

# **Cermet II Hygrometer**

## **Users Guide**

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## 1 INTRODUCTION

The CERMET II hygrometer is a continuous, on-line instrument for the measurement of moisture content in a gas over an operating range of -100 to +20 °C dew point and equivalent units (see Technical Specification). Dual alarm relay contacts are provided which are user configurable both in terms of setpoint and operating mode. Current output is standard and factory set at 4 - 20 mA. 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, if required.

Our Humidity Calibration Laboratory is accredited by UKAS for dew-point measurements in the range -90 °C to +82 °C dew point (calibration accreditation number 0179). It is also traceable directly to the National Institute of Standards & Technologies (**NIST**) USA over the range -75 °C to +20 °C dew point. Our full range calibration facility extends from -100 °C to +90 °C dew point.

## 2 PREPARATION

On delivery, please check that all the following standard components are present in the packing box:

- |                                   |                    |                          |
|-----------------------------------|--------------------|--------------------------|
| 1) Monitor - CERMET II hygrometer | 2) Moisture Sensor | 3) Sensor cable assembly |
| 4) Sensor seal                    | 5) Power cable     | 6) Sensor block          |
| 7) Screwdriver                    |                    |                          |

### 2.1 Installing the Monitor

The monitor requires an operating environment of 0 to 50 °C, 0 to 90% RH. The monitor case is designed for panel mounting. However, it can be used as a bench mounted device without any special preparation. For panel mounting, a suitable 92 x 45 mm (DIN 1/8) cutout is required. A minimum depth behind the panel of 140 mm is recommended (see Figure 1. Case Dimensions). The monitor is inserted from the front and secured using the two brackets provided. An optional NEMA 4 cover provides additional front panel protection for harsh environments.

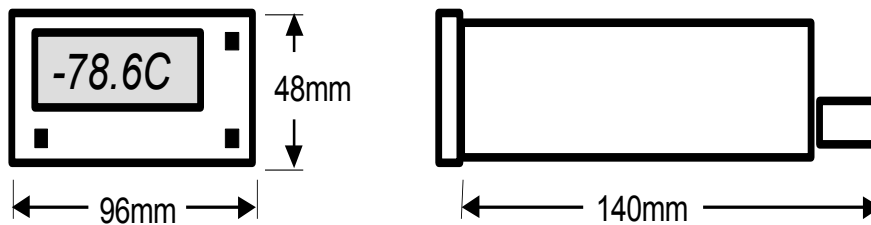


Figure 1 Case Dimensions

### 2.2 Electrical Connections

When the monitor is securely fastened in position, the electrical connections can be made to the back panel.

Figure 2 shows the connections for power, dew-point sensor, alarm relays and analogue output. The exact factory setup of the monitor unit can also be obtained by reference to the tick boxes shown on the connection detail label, which is applied to the monitor case.

#### 2.2.1 Electrical Power

The power supply to the monitor may be one of the following:

- 85-265 V AC 50/60 Hz and 95-370 V DC - **factory default setting**
- 18-36 V AC and 9-60 V DC – **optional**

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

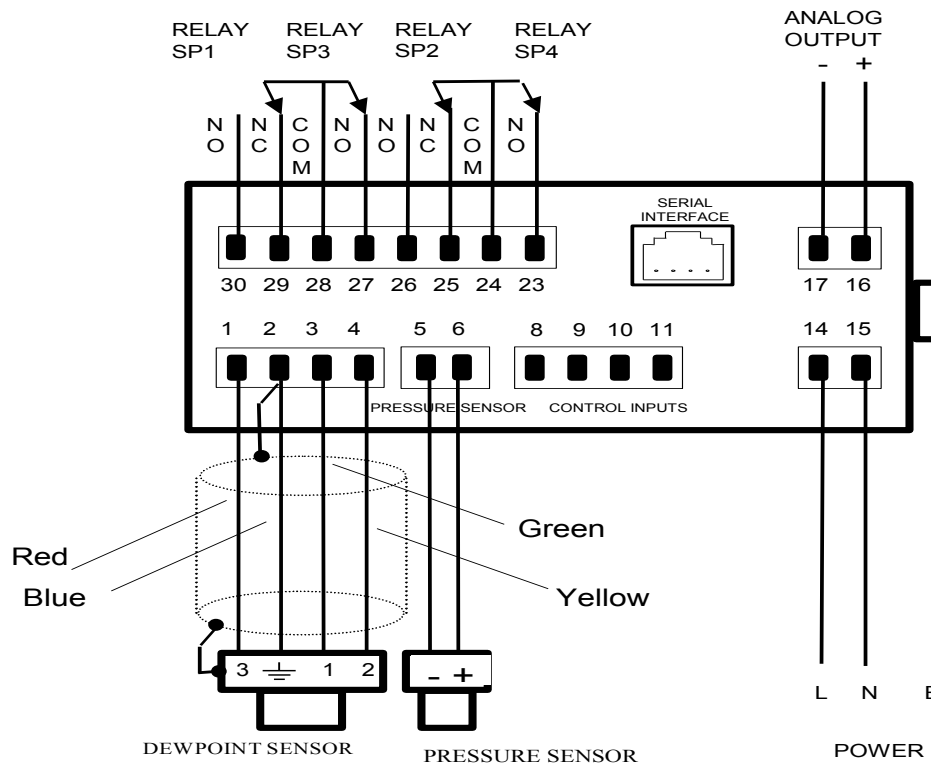


Figure 2 Instrument Wiring Diagram

**2.2.2 Setpoint (Alarm) Relays**

SP1 and SP2 are Form C (single pole, changeover) relay contacts and can be connected as Normally Open (NO) or Normally Closed (NC). Alarm contacts are rated at 10 A for 240 V AC operation or 8 A for 24 V DC (non-inductive load). Additional relays SP3 and SP4 (Optional) have Form A (single pole, normally open) relay contacts and are Normally Open (NO) only. For additional relays, contacts are rated at 5 A for both 240 V AC and 30 V DC operation (non-inductive load). Alarm configuration is detailed in section 3.3.

**2.2.3 Analogue Output**

The monitor as standard provides a 4 to 20 mA linear output over the entire operating range of the instrument for the selected engineering units. The output can be digitally scaled to cover a partial range of the measurement parameter. See **CAL** (under setup codes) in appendix 2.

**2.2.4 Digital Interface**

The monitor is equipped with an RS232 digital interface as standard, or optionally an RS485 digital interface. A 2metre RS232 or RS485 cable, terminated with a 9 way 'D' socket, is available on request.

**2.3 Sensor Cable**

The sensor cable should be connected to the monitor by its four terminated wires as follows:

- Red wire - pin 1
- Blue wire - pin 2
- Yellow wire - pin 4
- Green wire - pin 3

The standard cable length is 2 metres. Longer cable lengths can be supplied on request from Michell. Alternatively, users can provide their own cable but must ensure that it meets the requirements listed under Technical Specifications, see Appendix 1.

**2.4 Dew-point Sensor and Installation**

Remove the protective cap from sensor before installation and retain for future use. The sensor has a 5/8"-18 UNF mounting thread and can be mounted either in its flow-through sensor sampling block or directly inserted to a pipe or duct.

The bonded seal provided is designed for operation at pressures up to 40 MPa when the sensor is fitted using the 5/8" -18 UNF mounting thread and should be placed over the sensor before it is screwed into the sampling location. Fully tighten the fitting using a spanner of the correct size to a **minimum torque of 30.5Nm.**

A high integrity stainless steel sampling block is supplied as standard. When connected to a stainless steel tubing system, the sensor and sampling block need no additional support. However, should PTFE tubing be used, it may be necessary to secure the sampling block using a suitable spring clip or clamp. Michell recommend a gas flow rate of 1 to 5 litres/minute when the sensor is mounted in the standard sampling block. For direct insertion applications, gas flow can be from static to 10 metres / second.

### 3 INSTRUMENT SETUP

**NOTE:** 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)

- Changing display brightness
- Monitoring setpoint values

#### Advanced (Access to programming codes)

- Advanced setpoint programming
- Analogue output calibration and scaling
- Auxiliary (optional) channel setup
- Setting the engineering units
- Sensor connection fault relay setup
- Other related advanced functions

#### 3.1 Setup Security Feature

To prevent unauthorised access, the monitor has two DIP-switches that can be accessed by removal of the faceplate (refer to Figure 3). The ON position protects that mode, OFF makes alterations possible. The SETPOINT LOCKOUT switch (SW1) enables or disables Setpoint Programming. The PROGRAM LOCKOUT switch (SW2) enables or disables Code Programming mode.

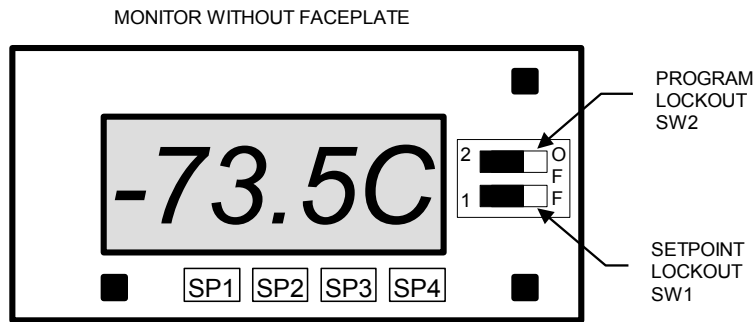


Figure 3 Location of the LOCKOUT Switches.

#### 3.2 Selecting the Engineering Units

Enter the PROGRAM UNLOCK mode (section 3.1), press **SETUP** and  $\uparrow$  to scroll through the menus.

The monitor can display Dew point in °C or °F, PPM(V), LB/MMSCF or g/m<sup>3</sup> (Natural Gas). The selection of these units is achieved by setting CODE 4 and CODE 7 as shown below:

Required Display Unit	CODE 7	CODE 4
Dew point in °C	000	207
Dew point in °F	000	217
PPM(V)	100	-
LB/MMSCF	200	-
g/m <sup>3</sup> (Natural Gas)	300	-

To set the range and resolution for PPM(V), LB/MMSCF and g/m<sup>3</sup>, set digit 3 of CODE 7 to :-

**0**    1 – 9999    **1**    0.1 – 999.9    **2**    0.01 – 99.99    **3**    0.001 – 9.999

For example, by setting CODE 7 to 102, displays PPM(V) with a resolution of 0.01 to a maximum of 99.99. Should the measured value exceed 100 PPM(V) with this setting, oVER will be displayed.

### 3.3 Changing the Setpoint Values

(Enter the SETPOINT UNLOCK mode as described in 3.1)

Press **SETUP** and ↓ simultaneously to access. The setpoints of the relays are altered by setting **SP\_n** (where n = 1 to 4 and represent SP1 to 4), to the required trip level. These are entered directly in the appropriate engineering units. When displaying PPM(V), then the setpoints are set in PPM(V) units.

The full matrix of codes for alarm configuration can be seen in Appendix 2, Setpoint control.

### 3.4 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 to scroll the features press ↑ or ↓.

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

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

The setpoint can have four different delay types:- **NorM** (normal), **rEPt** (repeat), **1Shot**, and **PuLSE**.

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

### 3.5 Analogue Output Scaling

(Enter the PROGRAM UNLOCK mode as described in 3.1)

Press **SETUP** then ↑, then **SETUP** again. Now use ↑ and ↓ to scroll through to the CAL menu. The analogue 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). To exit the CAL menu press **SETUP**, set CAL to 000 and use ↑ to scroll through the menus. See Appendix 2 for more information on output scaling options.

### 3.6 Display Brightness Adjustment

To adjust the display brightness press **SETUP** and ↑ buttons simultaneously, the display toggles between [bri] and [5], where 5 is default setting. Adjust the display brightness required (from 0 to 7) by using ↑ or ↓ buttons. Press **SETUP** several times to exit the programming mode.

### 3.7 Digital Communications

The monitor is fitted with ASCII RS232 communication interface as standard (RS485 optional). The communication settings can be found by setting CAL to 100, then, press the **SETUP** button once and then ↑ and ↓ to change the baud rate. Baud rates are 300, 600, 1200, 2400, 4800, 9600, 19,200 and 57.6 K. Press the **SETUP** button again to advance to the parity bit and then ↑ and ↓ to Change the parity bit. Parity settings are odd, even or off. Press the **SETUP** button again to advance to the address settings. Address settings are 0 to 255. Note, address 0 is not a valid RS485 address. Press the **SETUP** button again to return to CAL.

The default communication configuration is:

**Baudrate** 9600 **Data bits** 8 **Parity** none **Flow control** none

The commands used to read and write to the monitor follow the protocol shown below:

- 1) **Start Character** "s" or "S" for the start character (must be first character in string).
- 2) **Meter Address** An ASCII number from "0" to "255" for the meter address.
- 3) **Read/Write** The next character must be an ASCII "R" or "r" for read, or an ASCII "W" or "w" for write. Any other character will abort the operation.

- 4) **Register Address** The register address for the read/write operation is specified next. It can be either an ASCII number from "0" to "255" or registers 1 - 18 can be accessed by entering an ASCII letter from "A" to "R" (or "a" to "r", not case sensitive). If the address character is omitted in a read command, the meter will always respond with the data value currently on the display. (The register address must be specified for a write command).

For a full list of the register, that can be read or written to, see Appendix 6.

- 5) **Separator** After the register address in a write command, the next character must be something other than an ASCII number. This is used to separate the register address from the data value. It can be a space or a "," or any other character except a "\$" or a "\*".
- 6) **Data Value** After the separator character, the data value is sent. It must be an ASCII number in the range of "-32766" to "32766".
- 7) **Terminate** The last character in the message is the message terminator and this must be either a "\$" or a "\*". If the "\$" is used as a terminator, a minimum delay of 50mS is inserted before a reply is sent. If the "\*" is used as a terminator, a minimum delay of 2mS is inserted before a reply is sent. (the "\$" and "\*" characters must not appear anywhere else in the message string).

#### 4 PRESSURE COMPENSATION

(Enter the PROGRAM UNLOCK mode as described in 3.1)

The monitor has the ability to measure pressure in order to provide a pressure compensated value for PPM(V), LB/MMSCF or g/m<sup>3</sup>.

##### 4.1 Using a Pressure Transducer

In order to enable the use of a pressure transducer set CODE 4 to 307 (dual channel mode), by pressing **SETUP** and  $\uparrow$  to scroll through the menu's. If you wish to display Dew point whilst measuring pressure, then set CODE 4 to 307 to show Dew point in °C or 317 for °F. To display pressure in PSIG set CODE 6 to 000, or set CODE 6 to 100 to display in BARG.

##### 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.

$$\begin{aligned} \text{SCA\_2} &= 0.0062 \text{ per } 100 \text{ PSIG} \\ \text{OFF\_2} &= \text{pressure range} - ((20,000 \times (\text{pressure range} \setminus 1000)) \setminus 16) \end{aligned}$$

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

$$\begin{aligned} \text{SCA\_2} &= 0.0062 \times 10 &= \mathbf{0.0620} \\ \text{OFF\_2} &= 1000 - ((20,000 \times (1000 \setminus 1000)) \setminus 16) &= \mathbf{-250} \end{aligned}$$

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: -

$$\begin{aligned} \text{SCA\_2} &= 0.0062 \times 14.5 &= \mathbf{0.0899} \\ \text{OFF\_2} &= 1450 - ((20,000 \times (1450 \setminus 1000)) \setminus 16) &= \mathbf{-362} \end{aligned}$$

To exit the CAL menu, set CAL to 000 and press  $\uparrow$  to scroll through the menus.

##### Automatic Pressure Input Calibration

Alternatively, the pressure input can be calibrated using a 4 to 20 mA source. To do this, connect the current source between pin 2 (-ve) and pin 5 (+ve).

Set CAL to 022 and press **SETUP**. The monitor will then display ZERo and flash 0. Set the mA source to 4.0 mA and press **SETUP** to set 0 at 4 mA. Press **SETUP** and the monitor will display SPAn and flash the full scale pressure value. Set the mA source to 20.0 mA and use the  $\uparrow$  &  $\downarrow$  buttons to set the required pressure range. Then press **SETUP** to set the required pressure for 20.0 mA. Set CAL to 000 and press  $\uparrow$  to leave the menus.

## 4.2 Using a Fixed Pressure Input in Single Channel Mode

In order to display pressure compensated values of PPM(V), LB/MMSCF and  $\text{g/m}^3$  without the use of a pressure transducer, enter the pressure value manually. Enter the PROGRAM UNLOCK mode. Use **SETUP** and  $\uparrow$  to scroll through the menus and select code 7. Select the required pressure compensated value, i.e. CODE 7 = 1xx for ppmV, 2xx for lbmmscf or 3xx for  $\text{g/m}^3$ , and CAL = 052. Exit the menus and exit the PROGRAM UNLOCK MODE. Press **SETUP** for two seconds, and the display will show the set pressure. To change the pressure, use  $\uparrow$  and  $\downarrow$  and then press **SETUP**.

## 4.3 Pressure Transducer Connection

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 transmitter to pin 6 of the monitor, (-) of the transmitter to pin 5 of the monitor. Refer to Figure 2 for details.

## 5 OPERATION

Operation of the CERMET II hygrometer is very simple assuming that sensible precautions are taken to protect the sensor from damage.

### 5.1 Sampling Hints

Be Sure the Sample is Representative of the Gas Under Test: The sample point should be as close to the critical measurement point as possible. Also, never sample from the bottom of a pipe – entrained liquids may be drawn into the sensor.

Minimise Dead Space in Sample Lines: Dead space in sample lines causes moisture entrapment points, increased system response times or measurement errors as the trapped moisture is released into passing sample gas causing an increase in partial vapour pressure.

Remove Any Particulate Matter or Oil from the Gas Sample: Particulate matter at high velocity can damage the sensor. Similarly, at low velocity, they may "blind" the sensor and reduce its response speed. If particulate, such as degraded desiccant or pipe scale and rust, is likely to be present in the sample gas, use a particulate in-line filter. Michell technical sales will be happy to give advice.

Use High Quality Sample Tube and Fittings: We recommend that, wherever possible, stainless steel tubing and fittings be used. This is particularly important at low dew point since other materials have hygroscopic characteristics and adsorb moisture on the tube walls, slowing down response and, in extreme circumstances, giving false readings. For temporary applications, or where stainless steel tubing is not practical, use high quality thick-walled PTFE tubing

### 5.2 Which Gases to Measure?

The CERMET II Hygrometer is suitable for measurement of the moisture content of a wide variety of gases. In general, if the gas (in conjunction with water vapour) is not corrosive to Ceramics or base metals then it will be suitable for measurement by the CERMET II Hygrometer.

## 6 MAINTENANCE

Routine maintenance of the CERMET II Hygrometer is confined to regular re-calibrations. This work can only be done by exposure of the moisture sensor to sample gases of known moisture content. Calibration services traceable to the National Physical Laboratory (UK), 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 CERMET II hygrometer is maintained. Ceramic sensors are fully interchangeable with hygrometers. Sensor interchangeability is also not affected by sensor cable length; therefore, this method of maintaining calibration can be used for all sensor installations. For applications where the CERMET II hygrometer is not required for continuous operation, re-calibration of CERMET II hygrometer can be achieved by return of the complete instrument - monitor, sensor and interconnecting cable - to Michell Instruments.



**APPENDIX 1 TECHNICAL SPECIFICATIONS****Monitor**

<b>Display:</b>	5 digit LED
<b>Measurement Ranges:</b>	-100 to +20 °C dew point; -148 to +68 °F dew point; 0 to 9999 PPMV, 0 to 1000 LB/MMSCF, g/m <sup>3</sup> (Natural Gas).
<b>Pressure input channel:</b>	4-20 mA input scaleable to any engineering units.
<b>Electronic accuracy:</b>	Dew point ±0.5 °C, ±1.0 °F; PPMV ±1% of reading; LB/MMSCF ±1% of reading; secondary channel ±0.5% FS.
<b>Outputs:</b>	4-20 mA as standard or 0-20 mA optional (max load 500 ohms) or 0-10 V optional (min load 5 K ohms), scaleable by user.
<b>Alarm Relays:</b>	<u>Standard:</u> 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. <u>Optional:</u> 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.
<b>Operating environment:</b>	0 to +50 °C, 0 to 90% RH
<b>Power supply:</b>	<u>Standard:</u> 82-265 V AC, 50/60 Hz or 95-370 V DC <u>Optional:</u> 18-36 V AC or 9-60 V DC
<b>Power consumption:</b>	Max 10 Watts.
<b>Power connection:</b>	2 metre, 3 wire.
<b>Weight:</b>	0.6 Kg.
<b>Sensor cable:</b>	Copper braid screened cable; 4 core 7/0.2 (0.22mm <sup>2</sup> ), stranded, tinned copper conductors, PVC, insulated, Melinex taped, Black PVC outer. Fitted with sensor connector and terminations for monitor. Max length 1000 metres.
<b>Environmental protection:</b>	IP54 / NEMA 12. Optional protection cover to IP66 / NEMA 4.

**Sensor**

<b>Type:</b>	Michell Ceramic Sensor.
<b>Sensor Torque Loading:</b>	Minimum 30.5 Nm
<b>Calibration range:</b>	-100 to +20 °C dew point.
<b>Interchangeability:</b>	Fully interchangeable sensors.
<b>Dew-point Accuracy:</b>	±2.0 °C between -60 & -100 °C, ±1.0 °C between +20 & -59 °C
<b>Gas temperature:</b>	-40 to +60 °C
<b>Operating environment:</b>	-20 to +50 °C
<b>Storage temperature:</b>	-40 to +75 °C
<b>Temperature coefficients:</b>	Temperature compensated.
<b>Operating pressure:</b>	10 <sup>-6</sup> Bar vacuum to 40 MPa.
<b>Flow rate:</b>	1 to 5 litres/minute mounted in standard sampling block 0 to 10 metres/second direct insertion (80µm sintered guard)
<b>Traceable certification:</b>	-90 to +82 °C dew point traceable to the <b>National Physical Laboratory</b> ; -75 to +20 °C dew point traceable to <b>NIST (USA)</b> [For dew points < -90 °C: Direct reference to a fundamental cooled mirror dew point meter]
<b>Environmental protection:</b>	NEMA 4 / IP66.
<b>Weight:</b>	0.15 Kg

**APPENDIX 2 SETUP codes****CAL Calibration modes for input and output DEFAULT VALUE = 052**

Digit	1 <sup>st</sup> digit (left most) Calibration Mode	2 <sup>nd</sup> digit Calibration function	3 <sup>rd</sup> digit Object for calibration
0	Calibration functions as per 2 <sup>nd</sup> and 3 <sup>rd</sup> digit	No function	No function
1	Set baud rate, parity and serial address	Manual calibration (channel as per 3 <sup>rd</sup> digit)	Processed result (dew point, ppmV, lb/mm <sup>3</sup> scf, g/m <sup>3</sup> )
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	Analogue output scaling (analogue channel as per 3 <sup>rd</sup> digit)	N/A

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

Digit	1 <sup>st</sup> digit (left most) Additional LED's	2 <sup>nd</sup> digit Display data source	3 <sup>rd</sup> digit 0 only (no function)
0	LED annunciators are always off	Processed data - result (dew point, ppmV, lb/mm <sup>3</sup> scf, g/m <sup>3</sup> )	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 analogue output source DEFAULT VALUE = 000**

Digit	1 <sup>st</sup> digit (left most) Serial Mode	2 <sup>nd</sup> digit Analogue output 1 source	3 <sup>rd</sup> digit 0 only (no function)
0	Ascii mode	Analogue output 1 from processed result data (dew point, ppmV, lb/mm <sup>3</sup> scf, g/m <sup>3</sup> )	N/A
1	N/A	Analogue output 1 from processed data (dew point only)	N/A
2	N/A	Analogue output 1 from processed data (pressure)	N/A

**CODE 4 – Channel 1 Measurement task, sampling rate DEFAULT VALUE = 207**

Digit	1 <sup>st</sup> digit (left most) Analogue sample rate	2 <sup>nd</sup> digit Analogue output 1 source	3 <sup>rd</sup> 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 (50Hz)	N/A	N/A
3	Dual channel (50Hz)	N/A	N/A

**CODE 6 – Channel 2 Measurement task DEFAULT VALUE = 000**

Digit	1 <sup>st</sup> digit (left most) Measurement task	2 <sup>nd</sup> digit 0 only (no function)	3 <sup>rd</sup> 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	1 <sup>st</sup> digit (left most) Measurement task	2 <sup>nd</sup> digit 0 only (no function)	3 <sup>rd</sup> digit Range for result
0	Dew point	N/A	1 – 9999
1	PPMV	N/A	1 – 999.9
2	LB/MMSCF	N/A	0.01 – 99.99
3	g/m <sup>3</sup> (Natural Gas)	N/A	0.001 – 9.999

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

Digit	1 <sup>st</sup> digit (left most) Relay sense	2 <sup>nd</sup> digit Setpoint source	3 <sup>rd</sup> digit Setpoint function for SP1 – SP4
0	Relay energized above setpoint value	Processed result data (dew point, ppmV, lb/mmscf, g/m <sup>3</sup> )	No function
1	Relay energized below setpoint value	Dew point only	Relay latched
2	N/A	Pressure	De-energized relay
3	N/A	Open sensor connection	N/A
4	N/A	Open / short circuit sensor	Relay off for open sensor connection
5	N/A	Open / short circuit thermistor	Relay on for open sensor connection
6	N/A	All sensor faults	Relay toggles at 1Hz for sensor connection fault
7	N/A	N/A	Setup hysteresis, make/break delay and delay type

**APPENDIX 3 RECYCLING**

Michell Instruments Limited 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. The product you have purchased may contain recyclable and/or recycled parts and we will be happy to provide you with information on these components should you desire it.

**APPENDIX 4 Hazardous Products**

The Consumer Protection Act 1987, Section 6 of the Health and Safety at Work Act 1974 and the Control of Substances Hazardous to Health Regulations 1988, require that we advise the recipients and users of our products of any potential hazards associated with their storage, handling or use. The product detailed in this manual and all of our other products are not hazardous to health when stored and used within the technical and environmental limitations specified in our relevant catalogue or specification sheet. Should you require any further specific information regarding individual components of this product, please contact our Technical Sales Department.

**APPENDIX 5 WEEE and RoHS**

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

Michell Instruments are aware of the WEEE and RoHS Directives, and have investigated their requirements. 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 also progressing towards full compliance with the WEEE Directive. In the short term this will result in additions to product labelling, though in the long term customers may be required to return certain instruments for treatment at the end of their working life.

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**APPENDIX 6 Register Settings Accessible by Digital Communication**

<b>Register number</b>	<b>Function</b>	<b>Read only</b>
1	Alarm Status	
2	N/A	
3	Processed Data – Result	4
4	Processed Data – Channel 1 (dew-point)	4
5	Processed Data – Channel 2 (pressure)	4
6	Setpoint 1	
7	Setpoint 2	
8	Setpoint 3	
9	Setpoint 4	
10 to 23	N/A	
24	Scale Value – Result	
25	Scale Value – Channel 1	
26	Scale Value – Channel 2	
27	Offset Value – Result	
28	Offset Value – Channel 1	
29	Offset Value – Channel 2	
30 to 33	N/A	
34	D/A Zero – Analogue O/P 1	
35	N/A	
36	D/A Full Scale – Analogue O/P 1	
37 to 64	N/A	
65	Hysteresis - Setpoint 1	
66	Hysteresis - Setpoint 2	
67	Hysteresis - Setpoint 3	
68	Hysteresis - Setpoint 4	
69 to 70	N/A	
71	Make Delay - Setpoint 1	
72	Make Delay - Setpoint 2	
73	Make Delay - Setpoint 3	
74	Make Delay - Setpoint 4	
75 to 76	N/A	
77	Break Delay - Setpoint 1	
78	Break Delay - Setpoint 2	
79	Break Delay - Setpoint 3	
80	Break Delay - Setpoint 4	
81 to 128	N/A	
129	Cal Mode	
130	Code 1	
131	Code 2	
132	Code 3	
133	Code 4	
134	Code 5	
135	Code 6	
136	Code 7	
136	Code 8	
138 to 141	Reserved	
142	Setpoint 1 Control Register	
143	Setpoint 2 Control Register	
144	Setpoint 3 Control Register	
145	Setpoint 4 Control Register	
146 to 147	N/A	
148	Brightness	
149	Baudrate Settings	
150	Serial Address	

Register Settings Accessible by Digital Communication cont.

<b>Register number</b>	<b>Function</b>	<b>Read only</b>
151 to 152	N/A	
153	Model Number	4
154	Version Number	4
155 to 192	N/A	
193	Delay Type – Setpoint 1	
194	Delay Type – Setpoint 2	
195	Delay Type – Setpoint 3	
196	Delay Type – Setpoint 4	

## **APPENDIX 7    Michell Instruments Contact Details**

### **Customer Service**

For advice on this, or any other Michell Instruments product, please feel free to contact us via our Web Site: [www.michell.com](http://www.michell.com).

**APPENDIX 8 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

**Cermet II On-Line Hygrometer**

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

**EN55022:1998**

**Limits and methods of measurement of radio disturbance characteristics of information technology equipment.**

**EN 61000-6-3:2007**

**Electromagnetic compatibility (EMC) Part 6-3: Generic standards - Emission standards for residential, commercial and light-industrial environments.**

following the provisions of

**2004/108/EC**

**EMC Directive**



Andrew M.V. Stokes, Technical Director

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