MICHELL Instruments

DG3
Dew-Point Generator
User's Manual

97032 Issue 11
March 2013

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	

DG3

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

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Safety

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

This manual contains operating and safety instructions, which must be followed to ensure the safe operation and to maintain the equipment in a safe condition. The safety instructions are either warnings or cautions issued to protect the user and the equipment from injury or damage. Use qualified personnel and 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. The input power supply voltage limits are 220/240 V AC, 50Hz or 100/120 V AC, 60Hz depending on what was specified at time of order. **Refer to the yellow label located on the rear panel of the unit for the correct supply voltage required.**

Pressure Safety

DO NOT permit pressures greater than the safe working pressure to be applied to the instrument. The specified maximum gas inlet pressure is 10 barg (145 psig). Refer to the Technical Specifications in Appendix A.

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. Further details of applied standards may be found in the product specification.

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) gauge
°C	degrees Celsius
°F	degrees Fahrenheit
dp	dew point
EU	European Union
Hz	Hertz
Nl/min	normal liters per minute
lb	pound
mm	millimeter
ppm_v	parts per million (by volume)
psig	pound(s) per square inch (gauge)
scfh	standard cubic feet per hour
V	Volts
"	inch(es)

Warnings

The following general warnings listed below are applicable to this instrument. They are 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

The Michell DG3 Dew-point Generator is designed for use as part of a hygrometry calibration system. It is capable of generating dew points over the range -40°C to +20°C at flow rates of up to 5 Nl/min (10.6 scfh) for long periods of time with excellent stability.

The Michell DG3 is based on the volumetric mixing of dry and wet gases. This gives the fastest response when changing between set points when compared to other dew-point generation technologies, such as two-temperature, two-pressure or the combination of both. The wet-dry mixing ratio is controlled by flow metering valves for manual selection of the target dew point.

A dry gas source is fed to the generator from a pressure swing dryer, and split into two streams. One stream is bubbled through liquid water via a sintered glass nozzle ensuring it is completely saturated with water vapor, while the other stream remains dry. The two gas streams are then mixed at atmospheric pressure, in a single stage process to generate the target humidity level. The entire enclosure is insulated and temperature controlled ensuring the saturation, and therefore the output is always consistent.

The generator requires a supply of high quality dry gas with a moisture content of <50 ppm(V), (-48°C dew point), or better, to enable the maximum range of dew points to be generated. A suitable clean dry air supply (or other inert gas) can be provided by the Michell PSD2 Pressure Swing Drier at a constant flow for long periods without maintenance. Bottled air, oxygen or nitrogen can be used providing care is taken as to the integrity of the gas.

As with all humidity generators the DG3 should be used in conjunction with a Michell cooled mirror refrence instrument that is certified with a traceable calibration.

Note on Customization

Often calibration systems and components are customized to the particular requirements of the application at time of order. Throughout this manual we have attempted to highlight the common places where customization occurs, but good judgement and common sense should be exercised during interpretation. Customizations will be shown in the text of the original order or quotation.

2 INSTALLATION

Check that you have received all items listed on the packing check list. If anything is missing please contact our Customer Service Department.

2.1 Environmental Conditions

The DG3 should be used in an conditioned laboratory environment and requires an ambient temperature of +18 to +24°C (+64 to +75°F) for best results.

2.2 Enclosure

The DG3 is designed for 19" rack mounting (12U high) using M6 fixings. However, it can also be bench mounted without any special preparation. When rack mounting, simply screw the front panel to the rack using four M6 x 15mm screws and plastic washers.

2.3 Gas Connections

The generator requires a supply of high quality (oil free) dry gas with a moisture content of <50 ppm_V (<-48°C atmospheric dew point) at a maximum pressure of 10 barg or compressed air to the same specification as used during its setup/calibration. This enables the maximum range of dew points to be generated. A minimum flow of 7 Nl/min (14.8 scfh) is required.

The generator was setup/calibrated using either a Michell PSD2 Pressure Swing Dryer or a specific compressed air supply. A warning label stipulating what the air inlet specification needs to comply with, appears on the rear panel of the generator.

The gas inlet and outlet connections are Swagelok® 6mm stainless steel bulkhead union tube fittings located on the rear panel of the unit marked **GAS IN** and **GAS OUT** - unless otherwise specified at time of order.

2.4 Power Supply Connection

Either 220/240 V AC, 50Hz or 100/120 V AC, 60Hz power supply is required to operate this instrument. Refer to the yellow label located on the rear panel of the unit for the correct supply voltage required.

The power supply connection is via the 3-pin IEC plug located on the rear panel of the unit. A 3-core power cable is provided, the free end of which should be wired to a suitable earthed plug or directly via a fused power spur.

Power cable conductors are colored according to the convention:

Brown	L (Live)
Blue	N (Neutral)
Green/yellow	E (Earth)

3 OPERATION

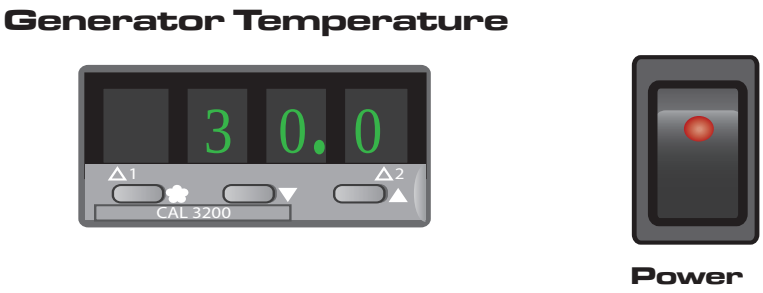
Please take the time to familiarize yourself with this entire section before starting operation.

Check that all connections are in accordance with the installation instructions.

3.1 First Time Operation

Before using the unit for the first time:

1. Fill the saturator with distilled water, according to the instructions in Section 3.2.
2. Switch on the generator via the front panel **POWER** switch.
3. Allow 1 hour for the generator temperature (factory set to 30°C) to stabilize. The generator temperature is controlled via a CAL3200 autotune PID temperature controller and displays the generator temperature.



4. Set **FULL DRY** dew point, according to Section 3.3.2, and allow the system to run for a minimum of 8 hours to purge the system pipework.

3.2 Filling the Saturator

WARNING
This unit operates under pressure. Safety goggles must be worn when filling the saturator.

Isolate the saturator system before attempting filling and subsequent top-ups while the unit is in operation. This is simply achieved by switching the valve marked Saturator On/Off **to the** Off **position**

NOTE: Ensure the level is checked with the unit in operation since water can be siphoned back into the water trap when depressurized, causing a false level to be shown.

1. Before operation, the saturator system must be filled with distilled water. Access to the saturator is through the hinged front panel of the unit. Refer to the diagram below to identify the saturator.
2. Unscrew the red plastic filling port nut and fill with clean distilled water to the level indicated on the label. The water level must be kept above the minimum level and below the maximum level. Replace the filling port nut and close the hinged panel.
3. A visually identical water trap for the saturator is included to prevent the siphoning back of water into the pipework when the wet flow is shut off (depressurized). The water level in the saturator and water trap should be added together when gauging if the generator is sufficiently filled with water. Replace the red filling port cap and close the hinged panel.

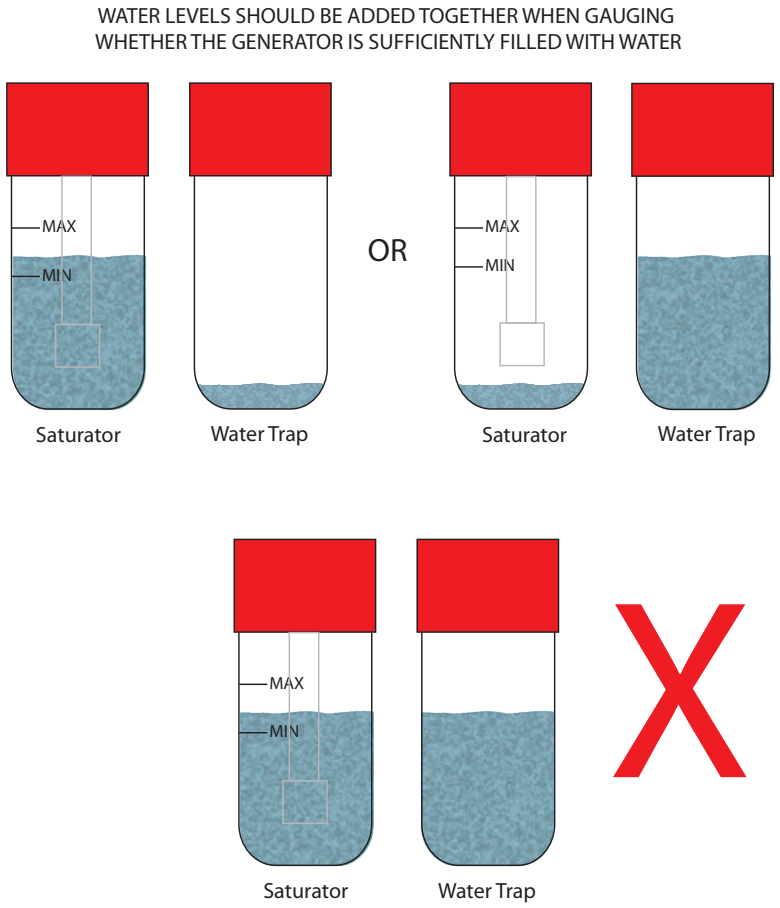


Figure 1 *Water Levels*

Frequency of top-ups is dependent on use and on the dew point being generated. If the generator is operating at high dew points for extended periods of time it may be necessary to fill the saturator more often, and it should be checked every other day.

3.3 General Operation

The pressure of the dry gas supply to the dew-point generator is controlled at 10 psi (factory set) by the pressure regulator fitted inside the generator.

The flow metering valves marked **Dry Flow Valve** and **Wet Flow Valve** control the mixing of wet and dry gas flows to generate the desired dew point. They are fitted with vernier handles to enable the operator to precisely repeat previous settings.

Any dew point can be generated over the range -40 to +20ºC dew point. This is simply achieved by manually adjusting the Dry and Wet Flow Valves located on front panel. A dew-point hygrometer connected to the output of the generator is required to determine the actual dew-point value.

Toggle valves marked **Saturator On/Off** and **Wet Flow On/Off** are provided to shut off the gas supply through the saturator when purging the system with dry gas prior to calibration or when filling the saturator with distilled water.

A toggle valve marked **Dry Flow On/Off** is provided to shut off the dry gas flow preventing any trace of dry gas mixing in the wet flow. For example, when generating purely saturated gas flow (+20°C dew point) and above.

3.3.1 Saturator Control

A ball valve marked **Saturator On/Off** is provided to shut off the gas supply through the saturator when purging the system with dry gas prior to calibration, or when filling the saturator with distilled water.

3.3.2 Full Dry / Purging

When operating for the first time, or after a long period without use, the system tubing should be purged. The procedure for doing this is as follows:

1. Turn off valves marked **Saturator On/Off** and **Wet Flow On/Off** (i.e. handle up/out).
2. Close valve marked **Wet Flow Valve** - **DO NOT OVER-TIGHTEN!**
3. Open valve marked **Dry Flow Valve**.
4. Turn on valve marked **Dry Flow Valve** (i.e. handle down/in).
5. Allow the system to run for a minimum of 4 hours.

3.3.3 Dew-Point Generation

To generate various dew points, follow this procedure in sequence to ensure correct operation.

NOTE: If a sequence of dew points are required it is important to start at the driest dew point and select progressively through the range always moving from dry to wet.

1. Fully open the **Dry Flow Valve**.
2. Turn on valves marked **Saturator On/Off** and **Wet Flow On/Off** (i.e. handle down/in).
3. Slowly adjust the **Wet Flow Valve** until the desired dew point is generated. To achieve the desired dew point, further adjustment to the **Dry Flow Valve** may be required.

NOTE: As there is a time delay between set-point changes and dew-point measurement stabilization, it will be necessary to adjust the Wet Flow Valve **in small increments and wait for the dew point to stabilize before further adjustment so that accurate dew points can be generated.**

After use, purge the system for several minutes to remove any moist gas before shut down.

4 MAINTENANCE

WARNING
This unit operates under pressure. It is recommended that safety goggles are worn.

Internal parts may be very HOT!

Routine maintenance of the Michell DG3 Automatic Dew-point Generator is limited to three tasks.

4.1 Saturator Filling

Check the water level of the saturator (see Section 3.2) on a weekly basis and fill if necessary. If the generator is operating at high dew points for extended periods of time it may be necessary to fill the saturator more often, and it should be checked every other day.

The water level in the saturator, and the visually identical water trap, should be added together when gauging whether the generator is sufficiently filled with water (see *Figure 2)*.

4.2 Checking Generator Temperature

The generator temperature control stability and level must be checked on a regular basis.

The temperature controller is factory set and locked at 30°C, and therefore does not require any further adjustment.

If the generator temperature is not 30°C (±2°C) then contact Michell Instruments' Customer Service Department for details.

4.3 Filter Element Replacement

A particulate filter is included within the generator on the gas inlet line. Access is through the hinged rear panel of the unit (see *Figure 1)*.

Frequency of the filter element replacement is dependent upon operating conditions. It is recommended that, initially, the filter element be examined on an six monthly basis. Then, depending on the conditions, increase or decrease the maintenance period accordingly.

Replacement filter element type – Michell order code: SSF-PF-10PK

The procedure to replace the filter element is as follows:

1. Switch off the dew-point generator.
2. Isolate and disconnect the dry air supply to the **GAS IN** port on the rear panel of the unit.
3. Locate and unscrew the filter bowl and element.
4. Discard and replace the filter element.
5. Re-assemble the filter and close the hinged panel.

4.4 Fault Diagnosis

Below are detailed some possible faults, their causes and recommended actions, for the Michell DG3 Dew-point Generator.

Symptom	Cause	Action
Generated dew point higher than spec	High generator chamber temperature	Check setting is 30°C (±2°C)
	High source gas dew point	Check source gas dew point
	Pipework leakage	Leak test pipework
Generated dew point lower than spec	Low generator chamber temperature	Check setting is 30°C (±2°C)
	Low saturator water level	Fill saturator bottle
	Pipework leakage	Leak test pipework
No flow	Power failure	Check fuses
	Pipework leakage	Leak test pipework
	Gas Out port blocked/restricted	Remove blockage/restriction

Appendix A

Technical Specifications

Appendix A Technical Specifications

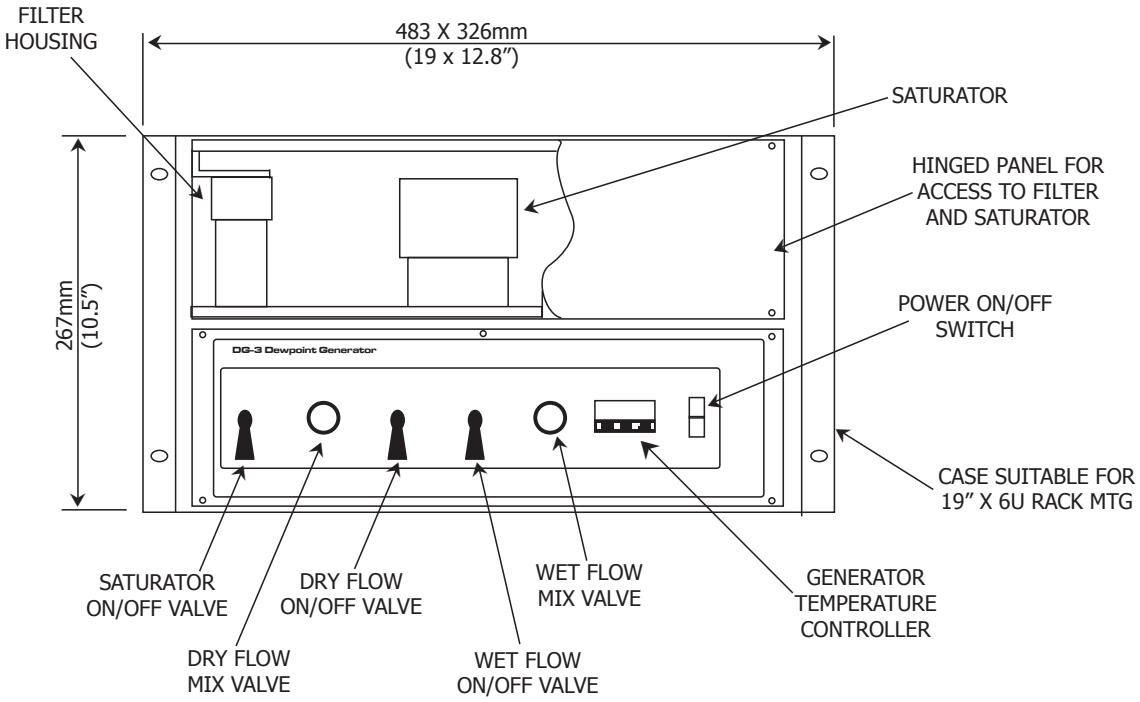
General	
Gas Supply	7 Nl/min (14.8 scfh) @ 10 barg max. and < 50 ppm_V (-48°C (-54°F) dew point)
Gas Output	1 to 5 Nl/min (2 to 10.6 scfh) @ 0.5 to 1 barg and -40°C to +20°C (-40 to +68°F) dew point
Filter	Particulate, borosilicate glass bonded micro-fiber
Saturator	Polycarbonate and porous polyethylene sinter
Heating	Finned heater element, 500 Watt (fan circulated)
Power	220/240 V AC, 50Hz or 100/120 V AC, 60Hz
Power Consumption	600 VA maximum
Power Supply Fuse	5A (F) quick blow
Storage Temperature	+5 to +40°C (+41 to +104°F)
Operating Temperature	+18 to +24°C (+64 to 75°F) (up to 90% RH)
Construction	Painted aluminum enclosure
Overall Dimensions	483 x 267 x 390mm (19 x 10.5 x 15.3") (w x h x d)
Weight	20kg (44lbs) approximately

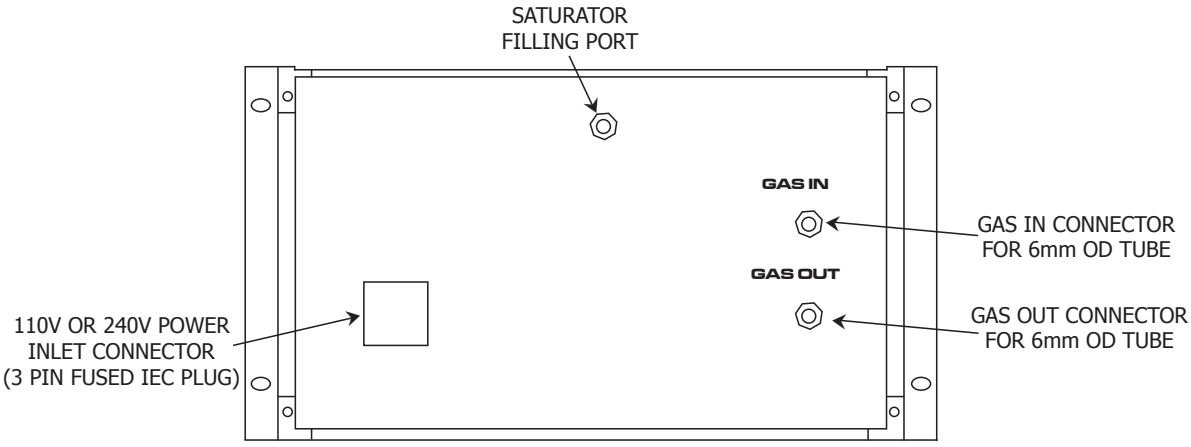
Appendix B

Drawings and Flow Diagram

Appendix B Drawings and Flow Diagram

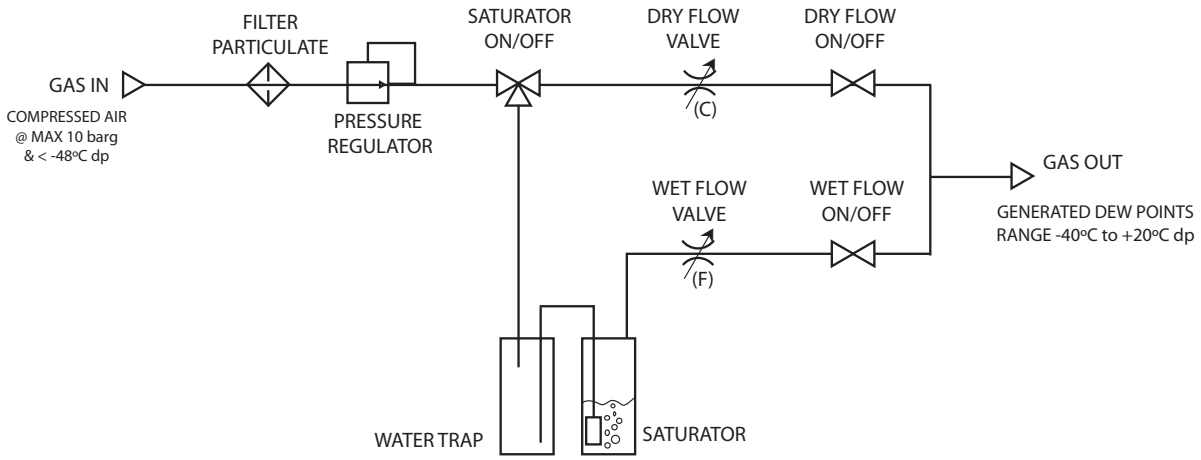
B.1 General Assembly





REAR VIEW

B.2 Flow Diagram



Appendix C

Quality, Recycling & Warranty Information

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C.1 Recycling Policy

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

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

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

C.2 WEEE And RoHS Compliance

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

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

Michell is in full compliance with the WEEE Directive (Registration No. WEE/JB0235YW). Customers may be required to return certain instruments for treatment at the end of their working life.
June 2010

C.3 Manufacturing Quality

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

BS EN ISO 9001: 2008

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

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

C.4 Calibration Facilities

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

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

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

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

C.5 Return Policy

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

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

C.6 Warranty

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

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

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

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

Appendix 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		

MICHELL Instruments

F0121, Issue 2, December 2011

http://www.michell.com