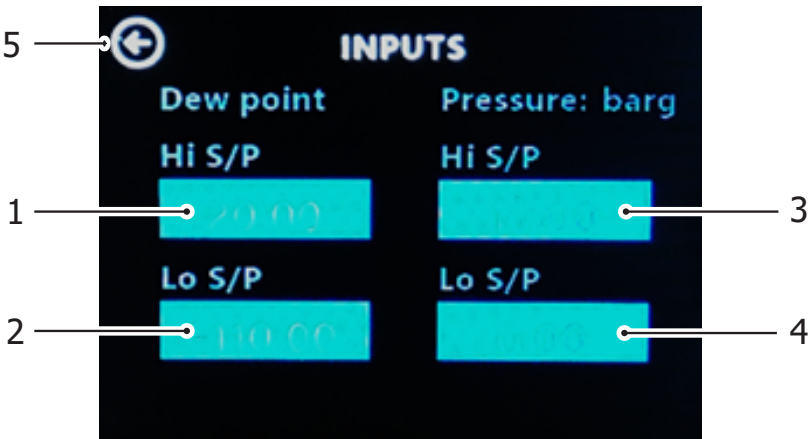


1	Selects the required temperature scale for the dew-point parameter
2	Sets the Modbus address for the Process Monitor RS485 digital communications
3	Selects the required pressure scale for the indicated pressure parameter
4	Selects the required moisture content calculation table
5	Adjusts the brightness of the Process Monitor display

Figure 13 *Display Configuration Screen Explained*

3.4.4 Input Configuration

This is a simple menu screen displaying the measured or fixed inputs to the Process Monitor, as shown below in *Figure 21*.



1	Displays the highest measurement value of the dew-point sensor input
2	Displays the lowest measurement range of the dew-point sensor input
3	Displays the highest indicated or fixed input of pressure
4	Displays the lowest indicated or fixed input of pressure
5	Toggles back in the menu structure

Figure 14 *Input Configuration Screen Explained*

Dew point and pressure are the two parameters inputted in the Process Monitor within the hygrometer system. These are displayed on this screen in different forms, as explained:

Dew Point The Easidew M12 Dew-Point Sensor outputs a Modbus RTU over RS485 signal into the Process Monitor and that sensor, irrespective of its ordered dew-point range, is digitally scaled to measure any dew point within the band of -110...+20 °C dp. The **Hi S/P** and **Lo S/P** boxes are greyed out; they confirm this -110...+20 °C range and this cannot be adjusted.

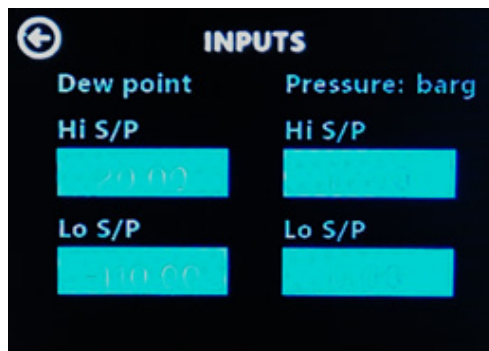
Pressure Section 3.4.5, Pressure Configuration, explains that pressure indication can be inputted into the Process Monitor either with a live pressure signal from an external 4...20 mA pressure sensor or through a fixed pressure value entry on the Process Monitor.

Dependent on this selection, the **Input Configuration** screen changes mode, as follows:

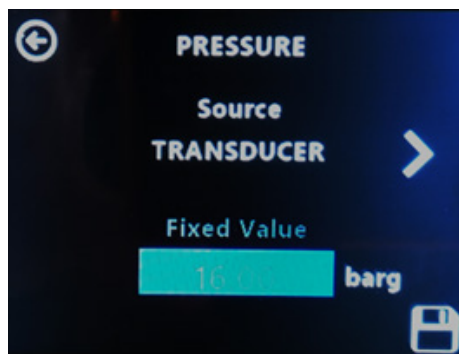
1. When a fixed pressure entry value is selected in the Pressure Configuration screen, the value is entered and saved.



2. If you go back to the **Input Configuration** screen you will see the display below, with the Pressure **Hi S/P** and **Lo S/P** boxes greyed out, confirming that no live pressure signal is being inputted to the Process Monitor.

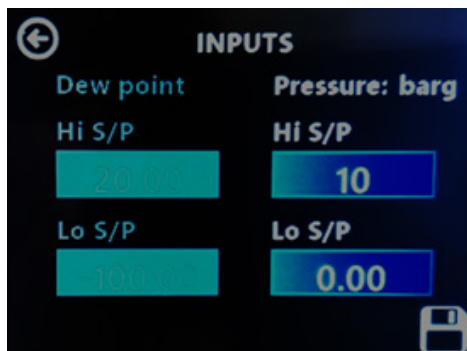


3. Go back to the **Pressure Configuration** screen and select **Transducer** (sensor), then save your selection.



4. Go back to the **Input Configuration** screen and enter the **Hi S/P** value equating to 20 mA, then the **Lo S/P** value equating to 4 mA value of the external pressure sensor. Save this input.

In the example below, a 0...10 bar (4...20 mA) pressure sensor is being used to input a live pressure signal into the Process Monitor.



3.4.5 Pressure Configuration

Pressure indication can be inputted into the Process Monitor either with a live pressure signal from an external 4...20 mA pressure sensor or through a fixed pressure value entry on the Process Monitor. To calculate moisture content from dew point, it is necessary to know the system pressure and this pressure indication input is then used for that purpose.

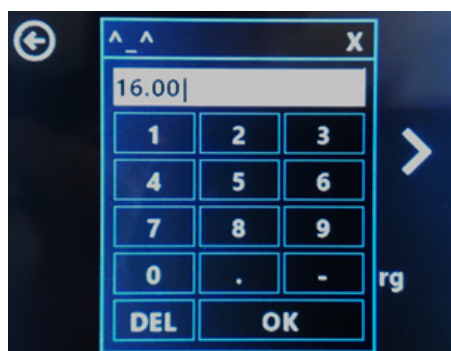
NOTE: This function is only relevant to moisture content calculation and is not applicable for dew-point measurement.

The two screens used to select live pressure input or fixed value input are shown below, along with a brief explanation of use.

1. Click on **Pressure**, then on the next screen select **Fixed Value** as the source input for Pressure.



2. Enter the fixed value, then save your entry.

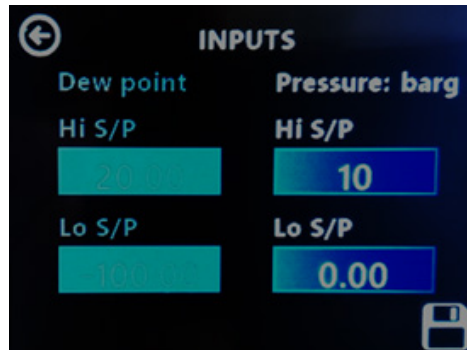


3. Click on the ⇐ arrow, then select Transducer (sensor) as the source input.



4. Go back to the **Input Configuration** screen, then enter the **Hi S/P** value equating to 20 mA and the **Lo S/P** value equating to 4 mA value of the external pressure sensor. Save this input.

In the example below, a 0...10 bar (4...20 mA) pressure sensor is being used to input a live pressure signal into the Process Monitor.



3.4.6 About Menu

This is an information screen that confirms the product name, main PCB firmware and display firmware.



4 MAINTENANCE

4.1 Maintenance and Calibration

Routine maintenance of the Easidew M12 Transmitter is confined to regular re-calibration. For most applications, annual re-calibration ensures that the stated accuracy of the Easidew M12 Transmitter is maintained.

Specialist calibration instrumentation is required to calibrate the transmitter and a true calibration can only be performed by exposure of the dew-point sensor to a reference gas of known dew point.

Calibration services are offered by Michell Instruments at their accredited calibration laboratories. All calibrations are traceable to national standards either via the National Physical Laboratory (UK) or the National Institute of Standards and Technology (USA).

The Easidew M12 transmitter can be returned to Michell Instruments either directly or via the authorized distributor, for calibration.

Alternatively, Michell Instruments can provide an exchange transmitter. Prior to re-calibration, an exchange transmitter can be ordered from Michell Instruments or an authorized distributor.

Once the replacement transmitter and calibration certificate have been received, the original transmitter can be disconnected and the replacement transmitter fitted in its place. The original transmitter should be packed in its original packing, if possible, and returned to Michell Instruments, either directly or via an authorized agent.

4.2 Fault Conditions

There are 2 conditions stated below, which will cause a **FAULT** message to be displayed for the dew-point or moisture content parameter on the display.

- The sensor cable connecting the Easidew M12 sensor to the Process Monitor is disconnected or damaged.
- The Easidew M12 sensor flags a fault condition from the measurement technology to the sensor registers, which is then transmitted to the Process Monitor.

If the **FAULT** message is displayed, it is recommended that the electrical wiring system between the Easidew M12 sensor and Process Monitor is checked for connectivity.

5 MEASUREMENT GUIDE

5.1 Sampling Considerations

There are two basic methods of measuring a sample with the Easidew M12 Transmitter:

- In-situ measurements are made by placing the transmitter inside the environment to be measured.
- Extractive measurements are made by installing the sensor into a block within a sample handling system, and flowing the sample outside of the environment to be measured through this system.

Extractive measurements are recommended when the conditions in the environment to be measured are not conducive to making reliable measurements with the product.

Examples of such conditional limitations are:

- Excessive flow rate
- Presence of particulates matter
- Presence of entrained liquids
- Excessive sample temperature

The basic considerations for each measurement type are as follows:

In-Situ

- 1. Dew-Point Sensor Position** – will the sensor see an area of the environment that is representative of what you want to measure?

For example, if the sensor is to be mounted into a glove box, there are three different positions in which it could be installed – each giving a different measurement:

- Position A is on the purge inlet. In this position the sensor will confirm the dew point of the gas entering the glove box, but will not detect any leaks in the glove box itself, or any moisture released from the work piece.
- Position B is on the gas outlet. In this position the sensor will be exposed to the gas leaving the glove box, and will therefore be detecting any moisture which has entered into the system (e.g. ingress/leaks), or has been released by the work piece.
- Position C is in the glovebox itself, in this position the sensor will be only detecting any moisture in its immediate vicinity. Leaks not in close proximity to the measurement point may not be detected as this moisture could be drawn directly to the outlet.

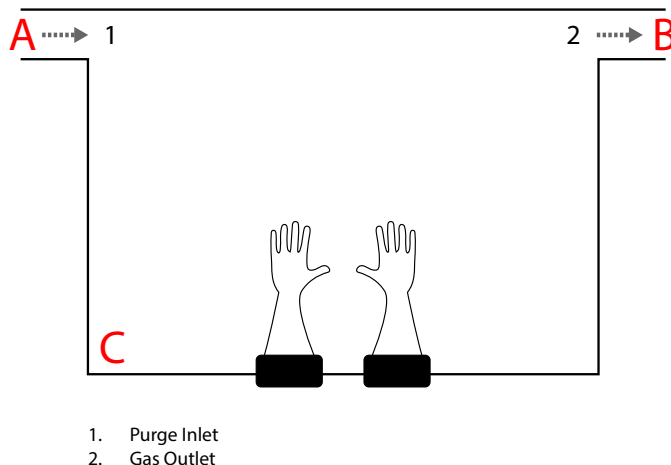


Figure 15 *Installation Location*

If the transmitter is to be mounted directly into a pipe or duct, then consider that the installation point should not be too close to the bottom of a bend where oil or other condensate may collect.

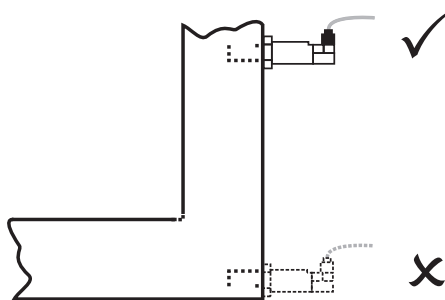


Figure 16 *Installation Location*

2. **Gas speed** – if you are planning on installing the sensor in a duct, consider how fast the sample gas is moving through it.

If the gas speed is very low, or occasionally static, then the moisture content through the length (and width, if it is more than a few cm across) of the duct is unlikely to be uniform.

Extremely high gas speeds can cause damage to the sensor. Direct insertion is not recommended in gas speeds in excess of 10m/s (32.8ft/s).

3. **Particulates** – Particulates travelling at speed can cause severe and irreversible damage to the sensor. At low velocity they can cling to the sensor, reducing its' surface area, and therefore response speed.

The sensor is provided with a basic level of particulate protection in the form of a sintered guard; either HMWPE (10µm pore size) or Stainless Steel (80µm pore size). If the sample stream contains smaller particulates than this, or generally large amounts of dust; extractive measurement is recommended to accommodate proper in-line filtration.

4. **Sample Temperature** – Although the Easidew M12 can be operated at sample temperatures up to 60 °C, it is advisable to keep the sample temperature as close to ambient, and as stable as possible to keep adsorption & desorption characteristics as consistent as possible (see Section 5.2, Sampling Hints, for more information).

Extractive

If the sensor is to be mounted into a sample conditioning system, then the above points are still of relevance, but it is important to consider the extraction point itself – make sure that the chosen extraction point is representative of the process, i.e. that the sample of interest is flowing past the extraction point, and it is not being pulled from a dead volume.

5.2 Sampling Hints

Measurement of moisture content is a complex subject, but does not need to be difficult. This section aims to explain the common mistakes made in measurement situations, the causes of the problem, and how to avoid them. Mistakes and bad practices can cause the measurement to vary from the expectation; therefore a good sampling technique is crucial for accurate and reliable results.

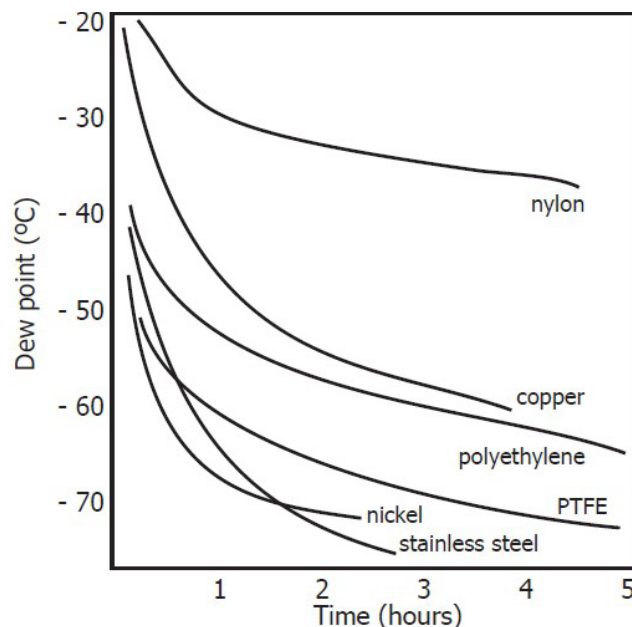


Figure 17 *Material Permeability Comparison*

All materials are permeable to water vapor, as the water molecule is extremely small cored to the structure of solids, even when compared to the crystalline structure of metals. The graph above shows the dew point inside tubing of different materials when purged with very dry gas, where the exterior of the tubing is in the ambient environment.

Many materials contain moisture as part of their structure, particularly organic materials (natural or synthetic), salts (or anything which contains them) and anything which has small pores. It is important to ensure that the materials used are suitable for the application.

If the partial water vapor pressure exerted on the outside of a compressed air line is higher than on the inside, the atmospheric water vapor will naturally push through the porous medium causing water to migrate into the pressurised air line. This effect is called transpiration.

Adsorption and Desorption

Adsorption is the adhesion of atoms, ions, or molecules from a gas, liquid, or dissolved solid to the surface of a material, creating a film. The rate of adsorption is increased at higher pressures and lower temperatures.

Desorption is the release of a substance from or through the surface of a material. In constant environmental conditions, an adsorbed substance will remain on a surface almost indefinitely. However, as the temperature rises, so does the likelihood of desorption occurring.

In practical terms, as the temperature of the environment fluctuates, water molecules are adsorbed and desorbed from the internal surfaces of the sample tubing, causing small fluctuations in the measured dew point.

Sample Tubing Length

The sample point should always be as close to the critical measurement point as possible, in order to obtain a truly representative measurement. The length of the sample line to the sensor or instrument should be as short as possible. Interconnection points and valves trap moisture, so using the simplest sampling arrangement possible will reduce the time it takes for the sample system to dry out when purged with dry gas.

Over a long tubing run, water will inevitably migrate into any line, and the effects of adsorption and desorption will become more apparent. It is clear from the graph shown above that the best materials to resist transpiration are stainless steel and PTFE.

Trapped Moisture

Dead volumes (areas which are not in a direct flow path) in sample lines, hold onto water molecules which are slowly released into the passing gas; this results in increased purge and response times, and wetter than expected readings. Hygroscopic materials in filters, valves (e.g. rubber from pressure regulators) or any other parts of the system can also trap moisture.

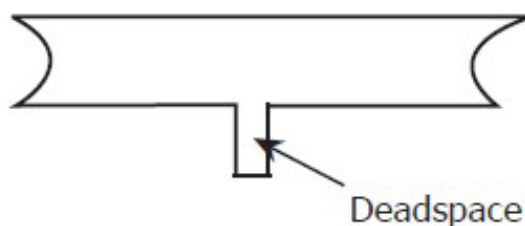


Figure 18 *Dead volume*

Sample Conditioning

Sample conditioning is often necessary to avoid exposure of sensitive measuring components to liquids and other contaminants which may cause damage or affect the accuracy over time, depending on the measurement technology.

Particulate filters are used for removing dirt, rust, scale and any other solids that may be in a sample stream. For protection against liquids, a coalescing filter should be used.

The membrane filter is a more expensive but highly effective alternative to a coalescing filter. It provides protection from liquid droplets, and can even stop flow to the analyser completely when a large slug of liquid is encountered.

Condensation and Leaks

Maintaining the temperature of the sample system tubing above the dew point of the sample is vital to prevent condensation. Any condensation invalidates the sampling process as it changes the water vapor content of the gas being measured. Condensed liquid can alter the humidity elsewhere by dripping or running to other locations where it may re-evaporate.

The integrity of all connections is also an important consideration, especially when sampling low dew points at an elevated pressure. If a small leak occurs in a high pressure line, gas will leak out but vortices at the leak point and a negative vapor pressure differential will also allow water vapor to contaminate the flow.

Flow Rates

Theoretically flow rate has no direct effect on the measured moisture content, but in practice it can have unanticipated effects on response speed and accuracy. The optimal flow rate varies depending on the measurement technology, and can always be found in the instrument or sensor manual.

An inadequate flow rate can:

- Accentuate adsorption and desorption effects on the gas passing through the sampling system.
- Allow pockets of wet gas to remain undisturbed in a complex sampling system, which will then gradually be released into the sample flow.
- Increase the chance of contamination from back diffusion: ambient air that is wetter than the sample can flow from the exhaust back into the system. A longer exhaust (sometimes called a pigtail) can also help alleviate this problem.
- Slow the response of the sensor to changes in moisture content.

Appendix A

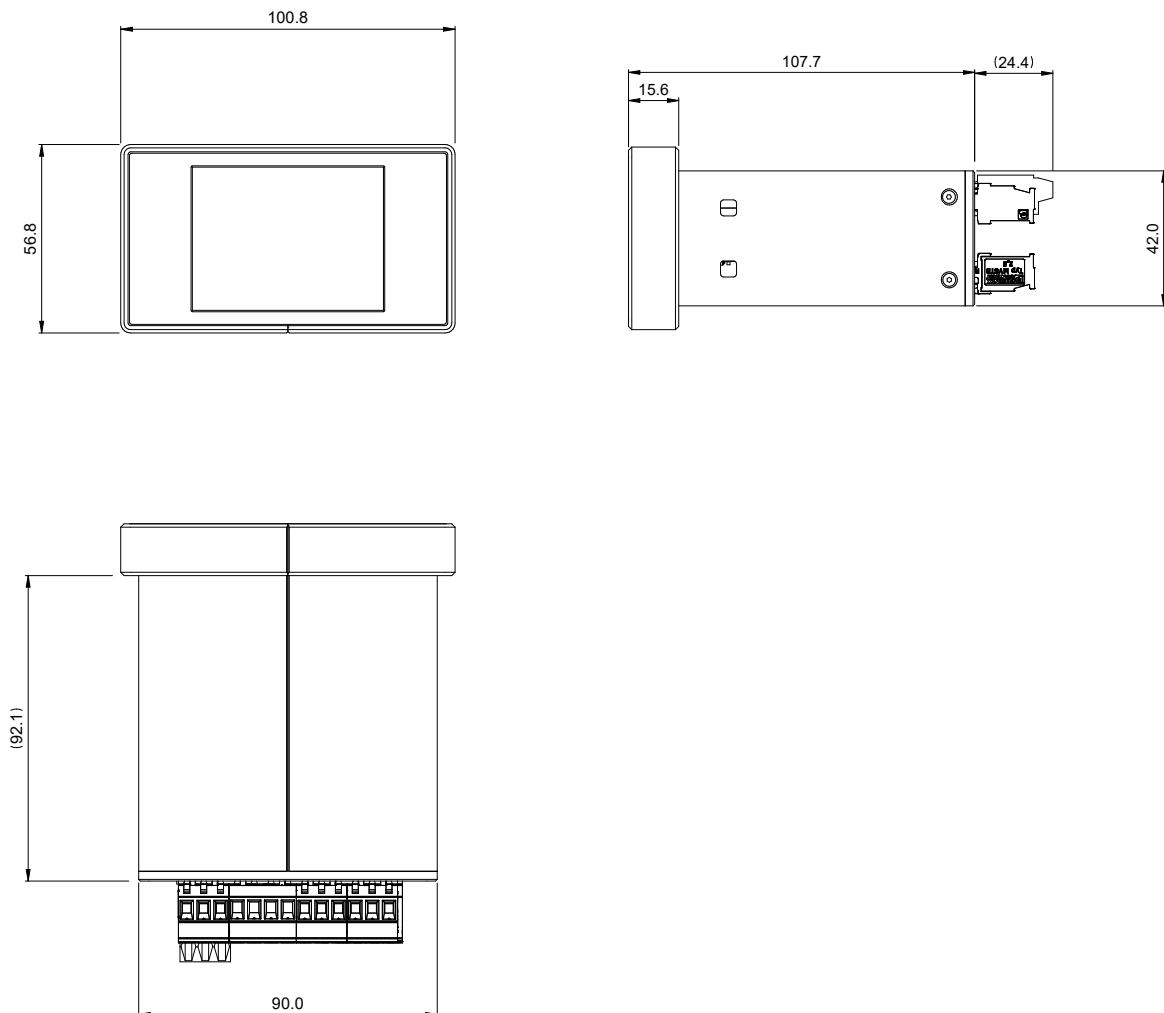
Technical Specifications

Appendix A Technical Specifications

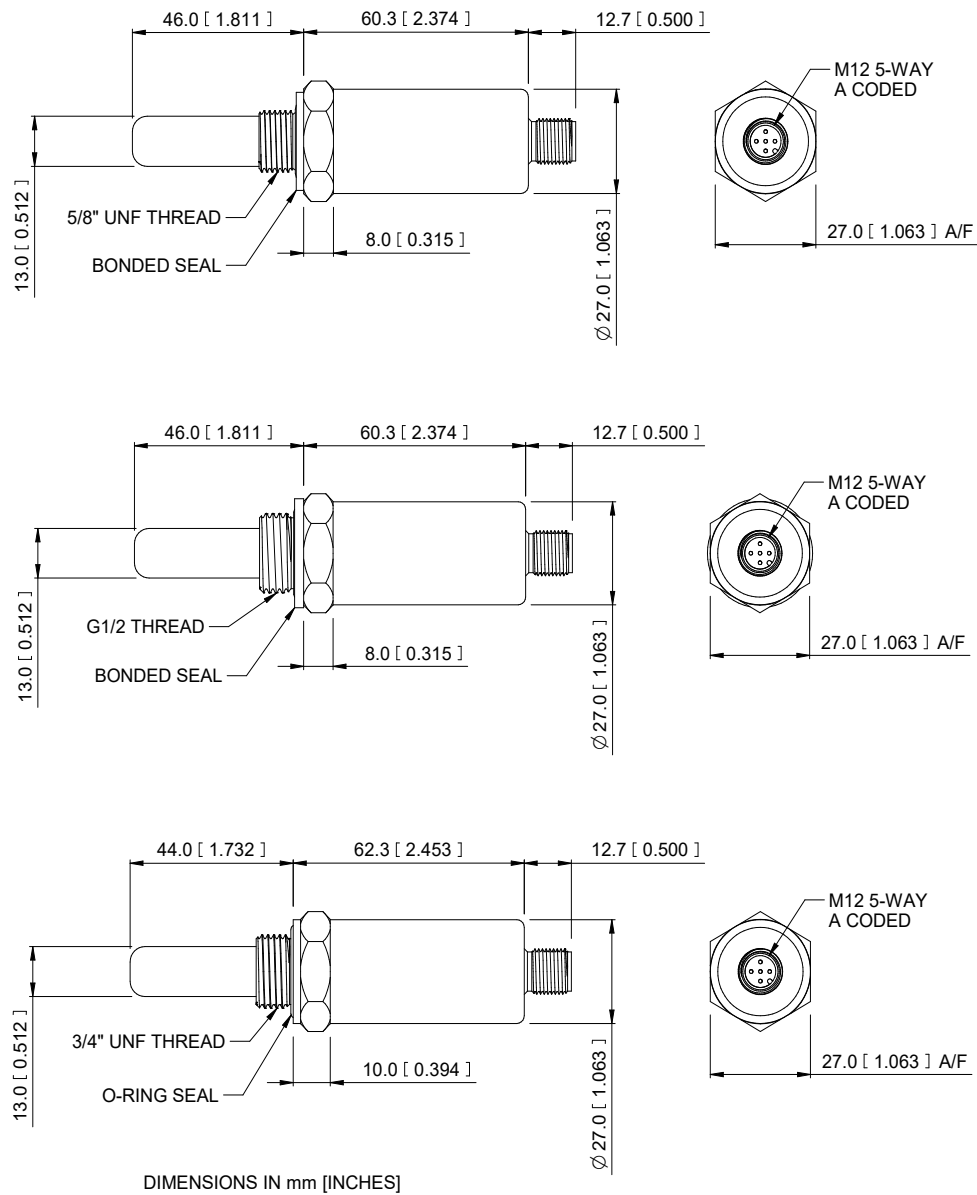
Performance Specifications	
Measurement Range	-110...+20 °C dew point (-166...+68 °F); -100...+20 °C (-148...+68 °F) dew point
Accuracy *	±1 °C from -60 to +20 °C dew point (±1.8 °F, -76...+68 °F dp) ±2 °C from -100 to -60 °C dew point (±3.6 °F, -148...-76 °F dp)
Response Time	5 mins to T95 (dry to wet)
Repeatability	0.5 °C (0.9 °F) dew point
Sensor Calibration	Traceable 13-point calibration certificate
Auxiliary Pressure Input	52.5 MPa (525 barg/7614 psig) maximum
Pressure Compensation	Live 4 ...20 mA pressure transmitter or fixed programmable value
Moisture Content Scales	Automatic compensation for ppm _v , lbs/MMscf, g/m ³ units
Relay Alarm Type/Rating	2 x Form A, 2 x Form C 30V DC 5A Namur compliant programmable relay contacts for process and fault conditions
Electrical Specifications	
Sensor Input Signal	Modbus RTU over RS485
Online Output Signals	3 x 4...20 mA channels; Modbus RTU over RS485; 4 programmable relay alarms
Online Outputs	Dew point, Moisture Content, Pressure
Maximum Analog Output Scaled Range	Dew point: -110 up to +20 °C (-166 up to +68 °F) Moisture content in gas: 0 up to 3000 ppm _v
Online Supply Voltage	85...265V AC; 18...30V DC
Online Power Consumption	AC Power: 7.8 VA (2.89 W) DC Current: 170 mA @24V DC
Electrical Safety	BS/EN61010-1: 2010
Operating Specifications	
Operating Temperature	Sensor: -40...+60 °C (-40...+140 °F) Process Monitor: 0...+70 °C (+32...+158 °F)
Compensated Temperature Range	Sensor: -20 °C...+50 °C (-4 °F...+122 °F); Process Monitor: not applicable
Storage Temperature	Sensor: -40...+60 °C (-40...+140 °F) Process Monitor: 0...+85 °C (+32...+185 °F)
Operating Pressure	52.5 MPa (525 barg/7614 psig) maximum
Sensor Flow Rate	1...5 l/min mounted in standard sampling block; 0...10 m/sec direct insertion
Mechanical Specifications	
Ingress Protection	Sensor: IP66 in accordance with standard BS EN 60529:1992+A2:2013; NEMA 4 protection in accordance with standard NEMA 250-2014 Process Monitor: IP54 & NEMA Type 2 & 12K front panel only
System Materials	Sensor & Sample Block: 316 stainless steel Process Monitor: UL Rated ABS - EpsotechAB AN2 V0
Dimensions	Sensor: L=119 x 27 mm / L=5.2" x ø1.77" (no connector cable) Process Monitor: 1/8 DIN Case, 90 x 40 x 92 mm / 3.54 x 1.57 x 3.62" (w x h x d) Sample Block: 55.2 x 30 mm / 2.17 x 1.18"

Filter (Sensor Protection)	Standard: HDPE <10µm Optional: 316 stainless steel sintered guard <80µm
Sensor/Sample Block Process Connections	G1/2" BSP, 3/4" 16 UNF, 5/8" 18 UNF
Sample Block Inlet/Outlet Connections	1/8" NPT
System Weights	Sensor 150 g (5.29 oz); Sample Block 250 g (8.82 oz); Process Monitor 280 g (9.88 oz)
Sensor Electrical Connections	Easidew M12: M12 5 pin (A Coded)
Online Sensor Cable	2, 5, 10 meter (6.5, 16.4, 32.81 ft) connector/cable available
Display Type	LCD touch screen 320 x 240 pixel

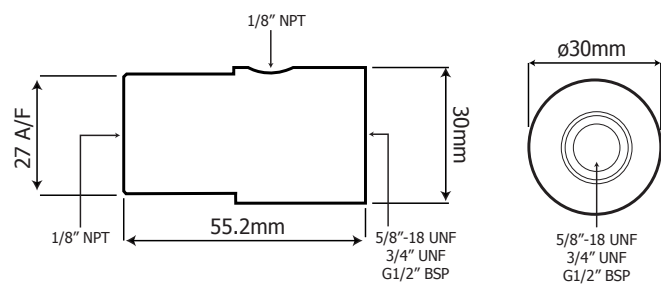
NOTES * Over Compensated Temperature Range



Easidew Online Process Monitor



M12 Sensor Cable (included)



Sample Block (included)

Appendix B

Process Monitor Register Map

Appendix B Process Monitor Register Map

This is a register map for all firmware versions of the Process Monitor. Some registers are not applicable to the Easidew Advanced Online Hygrometer.

Serial Port Settings: 9600 Baud Rate, 8 Data Bits, 1 Stop Bit, No Parity Bit, No Flow Control

Address	Function Description	Read/Write	Default Value	Register Configuration	Notes
0	Modbus Address	R/W		A1	1...32
1	Alarm Configuration	R/W		D	
2	mA output Configuration	R/W		E	
3	System Configuration	R/W		C	
4	O/p 1 low s/p hi word	R/W		FLOAT32	
5	O/p 1 low s/p lo word	R/W		FLOAT32	
6	O/p 1 high s/p hi word	R/W		FLOAT32	
7	O/p 1 high s/p lo word	R/W		FLOAT32	
8	O/p 2 low s/p hi word	R/W		FLOAT32	
9	O/p 2 low s/p lo word	R/W		FLOAT32	
10	O/p 2 high s/p hi word	R/W		FLOAT32	
11	O/p 2 high s/p lo word	R/W		FLOAT32	
12	O/p 3 low s/p hi word	R/W		FLOAT32	
13	O/p 3 low s/p lo word	R/W		FLOAT32	
14	O/p 3 high s/p hi word	R/W		FLOAT32	
15	O/p 3 high s/p lo word	R/W		FLOAT32	
16	I/p 1 min. hi word	R/W		FLOAT32	
17	I/p 1 min. lo word	R/W		FLOAT32	
18	I/p 1 max. hi word	R/W		FLOAT32	
19	I/p 1 max. lo word	R/W		FLOAT32	
20	I/p 2 min. hi word (n/a for Oxygen only)	R/W		FLOAT32	
21	I/p 2 min. lo word (n/a for Oxygen only)	R/W		FLOAT32	
22	I/p 2 max. hi word (n/a for Oxygen only)	R/W		FLOAT32	
23	I/p 2 max. lo word (n/a for Oxygen only)	R/W		FLOAT32	
24	Fixed pressure input value hi word (n/a for O ₂ only)	R/W		FLOAT32	
25	Fixed pressure input value lo word (n/a for O ₂ only)	R/W		FLOAT32	
26	Liquid Selection	R/W		G	

Address	Function Description	Read/Write	Default Value	Register Configuration	Notes
27	Liquid Mix Ratio (% of Mixed Liquid 1)	R/W		A1	
28	User Cs Table 1, Cs Value at -20 °C	R/W		A1	
29	User Cs Table 1, Cs Value at -10 °C	R/W		A1	
30	User Cs Table 1, Cs Value at 0 °C	R/W		A1	
31	User Cs Table 1, Cs Value at 10 °C	R/W		A1	
32	User Cs Table 1, Cs Value at 20 °C	R/W		A1	
33	User Cs Table 1, Cs Value at 30 °C	R/W		A1	
34	User Cs Table 1, Cs Value at 40 °C	R/W		A1	
35	User Cs Table 1, Cs Value at 50 °C	R/W		A1	
36	User Cs Table 1, Cs Value at 60 °C	R/W		A1	
37	User Cs Table 1, Cs Value at 70 °C	R/W		A1	
38	User Cs Table 2, Cs Value at -20 °C	R/W		A1	
39	User Cs Table 2, Cs Value at -10 °C	R/W		A1	
40	User Cs Table 2, Cs Value at 0 °C	R/W		A1	
41	User Cs Table 2, Cs Value at 10 °C	R/W		A1	
42	User Cs Table 2, Cs Value at 20 °C	R/W		A1	
43	User Cs Table 2, Cs Value at 30 °C	R/W		A1	
44	User Cs Table 2, Cs Value at 40 °C	R/W		A1	
45	User Cs Table 2, Cs Value at 50 °C	R/W		A1	
46	User Cs Table 2, Cs Value at 60 °C	R/W		A1	
47	User Cs Table 2, Cs Value at 70 °C	R/W		A1	
48	Dew Point Channel – ADC Val 4 mA	R/W		A1	0...4095
49	Dew Point Channel – ADC Val 20 mA	R/W		A1	0...4095
50	Pressure (P) /Tempr (L) Channel – ADC Val 4 mA (n/a for O ₂ only)	R/W		A1	0...4095
51	Pressure (P) /Tempr (L) Channel – ADC Val 20 mA (n/a for O ₂ only)	R/W		A1	0...4095
53	Analog Output 1 – DAC 4 mA Value	R/W		A1	0...65535
54	Analog Output 1 – DAC 20 mA Value	R/W		A1	0...65535
55	Analog Output 2 – DAC 4 mA Value	R/W		A1	0...65535
56	Analog Output 2 – DAC 20 mA Value	R/W		A1	0...65535
57	Analog Output 3 – DAC 4 mA Value	R/W		A1	0...65535
58	Analog Output 3 – DAC 20 mA Value	R/W		A1	0...65535

Address	Function Description	Read/Write	Default Value	Register Configuration	Notes
59	Display brightness	R/W		A1	0...100
60	Alarm 1 Low S/P Hi Word	R/W		FLOAT32	
61	Alarm 1 Low S/P Lo Word	R/W		FLOAT32	
62	Alarm 1 High S/P Hi Word	R/W		FLOAT32	
63	Alarm 1 High S/P Lo Word	R/W		FLOAT32	
64	Alarm 2 Low S/P Hi Word	R/W		FLOAT32	
65	Alarm 2 Low S/P Lo Word	R/W		FLOAT32	
66	Alarm 2 High S/P Hi Word	R/W		FLOAT32	
67	Alarm 2 High S/P Lo Word	R/W		FLOAT32	
68	Alarm 3 Low S/P Hi Word	R/W		FLOAT32	
69	Alarm 3 Low S/P Lo Word	R/W		FLOAT32	
70	Alarm 3 High S/P Hi Word	R/W		FLOAT32	
71	Alarm 3 High S/P Lo Word	R/W		FLOAT32	
72	Alarm 4 Low S/P Hi Word	R/W		FLOAT32	
73	Alarm 4 Low S/P Lo Word	R/W		FLOAT32	
74	Alarm 4 High S/P Hi Word	R/W		FLOAT32	
75	Alarm 4 High S/P Lo Word	R/W		FLOAT32	
77	Command register	W		H	
78	Number of alarms (not used)	R/W		A1	
80	Dew point in set unit (or O ₂ for O ₂ only)	R		B2	-3276.8 ...3276.7
81	Pressure (P) / Temperature (L) in set unit (n/a for O ₂ only)	R		B2	-3276.8 ...3276.7
82	Moisture – ppm _w – Hi Word	R		FLOAT32	
83	Moisture – ppm _w – Lo Word	R		FLOAT32	
84	Moisture – ppm _v (Ideal) – Hi Word	R		FLOAT32	
85	Moisture – ppm _v (Ideal) – Lo Word	R		FLOAT32	
86	Moisture – ppm _v (Nat Gas) – Hi Word	R		FLOAT32	
87	Moisture – ppm _v (Nat Gas) – Lo Word	R		FLOAT32	
88	Moisture – mg/m ³ (Nat Gas) – Hi Word	R		FLOAT32	
89	Moisture – mg/m ³ (Nat Gas) – Lo Word	R		FLOAT32	
90	Moisture – lb/mmscf (Nat Gas) – Hi Word	R		FLOAT32	
91	Moisture – lb/mmscf (Nat Gas) – Lo Word	R		FLOAT32	

Address	Function Description	Read/Write	Default Value	Register Configuration	Notes
92	Status Register	R		F	
93	Firmware version (Main Board)	R		A3	
94	Input CH1 (Dewp) Live ADC Count	R		A1	
95	Input CH2 (Pressr/Temprr) Live ADC Count (n/a for O ₂ only)	R		A1	
96	Product I.D.	R		A1	
97	Password (volatile)	R/W	4792	A1	
101	Dew point (or O ₂) in set unit as float – Hi Word	R		FLOAT32	
102	Dew point (or O ₂) in set unit as float – Lo Word	R		FLOAT32	
103	Pressure / Temp. in set unit as float – Hi Word (n/a for O ₂ only)	R		FLOAT32	
104	Pressure / Temp. in set unit as float – Lo Word (n/a for O ₂ only)	R		FLOAT32	

Register Configuration A

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

A1: Unsigned Short. Range = 0...65535

A2: Unsigned Short /10. Range = 0...6553.5

A3: Unsigned Short /100. Range = 0...655.35

Conversion: float*x = unsigned integer
Unsigned integer/x = float

Or cast:

float value to read= ((float) (value))/x;

unsigned short value to write= (unsigned short) (value*x)

Register Configuration B

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

B1: Signed Short. Range -32768...+32767

B2: Signed Short /10. Range -3276.8...+3276.7

B3: Signed Short /100. Range -327.68...+327.67

Most languages will cast from one type to another

Values to write into register manually:

if value is a negative number: $(\text{value} * x) + 65536$

if value is 0 or a positive number: $\text{value} * x$

e.g. for type B3

$$(-5.39 * 100) + 65536 = 64997$$

$$(2.01 * 100) = 201$$

Or Cast:

(unsigned short) (value * x)

Reading values from register manually:

If value in register is greater than 32767: $(\text{value} - 65536) / x$

If value in register is less than or equal to 32767: value / x

e.g. for type B3

$$(64997 - 65536) / 100 = -5.39$$

$$201 / 100 = 2.01$$

Or Cast:

((float) ((signed short) value)) / x;

Register Configuration C – System Configuration

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
		PP	MOD	CA	PR	IT	IT		TU	PU	PU	N/A	MU	MU	MU

<u>Pressure Units (PU)</u> 00 = Bar.G (def) 01 = Psi.G 10 = Mpag 11 = Spare	<u>Temperature Unit (TU)</u> 0 = C (def) 1 = F
<u>Main Unit</u> 0 = Dp (O2 %) 1 = ppm _v (I) (O2 ppm) 2 = lbmmscf 3 = mg/m ³ 4 = ppm _v (N)	<u>Instrument Type (IT) – not used</u> 00 = Promet IS 01 = Liquidew IS 10 = Pura 11 = O2
<u>Pressure Source (PR)</u> 0 = Sensor 1 = Fixed User	<u>ISO or IGT calculations (CA)</u> 0=IGT 1=ISO
<u>Model (MOD)</u> 0 = Promet 1 = Easidew Advanced	Pressure or ppm _v (I) secondary parameter (PP) – Easidew Advanced only 0 = Pressure 1 = ppm _v (ideal)

Register Configuration D – Alarm Configuration

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
A4	A4	A4	A4	A3	A3	A3	A3	A2	A2	A2	A2	A1	A1	A1	A1

<u>Alarm1 Parameter (A1)</u> 0000 = Dewpoint (O2) 0001 = Pressure/Temperature 0010 = ppm _w 0011 = ppm _v (Ideal) 0100 = ppm _v (Nat Gas) 0101 = mgm ³ 0110 = lbmmscf 1000 = Fault	<u>Alarm2 Parameter (A2)</u> 0000 = Dewpoint (O2) 0001 = Pressure/Temperature 0010 = ppm _w 0011 = ppm _v (Ideal) 0100 = ppm _v (Nat Gas) 0101 = mgm ³ 0110 = lbmmscf 1000 = Fault
<u>Alarm3 Parameter (A3)</u> 0000 = Dewpoint (O2) 0001 = Pressure/Temperature 0010 = ppm _w 0011 = ppm _v (Ideal) 0100 = ppm _v (Nat Gas) 0101 = mgm ³ 0110 = lbmmscf 1000 = Fault	<u>Alarm4 Parameter (A4)</u> 0000 = Dewpoint (O2) 0001 = Pressure/Temperature 0010 = ppm _w 0011 = ppm _v (Ideal) 0100 = ppm _v (Nat Gas) 0101 = mgm ³ 0110 = lbmmscf 1000 = Fault

Register Configuration E – mA Output Config

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
				03	03	03	03	02	02	02	02	01	01	01	01

<u>Output1 Parameter (O1)</u> 0000 = Dewpoint (O2) 0001 = Pressure/Temperature 0010 = ppm _w 0011 = ppm _v (Ideal) 0100 = ppm _v (Nat Gas) 0101 = mgm ³ 0110 = lbmmscf	<u>Output2 Parameter (O2)</u> 0000 = Dewpoint (O2) 0001 = Pressure/Temperature 0010 = ppm _w 0011 = ppm _v (Ideal) 0100 = ppm _v (Nat Gas) 0101 = mgm ³ 0110 = lbmmscf
<u>Output3 Parameter (O3)</u> 0000 = Dewpoint (O2) 0001 = Pressure/Temperature 0010 = ppm _w 0011 = ppm _v (Ideal) 0100 = ppm _v (Nat Gas) 0101 = mgm ³ 0110 = lbmmscf	

Register Configuration F – Status Register

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
A4	A4	A3	A3	A2	A2	A1	A1							PS	DS

<u>Relay Alarm Status flags (A1, A2, A3, A4)</u> Example: A1 = 00=OK (relay de-energized) A1 = 01=High (or Fault)(relay energized) A1 = 10=Low (relay energized)	<u>Dewpoint Sensor Status (DS)</u> 0=OK 1=Fault (or not available)
<u>Pressure/Temperature Sensor Status (PS)</u> 0=OK 1=Fault (or not available)	

Register Configuration G – Liquid Selection

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
	M2	M2	M2	M2	M2	M1	M1	M1	M1	M1	LQ	LQ	LQ	LQ	LQ

<u>Liquid Selection (LQ)</u> 0 = n-Butane 1 = n-Propane 2 = n-Hexane 3 = Cumene 4 = Benzene 5 = Toluene 6 = 1-butane 7 = Cyclohexane 8 = Oct-3-ene 9 = Ethylbenzene 10 = Dimethylbenzene 11 = Ethane 12 = Methylcyclohexane 13 = Butylbenzene 14 = Prop-1-ene 15 = But-1-ene 16 = Methane 17 = 2-Methylbutane 18 = USER1 19 = USER2 20 = MIXING	<u>Mixed Liquid 1 (M1)</u> 0 = n-Butane 1 = n-Propane 2 = n-Hexane 3 = Cumene 4 = Benzene 5 = Toluene 6 = 1-butane 7 = Cyclohexane 8 = Oct-3-ene 9 = Ethylbenzene 10 = Dimethylbenzene 11 = Ethane 12 = Methylcyclohexane 13 = Butylbenzene 14 = Prop-1-ene 15 = But-1-ene 16 = Methane 17 = 2-Methylbutane 18 = USER1 19 = USER2
<u>Mixed Liquid 1 (M2)</u> 0 = n-Butane 1 = n-Propane 2 = n-Hexane 3 = Cumene 4 = Benzene 5 = Toluene 6 = 1-butane 7 = Cyclohexane 8 = Oct-3-ene 9 = Ethylbenzene 10 = Dimethylbenzene 11 = Ethane 12 = Methylcyclohexane 13 = Butylbenzene 14 = Prop-1-ene 15 = But-1-ene 16 = Methane 17 = 2-Methylbutane 18 = USER1 19 = USER2	

Register Configuration H – Instrument Setup and Command Register (Reg 30)

2 = Set Dewpoint Channel 4 mA ADC Value
 3 = Set Dewpoint Channel 20 mA ADC Value
 4 = Set Pressure/Temperature Channel 4 mA ADC Value
 5 = Set Pressure/Temperature Channel 20 mA ADC Value

10 = Force Analog Output 1...4 mA
 11 = Force Analog Output 1...20 mA
 12 = Force Analog Output 2...4 mA
 13 = Force Analog Output 2...20 mA
 14 = Force Analog Output 1...12 mA
 15 = Force Analog Output 2...12 mA
 16 = Force Analog Output 3...4 mA
 17 = Force Analog Output 3...20 mA
 18 = Force Analog Output 3...12 mA

19 = All Alarm Relays de-energized
 20 = Energize Alarm Relay1
 21 = Energize Alarm Relay2
 22 = Energize Alarm Relay3
 23 = Energize Alarm Relay4

25 = Send Test String to Display Comms Channel

30 = Set control board to default register map values

31 = Enable Setup Mode (Alarms and Analog output updates disabled)
 32 = Disable Setup Mode (Alarms and Analog output updates enabled)

Defaults (auto-loaded when PCB is brand new or forced via Modbus)**Easidew**

Modbus ID	1
System config.	Main unit = °Cdp Pressure unit = psig Pressure source = internal Fixed pressure = 0.00
Alarm config.	AL1 = dp (low = -120.0, high = -40.0) AL2 = dp (low = -120.0, high = -60.0) AL3 = FAULT (low = high = 0.0) AL4 = FAULT (low = high = 0.0)
Input scale	Pressure = 0.0...+100.0
Output config.	OP1 = dp (-120.0...-40.0) OP2 = Pressure (0.0...+100.0) OP3 = ppm _v (ideal) (0.0...+100.0)

Appendix C

Quality, Recycling & Warranty Information

Appendix C Quality, Recycling & Warranty Information

Michell Instruments is dedicated to complying to all relevant legislation and directives. Full information can be found on our website at:

www.ProcessSensing.com/en-us/compliance/

This page contains information on the following directives:

- Anti-Facilitation of Tax Evasion Policy
- ATEX Directive
- Calibration Facilities
- Conflict Minerals
- FCC Statement
- Manufacturing Quality
- Modern Slavery Statement
- Pressure Equipment Directive
- REACH
- RoHS
- WEEE
- Recycling Policy
- Warranty and Returns

This information is also available in PDF format.

Appendix D

Return Document & Decontamination Declaration

Appendix D 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	



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