MICHELL Instruments

ES70
Sampling System
User's Manual

97506 Issue 1
December 2017

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

Use this information when contacting Michell Instruments for service purposes.

Instrument	
Code	
Serial Number	
Invoice Date	
Location of Instrument	
Tag No	

Instrument	
Code	
Serial Number	
Invoice Date	
Location of Instrument	
Tag No	

Instrument	
Code	
Serial Number	
Invoice Date	
Location of Instrument	
Tag No	

ES70
Sampling System

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

Contents

Figures

Appendices

Safety

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

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

Electrical Safety

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

Pressure Safety

DO NOT permit pressures greater than the safe working pressure to be applied to the instrument. Refer to Appendix A, Technical Specifications.

Toxic Materials

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

Repair and Maintenance

The instrument must be maintained either by the manufacturer or an accredited service agent. Refer to www.michell.com for details of Michell Instruments' worldwide offices contact information.

Safety Conformity

This product meets the essential protection requirements of the relevant EU directives.

Abbreviations

The following abbreviations are used in this manual:

AC	alternating current
barg	pressure unit (=100 kP or 0.987 atm)
ºC	degrees Celsius
ºF	degrees Fahrenheit
DC	direct current
dp	dew point
Hz	Hertz
kg	kilogram(s)
lb	pound
Nl/min	normal liters per minute
mA	milliampere
max	maximum
min	minute(s)
%	percentage
psig	pounds per square inch
scfh	standard cubic feet per hour
temp	temperature
V	Volts
W	Watts
Ω	Ohms

Warnings

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

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

1 INTRODUCTION

Michell Instruments designs and manufactures a broad range of sampling systems for a wide spectrum of industries and processes from the economical compressed air market to the oil and gas process market.

Sample extraction, handling and conditioning techniques are of critical importance to assure optimal performance and reliability of all analysers which accurately quantify specific components within a process gas or liquid composition. With a wide variety of options required for pressure and flow control, filtration, isolation and sample temperature control it can be difficult to see what is really required to get maximum performance from your analysers in any given application.

The ES70 series is designed to simplify sample system configuration by providing a set of choices for all requirements, such as panel or enclosure mount, filtering, upstream and downstream pressure and flow control etc. This provides a quick and simple method to choose all the required components suitable for the application requirements.

1.1 Materials

To ensure continuous and reliable dew-point or moisture measurement it is important that the dew-point transmitter is exposed to stable conditions of the gas to be monitored.

The ES70 systems utilizes high quality materials which ensure that the sample gas travels smoothly through the system.

Gas wetted parts:

- Stainless steel tube, filter housing and fittings (316 stainless steel)
- Filter element (oleo-phobic membrane or stainless steel mesh)
- Single- or dual-stage pressure reduction
- Transmitter sample block (316 stainless steel)
- Flowmeter (borosilicate glass) with Viton® seals or high-pressure rated armored type

1.2 System Designs

Our sampling system designs ensure that dew-point and moisture measurements can be performed in the most suitable conditions. The ES70 sampling systems can be supplied in various configurations and are designed to be used in conjunction with other Michell products, as follows:

- Easidew PRO XP Transmitter
- Easidew PRO I.S. Transmitter (with or without display)
- Promet I.S. (with or without pressure transmitter)
- Liquidew I.S.

Process connections are available with either 6mm or 1/4" tube fittings.

1.3 Filtration and Fast Loop

If the sample contains impurities it is crucial to remove the contaminants before they reach the sensing device. A fast-loop bypass flow arrangement can also be included to reduce sample flow response time lag and to enable the filter to be drained automatically of any potential hydrocarbon liquids and hydrates formed. The ES70 system can be supplied with various filtration and fast loop options;

- Particulate Filter: 5 micron Stainless Steel Mesh
- Coalescing Filter with manual drain
- Combined coalescing/oleophobic membrane with continuous drain flow (fast loop) - with Single Stage Regulation & Glass tube (20 barg rated) or Armoured flow meter (138 barg rated) with integral flow metering valve.
- Combined coalescing/oleophobic membrane with continuous drain flow (fast loop) - with Two Stage Regulation & Armoured flow meter (138 barg rated) with integral flow metering valve

1.4 Pressure / Flow Control and Measurement

Various options are available for management of pressure and flow within the sampling system;

- Upstream and Downstream, single stage or two stage pressure regulation, with a choice of gauges.
- Downstream flow metering with a choice of glass tube or armoured flow meters.

1.5 Mounting Variants

Depending on the application the sampling system can be supplied in 3 variations:

- Mounted on an open panel for indoor systems
- Mounted in an Outdoor Enclosure, IP66/NEMA4X rated, with window, 304 grade stainless steel
- Mounted in an Outdoor Enclosure, IP66/NEMA4X rated, with window, 316 grade stainless steel

1.6 Enclosure Environmental Control

Sampling systems fitted within enclosures may need heating to maintain a constant temperature environment of at least 10oC above the highest envisaged dew point temperature independent of surrounding temperature variations. Similarly, the enclosure may require cooling when ambient temperatures rise in summer months.

- Electrical heating with a choice of 20°C or 40°C set-point thermostats.
- Vortex Cooling with thermostat control (instrument air required) recommended for climates exceeding 45°C.
- Trace heated sample tubing is available as a factory supplied option.

2 INSTALLATION

2.1 Sampling System Installation

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

Relevant sections of this manual must be read in full before commencing measurement (see below).

2.1.1 Mounting Details

The ES70 base plate or enclosure is designed to be wall-mounted. It should be rigidly mounted vertically in a position free from high vibration levels and shaded from direct sunlight.

Dimensional drawings are shown in Appendix A

2.1.2 Gas Connections

Gas connections to the ES70 are via 6mm or ¼" Swagelok® tube fittings located at the base of the mounting plate or enclosure.

Connections are marked as follows:

GAS IN Sample gas entry point with a maximum supply pressure of 138 barg (2,000spig)

GAS OUT Sample gas exit point for connection to atmospheric vent or flare (up to maximum 3 barg)

Care must be taken to ensure that the outlet isolation valve is not fully closed.

2.1.3 Electrical Connections

All cables to or from the sampling system should go through the M20 plastic cable gland provided at the base of the enclosure.

3 OPERATION

3.1 Sampling Start-Up Procedure

The ES70 sampling system is designed for continuous operation.

Immediately after the power is applied, the dew-point transmitter will begin operation and all output signals will be live.

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

Relevant sections of this manual must be read in full before commencing measurement (see below).

3.2 Sample Flow 'Start-Up' Procedure

Refer to 'As Built' drawings for actual pressure and flow values.

Proceed as follows:

1. Ensure the outlet isolation valve is fully **CLOSED**.
2. Open the inlet isolation valve slowly, making sure that the pressure indicated on the pressure gauge does not exceed the maximum operational pressure. If achievable, ensure that the inlet isolation valve is fully **OPEN**.
3. Adjust the outlet isolation valve, setting the sample gas flow rate to the value shown on the system flow diagram.
4. Allow the sample gas to purge the system for the period of time indicated in the Good Measurement Practice Section (Stabilization Times).

4 GOOD MEASUREMENT PRACTICE

The ES70 is designed to operate in a flowing gas stream and is suitable for the measurement of the moisture content of a wide variety of gases. In general, if the gas (in conjunction with water vapor) is not corrosive to ceramics or base metals then it will be suitable for measurement by the ES70.

The system is designed for operation with sample gas flow rates of 1-5 Nl/min (sample block). Ideally, the flow rate should be set-up between 4 and 6 Nl/min. Flow regulation is provided within the ES70. Always use high quality valve gear, coupling connections and pipework.

The system will operate successfully at flow rates within its operational range and it is important to ensure that the flow rate through the sample block is high enough to avoid long time lags in response to humidity changes at the sample source.

Avoid pressure gradients in the system by placing excessive flow restriction on the output side of the sample block. In applications where the test gas has a very high flow rate, an instrument by-pass arrangement is preferable to flow restriction after the transmitter.

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.

An excessively high flow rate can:

- Introduce back pressure, causing slower response times potential changes in expected dew point.

Stabilization Times

Ensure that the system has sufficient time to stabilize before taking any readings. Typically the system should be allowed at least 24hrs to stabilize, but for measurements below -60°C dew point, up to 5 days should be allowed for the system to reach total equilibrium with the sample, given the very low moisture contents involved.

5 MAINTENANCE

5.1 General Maintenance Guidelines

Routine maintenance of the sampling system is confined to filter element replacement and regular recalibration of the dew-point transmitter.

5.2 Filter Element Maintenance

The composition of the gas determines the frequency of the filter element replacement, i.e. liquid and particulate contaminates, corrosive elements etc.

A disposable filter element continues to filter at its original efficiency as long as it is kept in service. The life of the element is determined by the increase in flow resistance caused by trapped solids in the element. The element should be changed when the flow falls below an acceptable level, or the pressure drop becomes too high. In any case the element should be replaced before the pressure drop across it reaches 0.7 barg (10.2 psig). The disposable filter elements cannot be cleaned as the solids are trapped within the depth of the element not on the surface.

5.2.1 Particulate Filter Maintenance

To replace the particulate filter element proceed as follows:

1. Isolate any gas supplies to the sampling system.

NOTE: Wear protective gloves when handling the filter housing.

2. Remove the bowl (1,2), element retainer (3) and filter element (4).

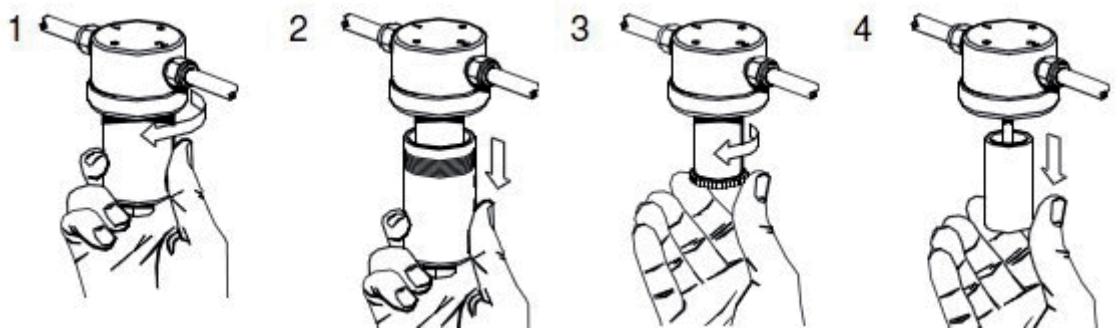

Figure 1 *Particulate Filter Maintenance 1*

NOTE: In order to untighten the bowl a spanner / wrench may be needed.

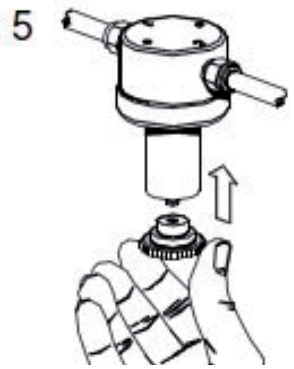

Figure 2 *Particulate Filter Maintenance 2*

Disposable and sintered PTFE filter elements are sealed by compression against a flat surface (5). Gaskets are not required between the filter element and components of the housing. The element is located by guides which fit the inside diameter of the tube at each end.

Figure 3 *Particulate Filter Maintenance 3*

The filter tube is securely sealed by tightening the element retainer a 1/4 to 1 turn after it first contacts the filter element, the amount will depend on the housing type and element size. A mark on the end of the retainer is used as a guide.

3. Before replacing the housing bowl ensure that the mating threads and sealing faces are clean and damage free. It is recommended that the threads and sealing faces are lubricated with a small amount of silicone grease before assembly.

4. Re-connect the tube with its fitting to its original configuration.

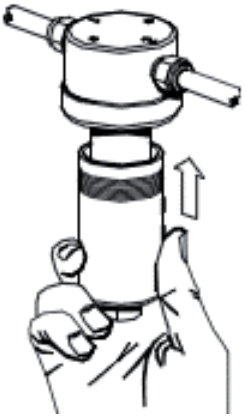

Figure 4 *Particulate Filter Maintenance 4*

5. Resume normal system operation by opening up the gas supplies to the sampling system as described in the relevant section of the Start-up Procedures (Section 3).

5.2.2 Coalescing Filter Maintenance

To replace the coalescing filter element proceed as follows:

1. Isolate any gas supplies to the sampling system.

NOTE: Wear protective gloves when handling the filter housing.

2. Unscrew the couplings (1 and 2) on the picture below

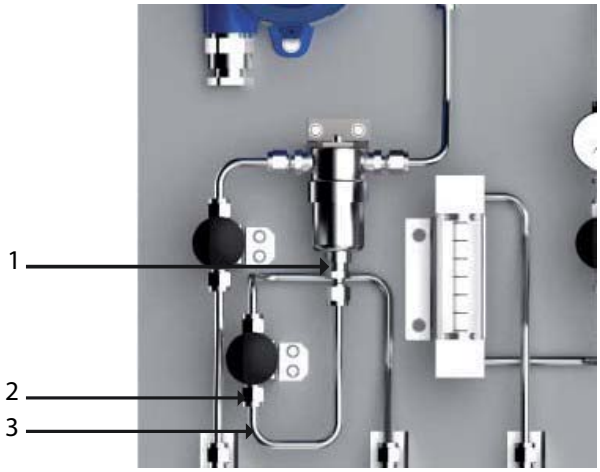

Figure 5 *Coalescing Filter Maintenance 1*

3. Disconnect the tube with its fitting (3).
4. Remove the bowl (1,2), element retainer (3) and filter element (4).

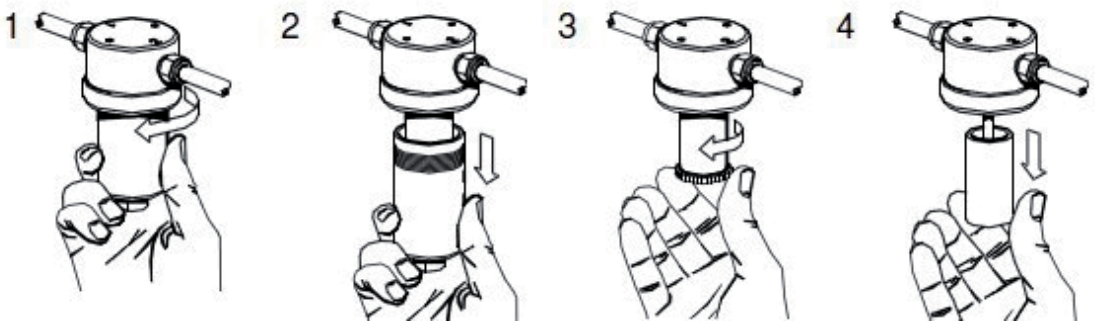

Figure 6 *Coalescing Filter Maintenance 2*

NOTE: In order to untighten the bowl a spanner / wrench may be needed.

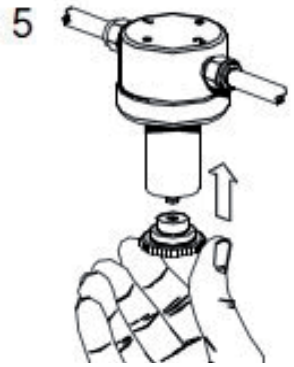

Figure 7 *Coalescing Filter Maintenance 3*

Disposable and sintered PTFE filter elements are sealed by compression against a flat surface (5). Gaskets are not required between the filter element and components of the housing. The element is located by guides which fit the inside diameter of the tube at each end.

Figure 8 *Coalescing Filter Maintenance 4*

The filter tube is securely sealed by tightening the element retainer a 1/4 to 1 turn after it first contacts the filter element, the amount will depend on the housing type and element size. A mark on the end of the retainer is used as a guide.

5. Before replacing the housing bowl ensure that the mating threads and sealing faces are clean and damage free. It is recommended that the threads and sealing faces are lubricated with a small amount of silicone grease before assembly.

6. Re-connect the tube with its fitting to its original configuration.

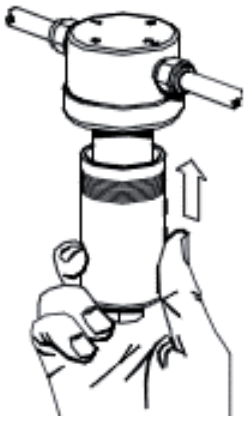

Figure 9 *Coalescing Filter Maintenance 5*

7. Resume normal system operation by opening up the gas supplies to the sampling system as described in the relevant section of the Start-up Procedures (Section 3).

5.3 Transmitter Maintenance

Calibration

Routine maintenance of the Easidew transmitter is confined to regular re-calibration by exposure of the Easidew to sample gases of known moisture content to ensure that the stated accuracy of the Easidew is maintained. Calibration services traceable to the UK National Physical Laboratory (NPL) and the US National Institute of Standards and Technology (NIST) are provided by Michell Instruments.

Michell Instruments offers a variety of re-calibration and exchange sensor schemes to suit specific needs. A Michell representative can provide detailed, custom advice (for Michell Instruments' contact information go to www.michell.com).

Transmitter replacement

The composition of the gas determines the frequency of the transmitter replacement, i.e. liquid and particulate contaminates, corrosive elements, etc.

It is recommended that the transmitter is changed on an annual basis to maintain the accuracy of the system.

Michell Instruments can provide an exchange transmitter. Prior to recalibration being necessary, an exchange transmitter can be ordered from Michell Instruments or any authorized dealer. Once the transmitter and calibration certificate have been received it can be fitted and the original transmitter returned to Michell Instruments.

To replace the transmitter, proceed as follows:

1. Isolate the sampling system from the sample gas supply and switch off all electrical supplies.
2. Disconnect the wiring from the transmitter and the sample tubes from the sample block. Remove the transmitter and sample block from the sampling system.
3. Remove the sample block from the transmitter.
4. Fit a new/recalibrated transmitter ensuring the bonded seal is positioned between the transmitter and the sample block.
5. Refit the transmitter and sample block to the sampling system and reconnect the sample tubes and transmitter cable (see Sample Block Section of the Easidew PRO XP Manual 97442).
6. Resume normal system operation by opening up the gas supplies to the sampling system in accordance with the relevant section of the Start-up Procedures (Section 3).

Appendix A

Technical Specifications

Appendix A Technical Specifications

Operating Specifications	
Operating Temperature	-15 to +60°C (+5 to +140°F)
Operating Inlet Pressure	Up to 138 barg dependent on configuration
Flow Rate	1 to 5 Nl/min (2.1 to 10.6 scfh)
Mechanical Specifications	
Process Connection and Material	Inlet/outlet connections via 6mm or ¼" stainless steel fittings, 316 stainless steel
Gas Wetted Parts	Stainless steel tube, filter housing and fittings (316 stainless steel), Filter element, Transmitter sample block (316 stainless steel), Flowmeter (borosilicate glass) with Viton® seals
Ingress Protection Indoor Outdoor	 No protection (base plate only) IP66, NEMA 4X
Dimensions Indoor base plate Outdoor SS enclosure	 750 x 750 x 2mm (29.5 x 29.5 x 0.07") (h x w x d) 800 x 800 x 300mm (31.4 x 31.4 x 11.8") (h x w x d)
Pressure and Flow Control	Via isolation valves, pressure gauge and flowmeter
Gas Filtration	Particulate Filter: 5 micron stainless steel mesh or Combined coalescing/oleophobic filter

Dimensions

Indoor

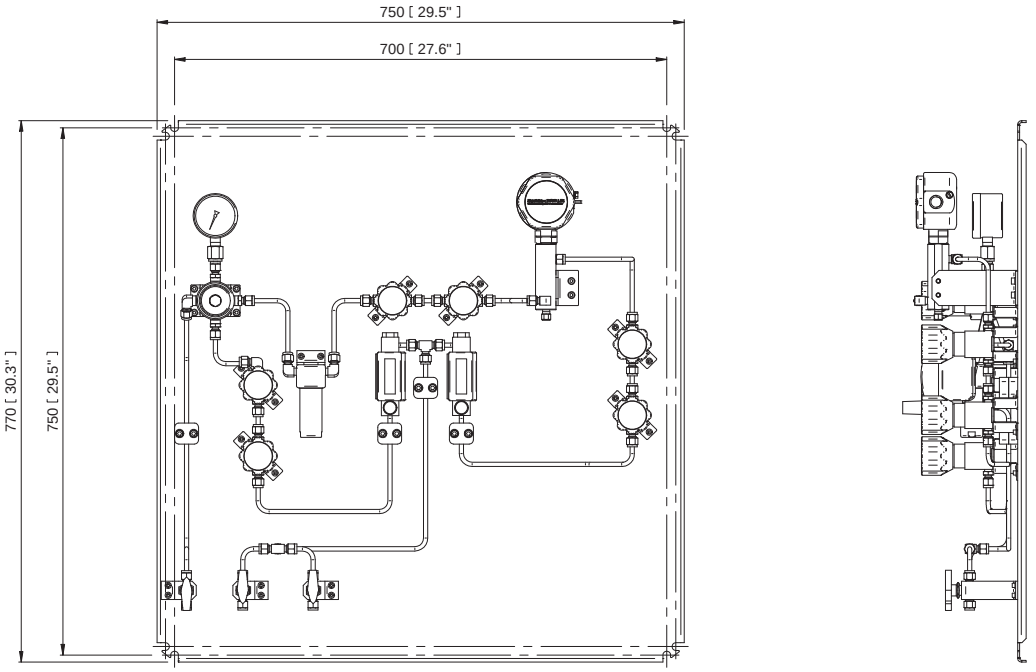

Figure 10 *Indoor Panel Dimensions*

Outdoor

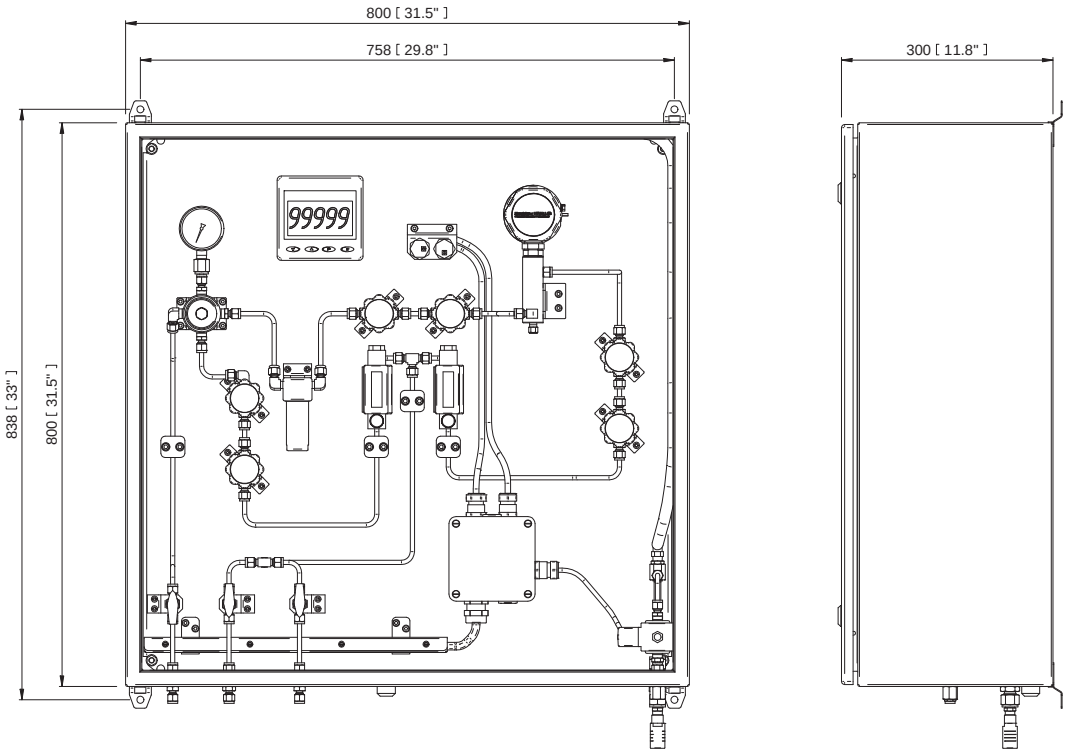

Figure 11 *Outdoor Enclosure Dimensions*

Appendix B

Quality, Recycling & Warranty Information

Appendix B 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.michell.com/compliance

This page contains information on the following directives:

- ATEX Directive
- Calibration Facilities
- Conflict Minerals
- FCC Statement
- Manufacturing Quality
- Modern Slavery Statement
- Pressure Equipment Directive
- REACH
- RoHS2
- WEEE2
- Recycling Policy
- Warranty and Returns

This information is also available in PDF format.

Appendix C

Return Document & Decontamination Declaration

Appendix C Return Document & Decontamination Declaration

Decontamination Certificate

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

Instrument			Serial Number	
Warranty Repair?	YES	NO	Original PO #	
Company Name			Contact Name	
Address				
Telephone #			E-mail address	
Reason for Return /Description of Fault:				

Has this equipment been exposed (internally or externally) to any of the following? Please circle (YES/NO) as applicable and provide details below		
Biohazards	YES	NO
Biological agents	YES	NO
Hazardous chemicals	YES	NO
Radioactive substances	YES	NO
Other hazards	YES	NO
Please provide details of any hazardous materials used with this equipment as indicated above (use continuation sheet if necessary)		
Your method of cleaning/decontamination		
Has the equipment been cleaned and decontaminated?	YES	NOT NECESSARY

Michell Instruments will not accept instruments that have been exposed to toxins, radio-activity or bio-hazardous materials. For most applications involving solvents, acidic, basic, flammable or toxic gases a simple purge with dry gas (dew point <-30°C) over 24 hours should be sufficient to decontaminate the unit prior to return.
Work will not be carried out on any unit that does not have a completed decontamination declaration.

Decontamination Declaration

I declare that the information above is true and complete to the best of my knowledge, and it is safe for Michell personnel to service or repair the returned instrument.

Name (Print)		Position	
Signature		Date	

MICHELL Instruments

F0121, Issue 2, December 2011

NOTES:

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