



# SF72 Rail Dew-Point Transmitter User's 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.

Transmitter	
Code	
Serial Number	
Invoice Date	
Location of Instrument	
Tag No	

Transmitter	
Code	
Serial Number	
Invoice Date	
Location of Instrument	
Tag No	

Transmitter	
Code	
Serial Number	
Invoice Date	
Location of Instrument	
Tag No	



## SF72 Rail Transmitter

For Michell Instruments' contact information please go to  
[www.michell.com](http://www.michell.com)

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## Safety

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

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

## Electrical Safety

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

## UL Approval

This product is UL approved within the operating temperature range of -20°C to +60°C. The IP66 rating of this product is outside the scope of UL Approval, but this product has been verified as being IP66 by independent, UKAS accredited, 3rd party listing.

## Pressure Safety

DO NOT permit pressures greater than the safe working pressure to be applied to the instrument. The specified safe working pressure is 45 MPa (450 barg / 6526 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. For Michell Instruments' contact information please go to [www.michell.com](http://www.michell.com).

## Calibration

The recommended calibration interval for this instrument is 12 months unless it is to be used in a mission-critical application or in a dirty or contaminated environment in which case the calibration interval should be reduced accordingly. The instrument should be returned to the manufacturer, Michell Instruments Ltd., or one of their accredited service agents for re-calibration.

## Safety Conformity

This product meets the essential protection requirements of the relevant EU and US standards and directives. Further details of applied standards may be found in the Technical Specifications in Appendix A.

## Abbreviations

The following abbreviations are used in this manual:

barg	pressure unit (=100 kP or 0.987 atm) (bar gauge)
°C	degrees Celsius
°F	degrees Fahrenheit
DC	direct current
g	grams
in	inch(es)
µm	micrometer
m/sec	meters per second
mA	milliampere
max	maximum
mm	millimetres
MPa	megapascal
NI/min	normal liters per minute
Nm	Newton meter
oz	ounces
psig	pounds per square inch
RH	relative humidity
scfh	standard cubic feet per hour
fps	feet per second
T	temperature
V	Volts
Ω	Ohms
∅	diameter

## 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

The SF72 dew-point transmitter is a compact sensor designed for use in industrial dryer applications at the key -50 to +10°Cdp (-58 to +50°Fdp) measuring points where response speed, reliability and long term stability of data within a control process is critical.

The transmitter is pressure rated to 45 MPa (450 barg / 6526 psig), ensuring process gas safety, through the use of a 10-year, field-proven stainless steel body and glass-to-metal seal, applicable for environments with constant vibration.

Our polymer based sensor is calibrated on a high volume traceable calibration system, providing OEM quantities of units.

The SF72 Rail Transmitter has been manufactured, tested and calibrated to the highest available standards and should be in perfect working order, ready for installation into a gas measurement application. If there are any questions about the instrument or how to install and operate it, please contact a Michell representative (for Michell Instruments' contact information go to [www.michell.com](http://www.michell.com)).

### 1.1 Features

The SF72 Rail Transmitter is a continuous on line 4-20 mA transmitter for the measurement of moisture content in air and other non-corrosive gases, particularly in rail use.

The key features are:

- M12 electrical connector
- Dew-point measurement range -60 to +60°Cdp (-76 to +140°Fdp)
- Fast response
- 316 stainless steel IP66 construction
- Traceable calibration certificate
- Accuracy  $\pm 2^{\circ}\text{Cdp}$  ( $\pm 3.6^{\circ}\text{Fdp}$ )
- G1/2" BSP process connection
- RFI/EMC certified to EN 50121-3-2:2006
- Shock/vibration certified to IEC 61373:1999-01

## 2 INSTALLATION

### 2.1 Unpacking the Instrument

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

- SF72 Rail Transmitter
- Bonded Seal
- Certificate of Calibration

Unpack the dew-point transmitter box as follows:

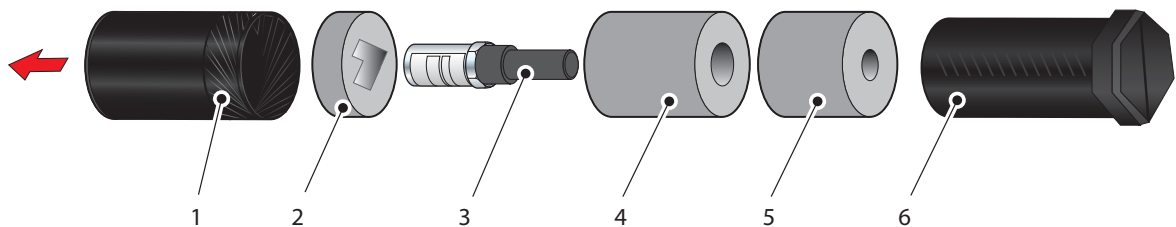


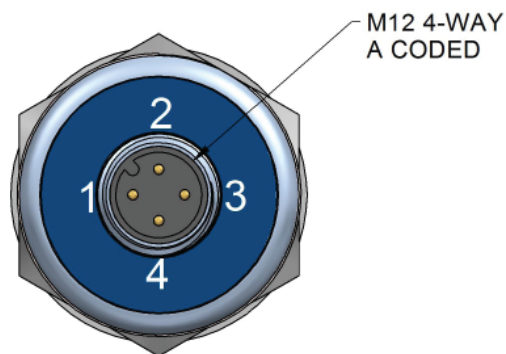
Figure 1 *Transmitter Unpacking Method*

1. Unscrew the cap (1) from the packing tube (6).
2. Remove the foam block (2).
3. Pull out the transmitter (3) from the tube, complete with the two foam covers (4) and (5).
4. Remove the foam covers from the transmitter but leave the black plastic protective cover in place until ready for installation.

**NOTE:** The transmitter sensing element is protected while in transit by a black cover containing a small desiccant capsule. This item is not required for the operation of the transmitter.

## 2.2 Electrical Connections

4-20 mA 2-wire	
PIN 3	4-20 mA
PIN 4	Power supply



### 2.2.1 Electrical Boundaries

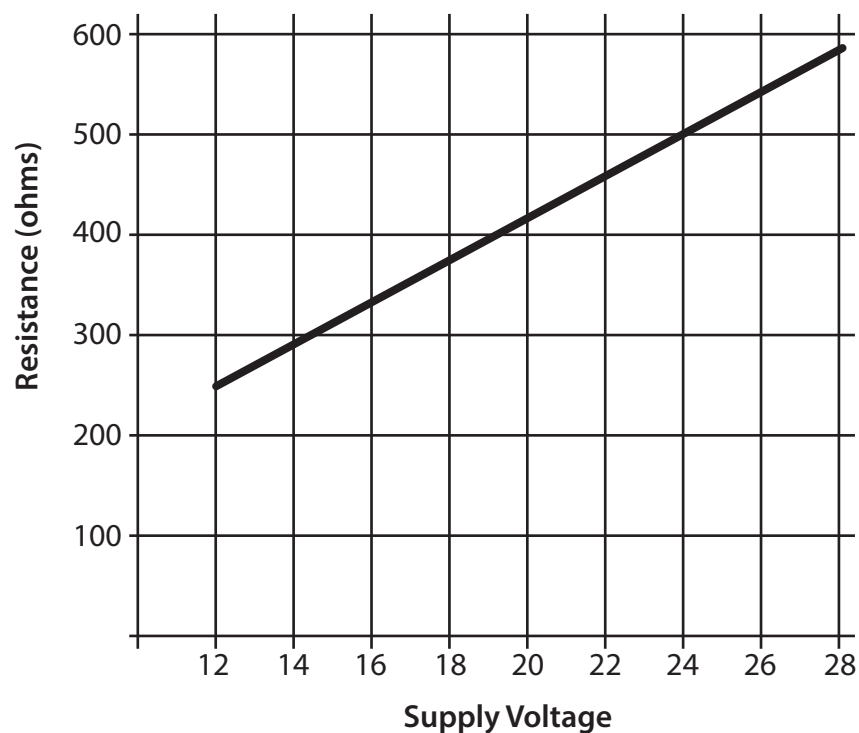


Figure 2 Maximum Load of SF72 Rail - Including Cable Resistance

## 2.3 Transmitter Mounting

Prior to installation of the transmitter, unscrew and remove the black plastic cover and desiccant capsule and retain for future use. Take care to prevent any contamination of the sensor before installation (**handle the transmitter by the main body only, avoiding contact with the sensor guard**).

The SF72 Rail Transmitter can be mounted either into a flow-through sensor sampling block (optional) or directly into a pipe or duct. It can be operated at pressures of up to 45 MPa (450 barg / 6526 psig) when fitted with the bonded seal.

The recommended gas flow rate, when mounted in the optional sampling block, is 1 to 5 NI/min (2.1 to 10.6 scfh). However, for direct insertion applications, gas flow can be from static to 10 m/sec (32.8 fps).

**NOTE: Check that the bonded seal is fitted and assemble into the sampling location, by hand, using the wrench flats only. DO NOT grip and twist the sensor cover when installing the sensor.**

When installed, 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)

### 2.3.1 Transmitter Mounting - Sample Block (Optional)



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

To mount the transmitter into the sensor block (preferred method), proceed as follows, refer to *Figure 3*

1. Remove the protective cover (2) and the desiccant capsule (2a) from the tip of the transmitter (1).
2. Check that the seal is fitted behind 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 (see Section 2.3). **NOTE: Use the flats of the hexagonal nut and not the sensor body.**
4. Fit the transmitter cable assembly to the connector at the base of the transmitter and tighten.

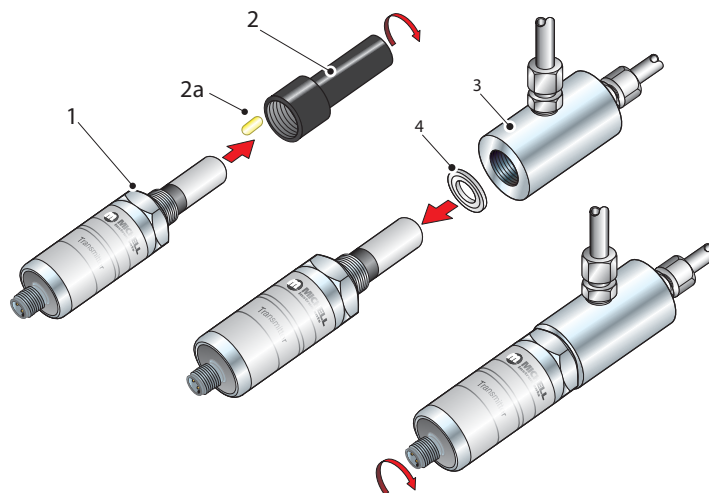


Figure 3 Transmitter Mounting - Sensor Block

### 2.3.2 Transmitter Mounting - Direct Pipeline Connection

The transmitter may be directly mounted into a pipe or duct as shown in *Figure 4*.



**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 4*. 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 protective cover and the desiccant capsule have been removed from the tip of the transmitter (3).



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

2. Check that the seal is fitted behind the threaded part of the transmitter body.
3. Screw the transmitter (3) into the pipe. 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.**

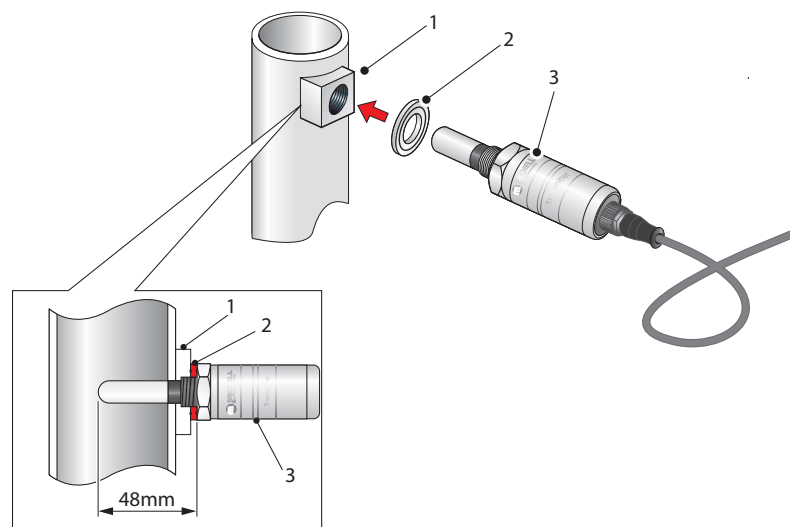


Figure 4 Transmitter Mounting - Pipe or Duct

### 3 OPERATION

Operation is very simple assuming the following installation techniques are adhered to:

#### 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 as entrained liquids may be drawn into the sensing element.

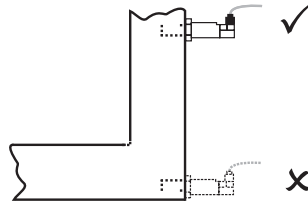


Figure 5 *Installation Location*

##### Minimize Dead Space in Sample Lines:

Dead space causes moisture entrapment points, increased system response times and measurement errors, as a result of the trapped moisture being released into the passing sample gas and causing an increase in partial vapor pressure.

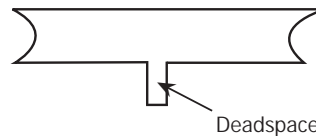


Figure 6 *Indication of Dead Space*

##### Remove Any Particulate Matter or Oil from the Gas Sample:

Particulate matter at high velocity can damage the sensing element and similarly, at low velocity, they may 'blind' the sensing element and reduce its response speed. If particulate, such as degraded desiccant, pipe scale or rust is present in the sample gas, use an in-line filter, as a minimum level of protection. For more demanding applications Michell Instruments offers a range of sampling systems (for more information contact [www.michell.com](http://www.michell.com)).

##### Use High Quality Sample Tube and Fittings:

Michell Instruments recommends that, wherever possible, stainless steel tubing and fittings should be used. This is particularly important at low dew points 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.

##### Position Transmitter away from Heat Source:

It is recommended, as good instrumentation practice, that the transmitter is placed away from any heat source to avoid adsorption/desorption.

## 4 MAINTENANCE

### Calibration

Routine maintenance of the SF72 Rail Transmitter is confined to regular re-calibration by exposure of the SF72 Rail Transmitter to sample gases of known moisture content to ensure that the stated accuracy of the SF72 Rail Transmitter 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 re-calibration service to suit specific needs. A Michell representative can provide detailed, custom advice (for Michell Instruments' contact information go to [www.michell.com](http://www.michell.com)).

### Sensor Guard Replacement

The sensor is supplied with a white HDPE guard (standard) or a stainless steel guard (if specified at time of order). The method of replacement is the same for both types.

#### HDPE Guard

The HDPE guard provides  $<10\mu\text{m}$  protection to the dew-point sensor. It is designed to show any contamination and the guard should be changed if the surface becomes discolored.

When replacing the guard, care should be taken to handle the guard by the bottom part only. Replacement guards (EA2-HDPE) - pack of 10 - can be obtained by contacting Michell Instruments ([www.michell.com](http://www.michell.com)) or your local distributor.

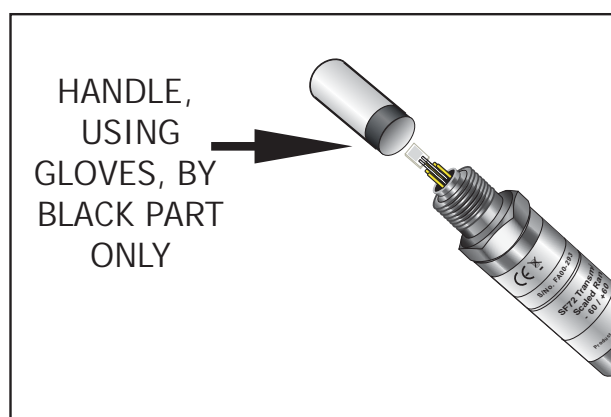


Figure 7 Replacement of HDPE Guard

#### Stainless Steel Guard

The stainless steel guard provides  $<80\mu\text{m}$  protection to the dew-point sensor. It is designed to show any contamination and the guard should be changed if the surface becomes discolored.

When replacing the guard, care should be taken to handle the guard by the bottom part only. A replacement guard (SSG) can be obtained by contacting Michell Instruments ([www.michell.com](http://www.michell.com)) or your local distributor.

### Bonded Seal

If the installed bonded seal gets damaged or lost, a pack of 5 replacement bonded seals can be obtained by contacting Michell Instruments, or your local distributor, and quoting part number 5/8-BS.



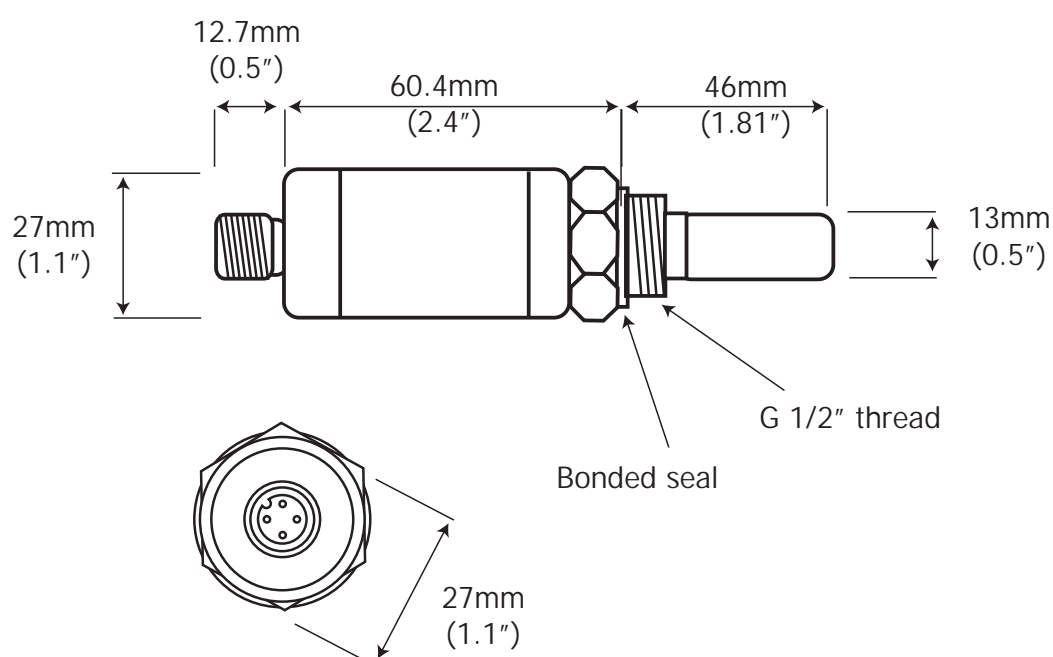
# Appendix A

## Technical Specifications

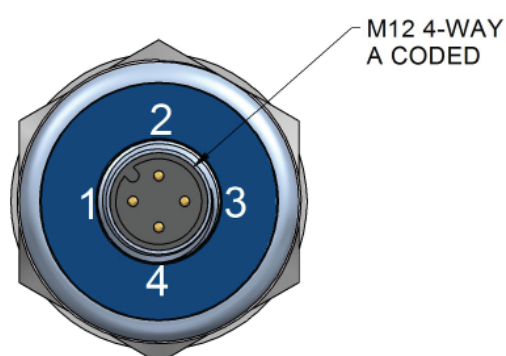
## Appendix A Technical Specifications

Performance	
Measurement Range (Dew Point)	-60 to +60°Cdp (-76 to +140°Fdp)
Accuracy (Dew Point)	±2°Cdp (±3.6°Fdp)
Repeatability	±0.2°Cdp (±0.36°Fdp)
Long Term Stability	<1% per year at reference conditions
Calibration	Traceable 8-point calibration certificate
Electrical Specifications	
Output Signal	4-20 mA (2-wire connection, current source)
Output	Dew point
Analog Output Scaled Range	Standard -60 to +60°C (-76 to +140°F) Non-standard available upon request
Supply Voltage	12 to 28 V DC
Load Resistance	Max 250 Ω @ 12 V (500 Ω @ 24 V)
Electrical Connection	M12 4-way A coded
Operating Specifications	
Start-up Temperature	<b>Ambient:</b> -40 to +50°C (-40 to +122°F) <b>Gas:</b> -40 to +70°C (-40 to +158°F)
Operating Temperature	<b>Ambient:</b> -40 to +50°C (-40 to +122°F) <b>Gas:</b> -40 to +60°C (-40 to +140°F)
Storage Temperature	-40 to +85°C (-40 to +185°F)
Operating Pressure	45 MPa (450 barg / 6526 psig) max
Overpressure Rating	x 2 operating pressure 90 MPa (900 barg / 13,000 psig)
Flow Rate	1 to 5 NI/min (2.1 to 10.6 scfh) mounted in standard sampling block; 0 to 10 m/sec (0 to 32.8 fps) direct insertion
Thermal Compensation	Characterized over operating range
Mechanical Specifications	
Ingress Protection	IP66 in accordance with standard BS EN60529:1992
Housing Material	316 stainless steel
Dimensions	L=119mm x ø27mm (4.7" x ø1.06")
Filter	HDPE Guard < 10µm
Process Connection & Material	G½" BSP, 316 stainless steel
Weight	150g (5.29oz)
Digital Diagnostic Communications	RS485, 2-wire Modbus RTU
Rail Certifications	
Shock and Vibration	IEC 61373:1999-01
RFI/EMC Emissions & Immunity	EN 50121-3-2:2006

## A.1 Dimensions

Figure 8 *Dimensions*

4-20 mA 2-wire	
PIN 3	4-20 mA
PIN 4	Power supply

Figure 9 *Electrical Connections*

# 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](http://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 &amp; 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. <b>Work will not be carried out on any unit that does not have a completed decontamination declaration.</b>				
<b>Decontamination Declaration</b>				
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	

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



On behalf of the above named company, I declare that, on the date that the equipment accompanied by this declaration is placed on the market, the equipment conforms with all technical and regulatory requirements of the directives.

## SF72 (Rail) Dew Point Transmitter

and complies with all the essential requirements of the EU directives listed below.

### **2014/30/EU EMC Directive**

(effective from 22<sup>nd</sup> July 2017)

### **2011/65/EU Restriction of Hazardous Substances Directive (RoHS2)**

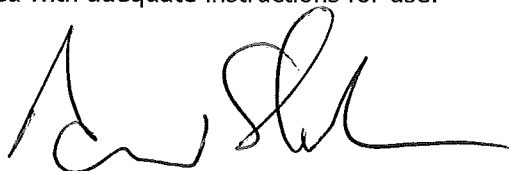
RoHS2 EU Directive 2011/65/EU (Article 3, [24]) states, "*industrial monitoring and control instruments means monitoring and control instruments designed exclusively for industrial or professional use*". (mandatory compliance effective date 22<sup>nd</sup> July 2017).

and has been designed to be in conformance with the relevant sections of the following standards or other normative documents.

EN50121-3-2:2006	Railway applications. Electromagnetic compatibility. Rolling stock. Train and complete vehicle
EN61326-1:2006	Electrical equipment for measurement, control and laboratory use – EMC requirements –Class B (emissions) and Industrial Locations (immunity).
EN61010-1:2010	Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use - Part 1: General Requirements

### **2014/68/EU PE Directive**

This product and sample systems & accessories that may be supplied with them do not bear CE marking for the Pressure Equipment Directive, and are supplied in accordance with Article 4, paragraph 3 of 2014/68/EU by using SEP (sound engineering practice) in the design and manufacturer and are provided with adequate instructions for use.



Andrew M.V. Stokes, Technical Director

December 2016





<http://www.michell.com>