SF82
Dew-Point Transmitter
User's Manual

99976 Issue 1

June 2019

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

Use this information when contacting Michell Instruments for service purposes.

Analyzer	
Code	
Serial Number	
Invoice Date	
Location of Analyzer	
Tag No	

Analyzer	
Code	
Serial Number	
Invoice Date	
Location of Analyzer	
Tag No	

Analyzer	
Code	
Serial Number	
Invoice Date	
Location of Analyzer	
Tag No	

SF82

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CONTENTS

Safety iii
Electrical Safety iii
Pressure Safety iii
Toxic Materials iii
Repair and Maintenance iii
Calibration iii
Safety Conformity iv
Abbreviations iv
Warnings iv
1. INTRODUCTION 1
2. INSTALLATION 2
2.1. Unpacking the Instrument 2
2.2. Preparation of the Sensor Cable 3
2.3. Cable Connection 5
2.4. Electrical Schematic 5
2.4.1. Electrical Boundaries 6
2.4.2. Digital Communications (M12 Version Only) 6
2.5. Transmitter Installatiom 6
2.5.1. Sampling Considerations 6
2.5.2. Good Measuring Practice 9
2.5.3. Transmitter Mounting 12

APPENDICES

Appendix A 16
Technical Specifications 17
Product Dimensions 19
Appendix B 22
Quality, Recycling & Warranty Information 23
Appendix C 24
Return Document & Decontamination Declaration 25
Appendix D 26
Modbus Register Map 27
Register Address 28

FIGURES

Figure 1 Connector Terminal Block Removal 3
Figure 2 Wiring Connections 3
Figure 3 Sensor Connector Installation 4
Figure 4 Cable Connections 4
Figure 5 Connector Installation 5
Figure 6 2-Wire Connection Diagram 5
Figure 7 Maximum Load of SF82 - Including Cable Resistance 6
Figure 8 Installation Location 7
Figure 9 Installation Location 8
Figure 10 Transmitter Mounting - Sensor Block 9
Figure 11 Material Permeability Comparison 9
Figure 12 Transmitter Mounting - Pipe or Duct 12
Figure 13 Transmitter Mounting with Adapter 14

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

This instrument is designed to be electrically safe when used with the options and accessories supplied by Michell Instruments for use with it. This instrument has been independently verified as complying with the IEC/EN 61010 Standard for Electrical Safety for Europe and for the equivalent 61010 standards in use in N. America. The instrument is approved for use within the operating temperature range of -40°C to +60°C, and dependant on version, as being IP66/65. See Specification section for full details.

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 MPag (450 barg / 6500 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.

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.

Abbreviations

The following abbreviations are used in this manual:

barg	pressure unit (=100 kP or 0.987 atm) (bar gauge)
ºC	degrees Celsius
ºF	degrees Fahrenheit
DC	direct current
g	grams
in	inch(es)
µm	micrometer
m/sec	meters per second
mA	milliampere
mm	millimetres
MPa	megapascal
Nl/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
ø	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 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 Instruments SF82 is a loop-powered dew-point transmitter, designed to make dew point measurements in a flowing sample. The SF82 transmitter is available with 3 different process connections:

- 5/8" - 18 UNF
- 3/4" – 16 UNF
- G1/2" - BSPP

The SF82 2-wire is available with a choice of electrical connections:

- DIN 43650 Form C
- M12 5-pin

2. INSTALLATION

2.1. Unpacking the Instrument

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

- SF82 Transmitter
- Certificate of Calibration
- Connector (for sensor/cable) for MiniDIN 43650 C version only

It is recommended that all packaging is retained, in case products are returned for service or calibration. Alternatively, if you choose to dispose of the packaging materials, ensure they are recycled in accordance with local legislation.

The transmitter will also be supplied with a process seal, which will be fitted to the unit. Depending on the version, this will either be a bonded seal (5/8" or G1/2" thread versions) or an o-ring seal (3/4" thread versions).

The transmitter sensing element is protected while in transit by a cover containing a small desiccant capsule. The connection pins are protected by a red plastic cap. None of these plastic items are required for the operation of the transmitter. It is recommended that the MiniDIN 43650 C connector is kept in a safe place until the transmitter is ready for wiring.

2.2. Preparation of the Sensor Cable

The sensor cable is NOT supplied as standard. Cables can be obtained by contacting your local Michell Instruments representative (see www.michell.com for details).

DIN 43650 Version

Cable connections to the SF82 transmitter are made via the removable connector. Removing the central screw enables the connector terminal block to be removed from the outer housing by using a small screwdriver to prise it clear.

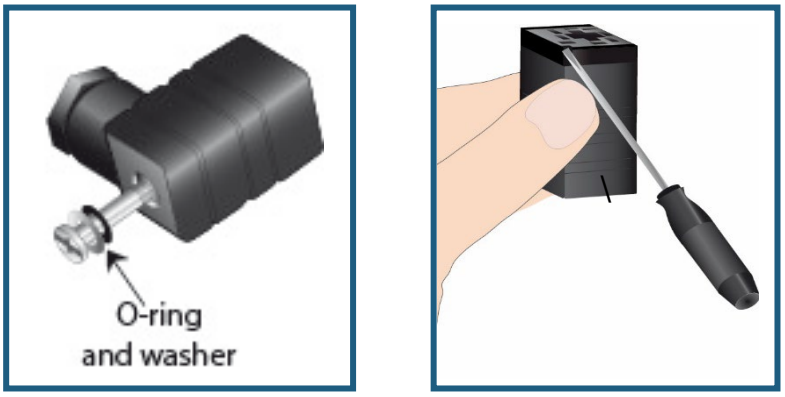


Figure 1 Connector Terminal Block Removal

Caution: when removing the central screw ensure that the small sealing O-ring and the washer are retained on the screw and are present during re-installation

The sensor cables are terminated as per the following diagram:

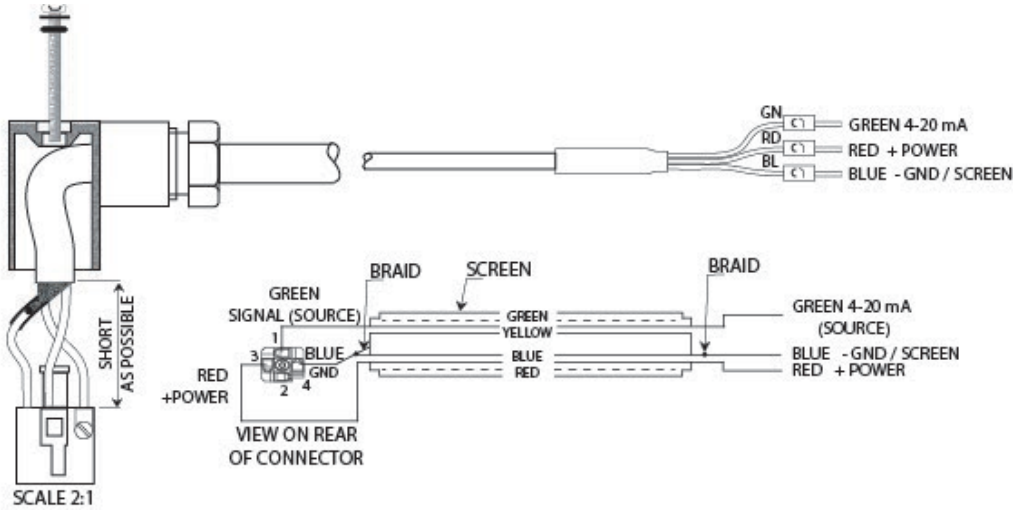


Figure 2 Wiring Connections

Note: The cable screen (see figure 2) should only be connected to a ground point at either the transmitter installation side, or at the receiving equipment. Failure to observe this precaution can result in ground loops and equipment malfunction.

Always connect the 4-20 m return signal to a suitable load (see figure 3) before the power is applied. Without this connection, the transmitter may be damaged if allowed to operate for prolonged periods.

M12 5-Pin Version

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

- 0.8 m
- 2 m
- 5 m
- 10 m

4-20 mA 2-wire	
PIN 1	Modbus A
PIN 2	Modbus B
PIN 3	4-20 mA
PIN 4	Power Supply
PIN 5	0 V

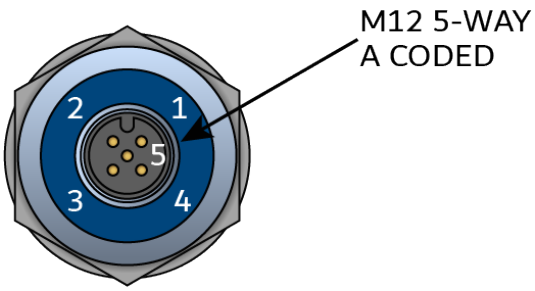


Figure 3 *Sensor Connector Installation*

The other end of the sensor cable is unterminated, for straightforward connection into the desired monitoring system.

Function	Pin	Wire Colour
Modbus A	1	Brown
Modbus B	2	White
4 -20 mA	3	Blue
Power Supply	4	Black
0 v	5	Grey

Figure 4 *Cable Connections*

If longer cable runs are required, off the shelf 5-pin M12 cables can be connected between the SF82 transmitter and the cable provided by Michell Instruments.

Note: The cable screen should only be connected to ground point at either the transmitter installation side or at the receiving equipment. Failure to observe this precaution can result in ground loops and equipment malfunction.

2.3. Cable Connection

DIN 43650 Version

To ensure the specified ingress protection is achieved, when installing the connector, the securing screw (with the O-ring and washer) must be tightened to a minimum torque of 3.4 Nm (2.5 ft-lbs). The sensor cable used must be a minimum diameter of 4.6 mm (0.2").

M12 5-Pin Version

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

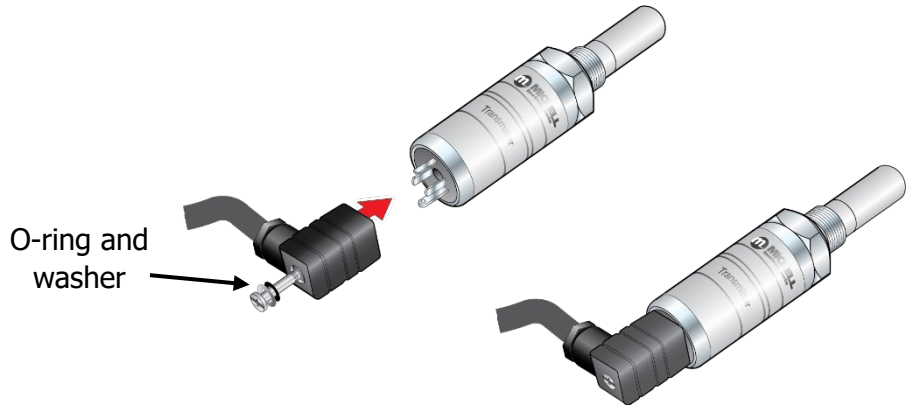


Figure 5 Connector Installation

2.4. Electrical Schematic

Note: The cable screen should only be connected to a ground point at either the transmitter installation side, or at the receiving equipment. Failure to observe this precaution can result in ground loops and equipment malfunction.

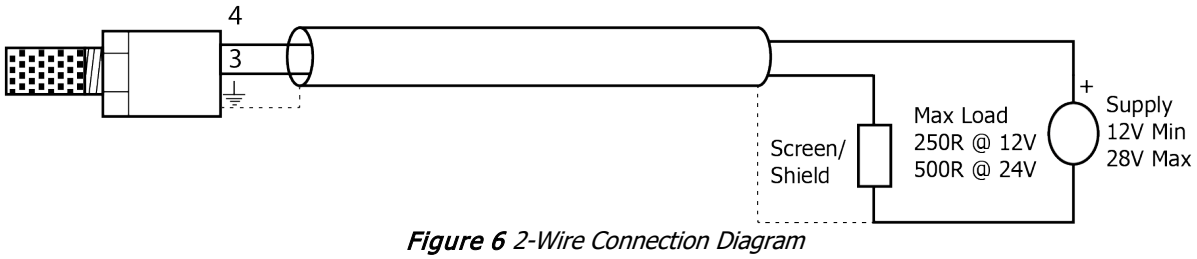


Figure 6 2-Wire Connection Diagram

2.4.1. Electrical Boundaries

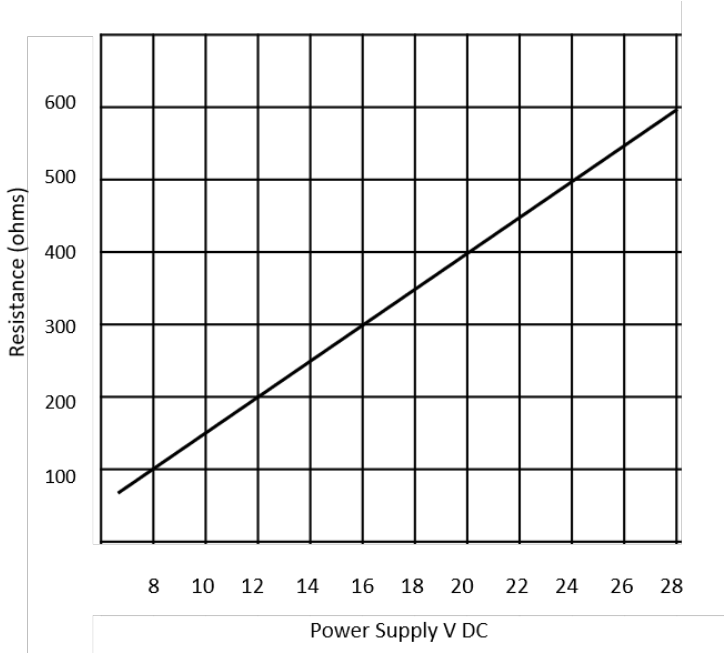


Figure 7 Maximum Load of SF82 - Including Cable Resistance

2.4.2. Digital Communications (M12 Version Only)

Modbus RTU over RS485 communication is available on the SF82 M12, and can be used simultaneously with the 2-wire current output. Section 2.2 describes the electrical connections to the transmitter.

The Modbus register map can be found at the end of this manual.

2.5. Transmitter Installatiom

2.5.1. Sampling Considerations

There are two basic methods of measuring a sample with the SF82 Transmitter:

In-situ measurements are made by placing the transmitter inside the environment to be measured.

Extractive measurements are made by installing the sensor into a block within a sample handling system and flowing the sample outside of the environment to be measured through this system.

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

Examples of such conditional limitations are:

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

The basic considerations for each measurement type are as follows:

In-Situ

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

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

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

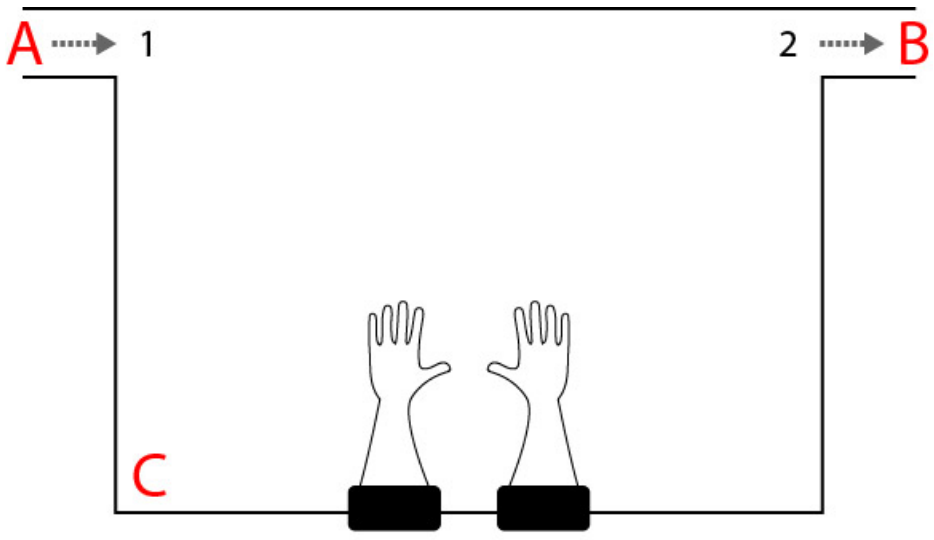


Figure 8 *Installation Location*

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

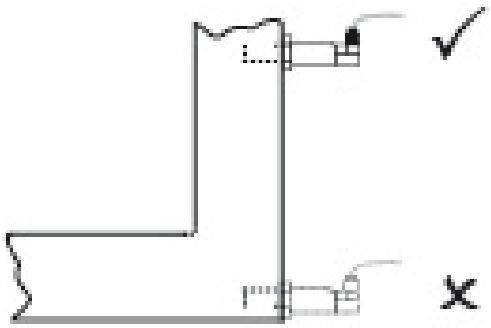


Figure 9 Installation Location

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

- If the gas speed is very low, or occasionally static, then the moisture content through the length (and width, if it is more than a few cm across) of the duct is unlikely to be uniform.
- Extremely high gas speeds can cause damage to the sensor. Direct insertion is not recommended in gas speeds in excess of 10m/s (32.8ft/s).

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

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

4. **Sample Temperature** – Although the sensor can be operated at sample temperatures up to 60°C, it is advisable to keep the sample temperature as close to ambient, and as stable as possible to keep adsorption & desorption characteristics as consistent as possible (see section 2.5.2 Sampling Hints for more information).

Extractive

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

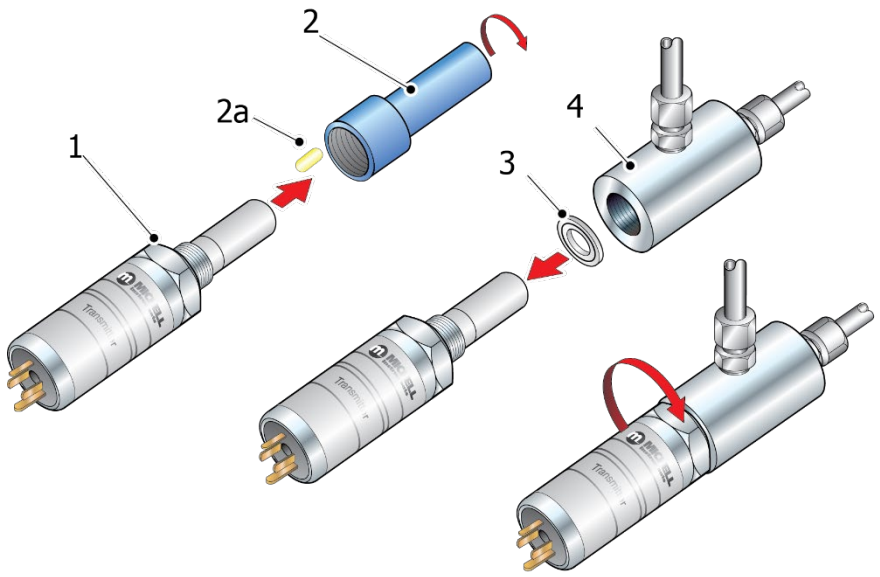


Figure 10 *Transmitter Mounting - Sensor Block*

2.5.2. Good Measuring Practice

Ensuring reliable and accurate moisture measurements requires the correct sampling techniques, and a basic understanding of how water vapour behaves. This section aims to explain the common mistakes and how to avoid them.

Sampling Materials – Permeation and Diffusion

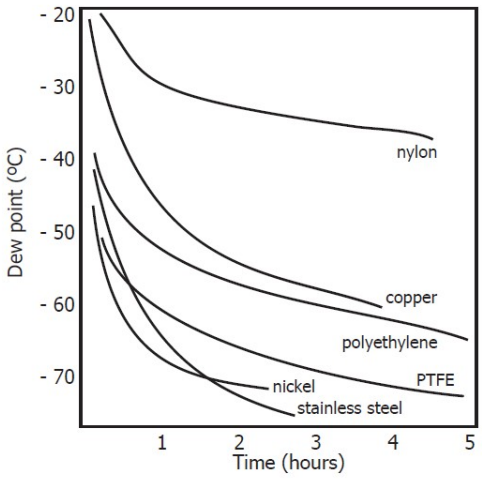


Figure 11 *Material Permeability Comparison*

All materials are permeable to water vapour since water molecules are extremely small compared to the structure of solids, even including the crystalline structure of metals. The graph above demonstrates this effect by showing the increase in dew point temperature seen when passing very dry gas through tubing of different materials, where the exterior of the tubing is in the ambient environment. If the partial water vapour pressure exerted on the outside of a compressed air line is higher than on the inside, the atmospheric water vapour will naturally push through the porous medium causing water to migrate into the pressurised air line. This effect is called transpiration.

What this demonstrates is the dramatic effect that different tubing materials have on the humidity levels of a gas passed through them. Many materials contain moisture as part of their structure and when these are used as tubing for a dry gas the gas will absorb some of the moisture. Always avoid using organic materials (e.g. rubber), materials containing salts and anything which has small pores which can easily trap moisture (e.g. nylon).

As well as trapping moisture, porous sampling materials will also allow moisture vapour to ingress into the sample line from outside. This effect is called diffusion and occurs when the partial water vapour pressure exerted on the outside of a sample tube is higher than on the inside. Remember that water molecules are very small so in this case the term 'porous' applies to materials that would be considered impermeable in an everyday sense – such as polyethylene or PTFE. Stainless steel and other metals can be considered as practically impermeable and it is surface finish of pipework that becomes the dominant factor. Electropolished stainless steel gives the best results over the shortest time period.

Take into consideration the gas you are measuring, and then choose materials appropriate to the results you need. The effects of diffusion or moisture trapped in materials are more significant when measuring very dry gases than when measuring a sample with a high level of humidity.

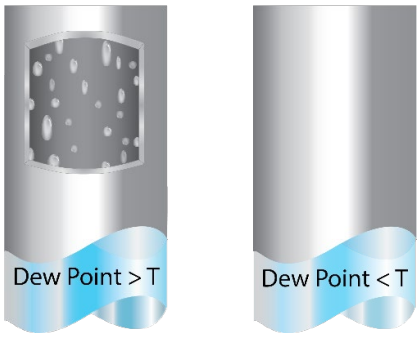
Temperature and Pressure effects

As the temperature or pressure of the environment fluctuates, water molecules are adsorbed and desorbed from the internal surfaces of the sample tubing, causing small fluctuations in the measured dew point.

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

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

Ensuring the temperature of the sampling components is kept at consistent levels is important to prevent temperature fluctuation (i.e. through diurnal changes) continually varying the rates of adsorption and desorption. This effect will manifest through a measured value which increases during the day (as desorption peaks), then decreasing at night as more moisture is adsorbed into the sampling equipment.



If temperatures drop below the sample dew point, water may condense in sample tubing and affect the accuracy of measurements.

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

Although ambient pressure does not change drastically in a single location, the gas sample pressure does need to be kept constant to avoid inconsistencies introduced by adsorption or desorption. The integrity of all connections is also an important consideration, especially when sampling low dew points at an elevated pressure. If a small leak occurs in a high-pressure line, gas will leak out, however, vortices at the leak point and a negative vapour pressure differential will also allow water vapour to contaminate the flow.

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. An inadequate flow rate may:

- 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 tube can 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 and unpredictable changes in dew point
- Result in a reduction in depression capabilities in chilled mirror instruments by having a cooling effect on the mirror. This is most apparent with gases that have a high thermal conductivity such as hydrogen and helium.

System design for fastest response times

The more complicated the sample system, the more areas there are for trapped moisture to hide. The key pitfalls to look out for here are the length of the sample tubing and dead volumes.

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

Over a long tubing run, water will inevitably migrate into any line, and the effects of adsorption and desorption will become more apparent.

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

Plan your sampling system to ensure that the sample tap point and the measurement point are as close as possible to avoid long runs of tubing and dead volumes.

Filtration

All trace moisture measurement instruments and sensors are by their nature sensitive devices. Many processes contain dust, dirt or liquid droplets. Particulate filters are used for removing dirt, rust, scale and any other solids that may be in a sample stream. For protection against liquids, a coalescing or membrane filter should be used. The membrane provides protection from liquid droplets and can even stop flow to the analyser completely when a large slug of liquid is encountered, saving the sensor from potentially irreparable damage.

2.5.3. Transmitter Mounting

Once an installation location has been chosen, this point will require a thread to match the transmitter thread. Fixing dimensions are shown in Figure 6. 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.

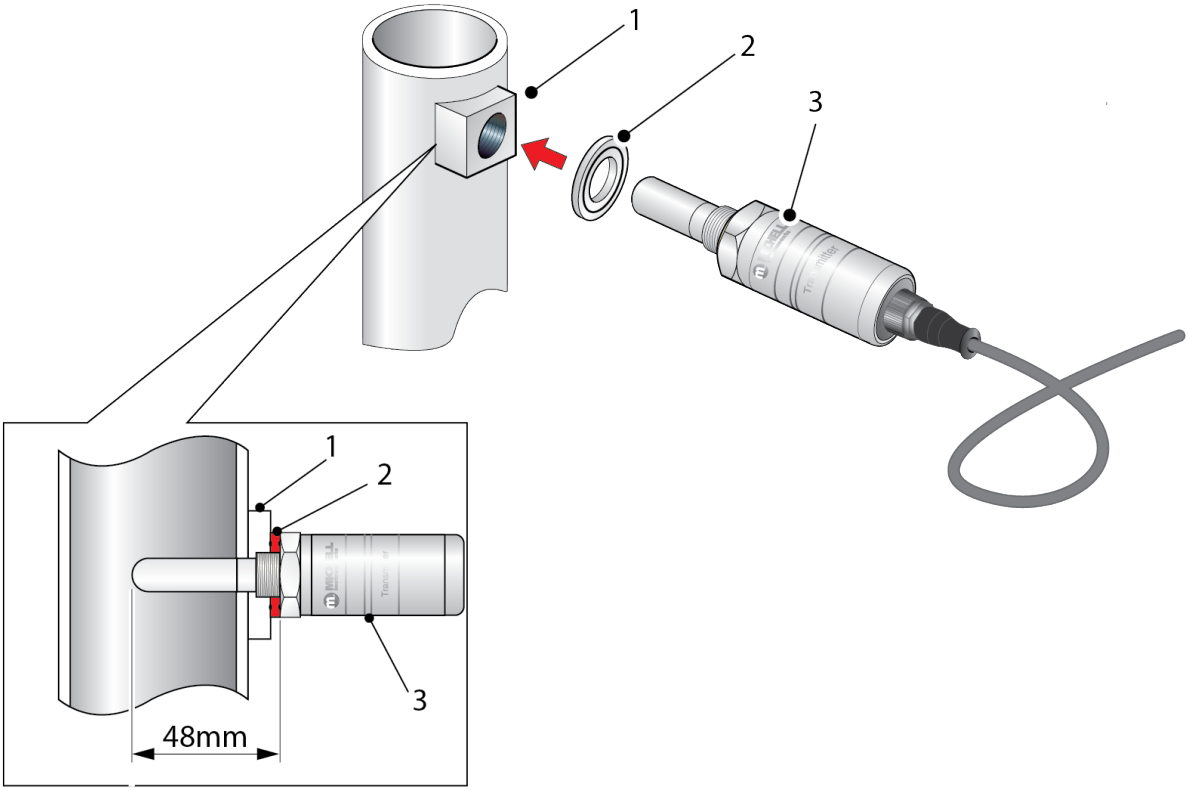


Figure 12 *Transmitter Mounting - Pipe or Duct*

2.5.3.1. 5/8" 18 UNF Version

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

2.5.3.2. 3/4" - 16 UNF Version

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

2.5.3.3. G1/2" BSPP Version

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

2.5.3.4. Installation using Additional Thread Adaptor

1. Remove the protective cover and desiccant capsule from the transmitter and retain for future use
2. Prevent any contamination of the sensor before installation by handling the transmitter by the main body only, avoiding contact with the sensor guard.
3. Pass the bonded seal over the 5/8"- 18 UNF mounting thread.
4. Screw the transmitter into the adaptor, and tighten to 30.5 Nm (22.5 ft-lbs)
5. **NOTE: Use the flats of the hexagonal nut and not the sensor body.**
6. Screw the transmitter (1) with its seal (3) and adapter (4) into the sampling location block (and fully tighten using a wrench to the following torque settings:

- G 1/2" BSP 56 Nm (41.3 ft-lbs)
- 3/4" - 16 UNF 40 Nm (29.5 ft-lbs)

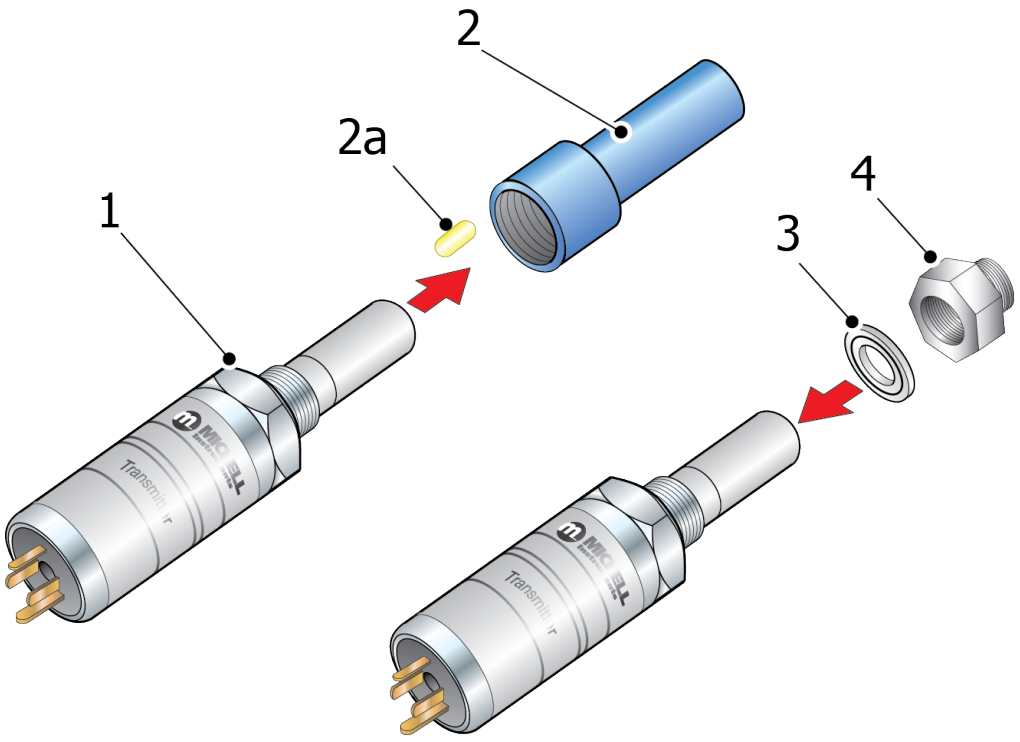


Figure 13 *Transmitter Mounting with Adapter*

Calibration

Annual recalibration of the SF82 is recommended to maintain the performance. 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).

Sensor Guard Replacement

The sensor is supplied with a white HMWPE guard (standard) or a stainless steel guard (if specified at time or order).

The sensor guard should be replaced if the surface shows any damage or signs of discolouration. When replacing a guard, make sure to wear clean disposable gloves, and handle by the threaded base section only.

Replacement HMWPE or stainless steel guards can be ordered from your Michell Instruments representative.

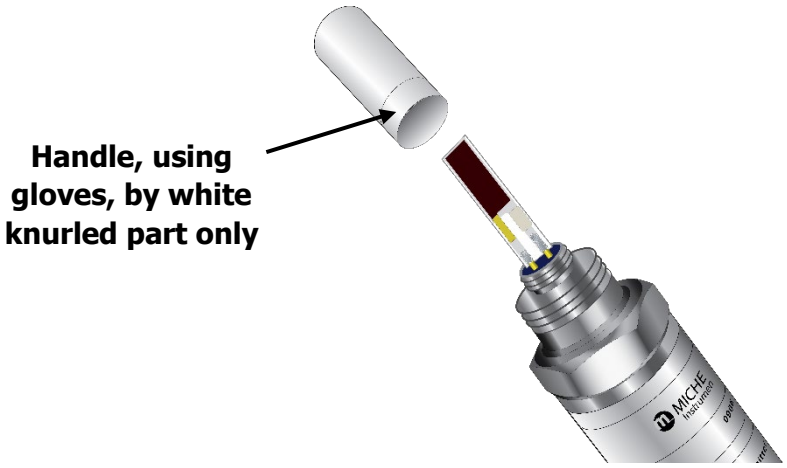


Figure 14 *Replacement HMWPE Guard*

Bonded Seal

If the supplied bonded seal is damaged or lost, a pack of 5 replacement bonded seals can be obtained by contacting your Michell Instruments representative.

O-ring Seal

If the supplied O-ring seal is damaged or lost a pack of 5 replacement O-ring seals

can be obtained by contacting your Michell Instruments representative.

APPENDIX A
Technical Specifications

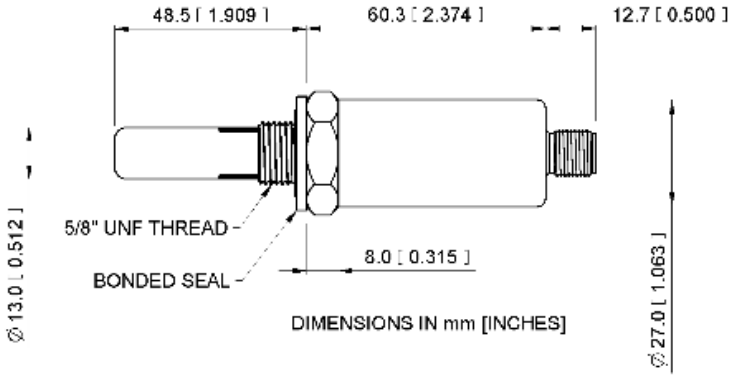
Technical Specifications		
Performance		
Product	**SF82 MiniDIN 43650**	**SF82 M12**
Measurement Range (Dew Point)	-60 ºC to +60 ºC dew point	
Accuracy (Dew Point)	±2 °C dew point*	
Response Time	63% at room temperature at 1 bara -60 ºC to -20 ºC dew point: 6 s -20 ºC to -60 ºC dew point: 40 s	
Repeatability	0.5 ºC dew point	
Calibration	9-point calibration certificate traceable to national standards	
Electrical Specifications		
Output Signal	User configurable over range; 4-20 mA (2 wire connection, current source)	User configurable over range; 4-20 mA (2 wire connection, current source) Modbus RTU over RS485 digital communications
Moisture Output	Dew point or moisture content	
Temperature Output	Not available	Data via Modbus RTU
Analog output scaled range 4-20 mA (Dew point)	-60 °C to +60 °C dew point -50 °C to +50 °C dew point -50 °C to +30 °C dew point -80 °C to +20 °C dew point -20 °C to +50 °C dew point (Non standard ranges available on request)	
Analog output scaled range 4-20 mA (Moisture content in gas)	0 to 24000 ppm_v (Non standard ranges available on request)	
Supply Voltage	6.5 to 28 V DC	5 to 28 V DC
Load Resistance	Max 250 Ω @ 12 V (500 Ω @ 24 V)	
Current consumption	23 mA max	Analog only 23 mA max, digital only 6 mA max
Electrical Safety	IEC61010-1, UL61010-1 & CAN/CSA C22.2 No. 61010	IEC61010-1, UL61010-1 & CAN/CSA C22.2 No. 61010 EN61373 Rail Rolling Stock EN50121-3-2 Rail EMC/RFI

Operating Specifications		
Operating temperature	-20 °C to +60 °C	
Compensated temperature range	-20 °C to +50 °C	
Storage Temperature	-40 °C to +60 °C	
Maximum Operating Pressure	10 MPag (100 barg) maximum	
Pressure Safety Rating	45 MPag (450 barg) maximum	
Flow rate	1 to 5 Nl/min mounted in standard sampling block; 0 to 10 m/sec direct insertion	
Mechanical Specifications		
Ingress protection	IP66 in accordance with BS EN 60529 (current version): NEMA 4 ingress protection in accordance with NEMA 250 (current version)	IP65
Housing material	316 stainless steel	
Dimensions	L = 133 mm x ø45 mm (with connector cable)	L = 156 mm x ø45 mm (with connector cable)
Filter (sensor protection)	**Standard:** HMWPE <10 µm **Optional:** 316 stainless steel sintered guard <80 µm	
Process connection	5/8" - 18 UNF 3/4" - 16 UNF G1/2" - BSP	
Weight	150 g (excluding connector cable)	
Electrical connections	MiniDIN 43650 form C	M12 5 pin (A coded)
Mating Electrical Connectors	Mating connector supplied as standard Optional 0.8, 2, 5, 10 metre MiniDIN connector/cable available	Optional 0.8 , 2, 5, 10 meter M12 A coded connector/cable available
Diagnostic conditions (factory programmed)	Sensor fault: 23 mA Under-range dew point: mA Over-range dew point: mA	

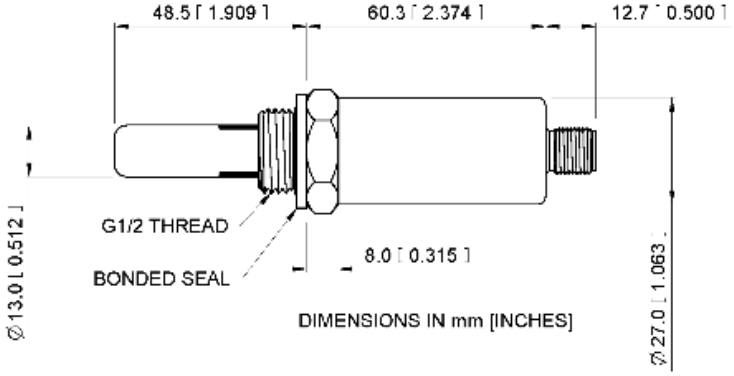
NOTES: * Over Compensated Temperature Range

Product Dimensions

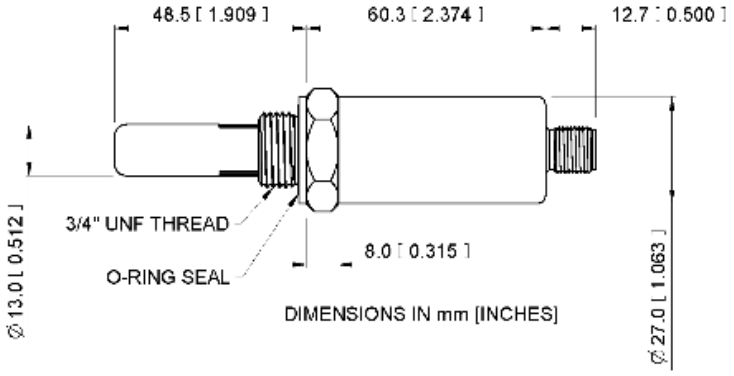
M12, 5/8" UNF



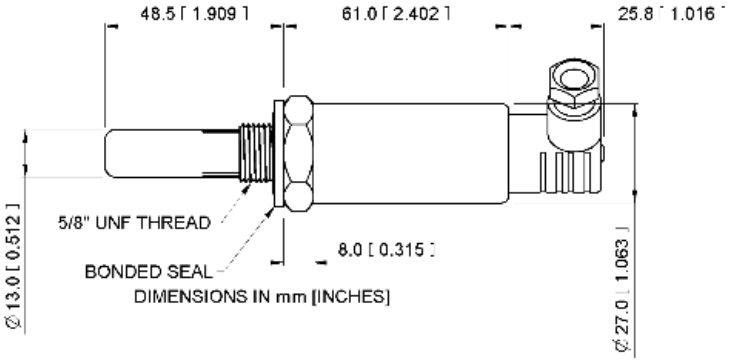
M12, G1/2



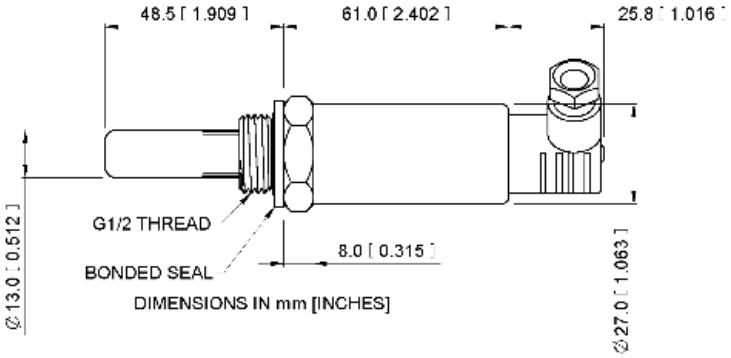
M12, 3/4" UNF



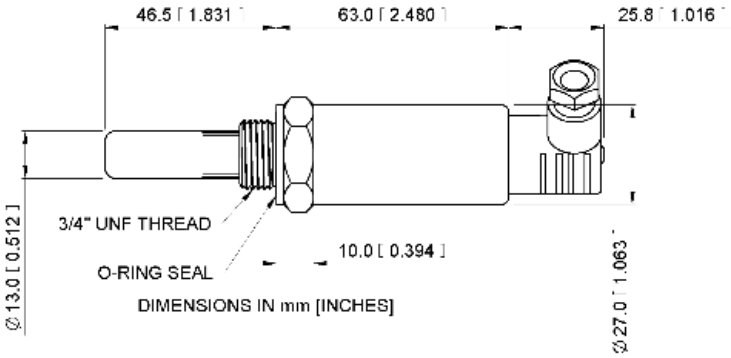
MiniDIN, 5/8" UNF



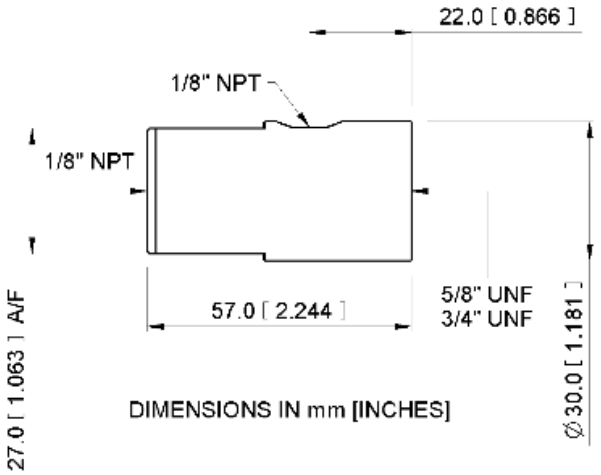
MiniDIN, G1/2



MiniDIN, 3/4" UNF

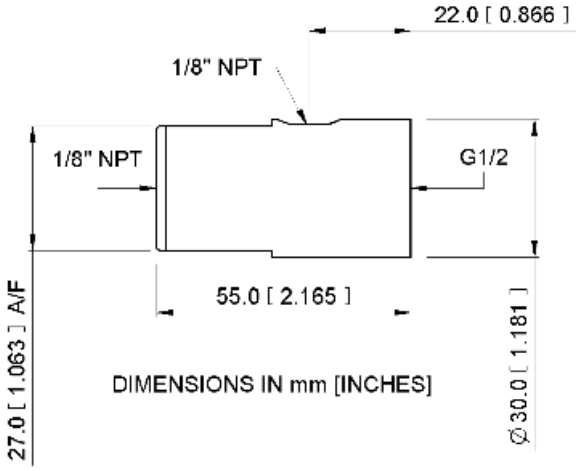


G1/2

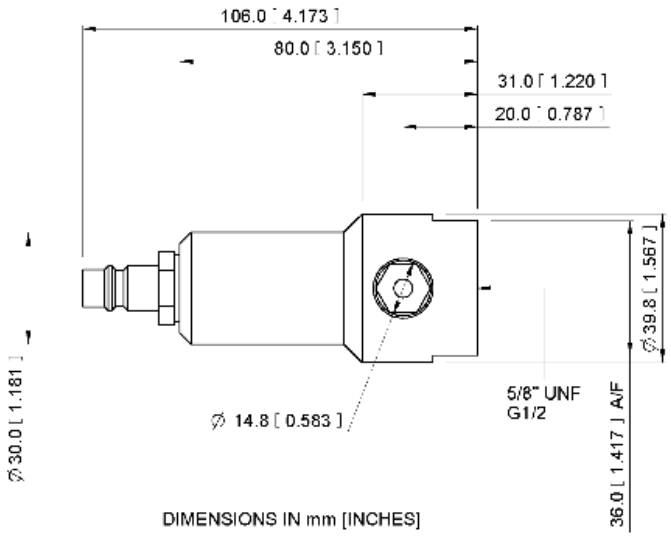


5/8" UNF

3/4" UNF



Quick Connect



APPENDIX B
Quality, Recycling & Warranty Information

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

APPENDIX C
Return Document & Contamination Declaration

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

APPENDIX D
Modbus Register Map

Modbus Register Map

All the data values relating to the SF82 are stored in 16-bit wide holding registers. Registers can contain either measured or calculated values (dew-point, temperature, etc.), or configuration data (output settings).

Modbus RTU Implementation

This is a partial implementation of the Modbus RTU Standard with the following codes implemented:

Function Code	Description
3	Read Holding Register
6	Write Holding Register
16	Write Multiple Holding Registers

Register Types

Data Type	Description
uint16	16-bit unsigned integer, can contain options list e.g. 0 = Dew Point, 1 = Temperature.
int16	16-bit signed integer.
int32	32-bit signed integer, stored across 2 16-bit registers.
float	IEEE754 single precision floating pint, stored across 2 16-bit registers

Serial Port Settings (RS485)

9600 Baud Rate, 8 Data Bits, No Parity, 1 Stop Bit, No Flow Control

http://www.simplymodbus.ca/FAQ.htm is an excellent resource covering the basics of the Modbus protocol. Full descriptions of the function codes (FC03/FC06/FC16) can be found in the sidebar.

https://www.scadacore.com/tools/programming-calculators/online-hex-converter/ is an excellent resource for determining register types/byte order issues in raw received Modbus data.

Register Address

Dec	Hex	Access	Data Type	Description	Comment
0	00	R	uint16	Instrument Modbus Address	
1	01	R	uint16	Instrument ID	
2	02	R	uint16	Sensor Batch Number	Batch 0xA123 Serial 0x0001 Complete sensor serial would be A123-001
3	03	R	uint16	Sensor Serial Number	
4	04	R	uint16	Firmware Version	Divide by 1000, ie 12003 = V12.003
5	05	R	uint16	Register Map Version	Divide by 1000, ie 12003 = V12.003
6	06	R	uint16	Year of Calibration	
7	07	R	uint16	Month of Calibration	
8	08	R	uint16	Day of Calibration	
…	…				
14	0E	R	special	Status	bit0 = Dew-point Sensor Short bit1 = Dew-point Sensor Open bit2 = Temperature Sensor Short bit3 = Temperature Sensor Open bit4 = Analogue Output Under-Range bit5 = Analogue Output Over-Range bit6 = Analogue Output Out-Of-Range ... bit14 = Memory Fault bit15 = Hardware Fault
…	…				
17	11	R	float	Dew Point (High Word)	
18	12			Dew Point (Low Word)	
19	13	R	float	Temperature (High Word)	
20	14			Temperature (Low Word)	

21	15	R	float	ppmV Ideal Gas (High Word)	
22	16			ppmV Ideal Gas (Low Word)	
…	…				
101	65	R/W	float	Pressure Value (High Word)	Used for ppmV Ideal Gas calculation
102	66			Pressure Value (Low Word)	
…	…				
110	6E	R/W	uint16	Analogue Output Parameter	0 = Off 1 = Dew Point 2 = Temperature 3 = ppmV Ideal Gas
111	6F	R/W	float	Analogue Output Range Low (High Word)	This value is clipped when parameter is changed. See parameter ranges below
112	70			Analogue Output Range Low (Low Word)	
113	71	R/W	float	Analogue Output Range High (High Word)	This value is clipped when parameter is changed. See parameter ranges below
114	72			Analogue Output Range High (Low Word)	
…	…				
120	78	R/W	uint16	Analogue Output, Under-Range Output	0 = None 1 = Low Alarm (3.5ma) 2 = High Alarm (23ma) 3 = Minimum Scale (4ma) 4 = Maximum Scale (20ma) 5 = Namur Low Alarm (3.7ma) 6 = Namur High Alarm (20.5ma)
121	79	R/W	uint16	Analogue Output, Over-Range Output	
122	7A	R/W	uint16	Analogue Output, Dew-Point Sensor Fault	
123	7B	R/W	uint16	Analogue Output, Temperature Sensor Fault	

Parameter Ranges	Min	Max
Dew Point	-150	250
Temperature	-150	250
ppmV	0	30000

http://www.michell.com