SF82
Dewpoint Transmitter
User's Manual

KAHN INSTRUMENTS, INC.
885 Wells Road, Wethersfield, CT 06109
Phone: 860-529-8643 Fax: 860-529-1895
E-mail: hygros@kahn.com www.kahn.com

SF82

For more information, please visit www.kahn.com

CONTENTS

APPENDICES

FIGURES

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 insure 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 Kahn 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 North America. The instrument is approved for use within the operating temperature range of -40°F to +140°F (-40°C to +60°C) and dependant on version, as being NEMA 4 / 12 (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 6500 psig (450 barg). 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, Maintenance and 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 Kahn Instruments for repair and 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)
°C	degrees Celsius
°F	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 Kahn 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 be retained in case transmitter is returned for service or calibration.

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

While in transit, the transmitter sensing element is protected 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 be 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 Kahn Instruments.

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 pry it clear.

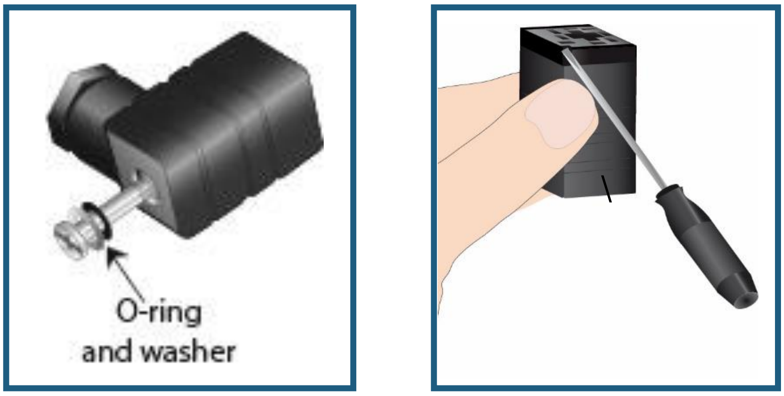


Figure 1 *Connector Terminal Block Removal*

Caution: when removing the central screw insure 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:

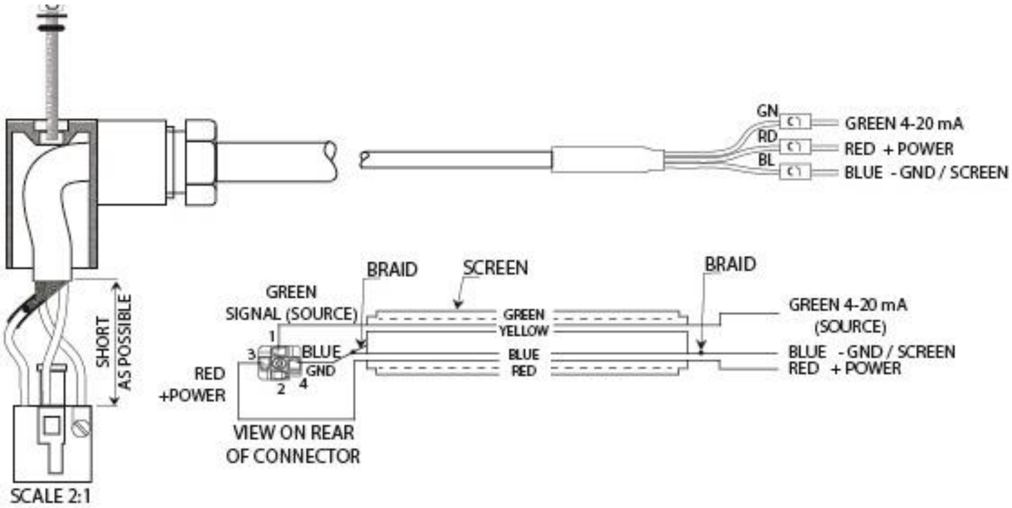


Figure 2 *Wiring Connections*

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 Kahn Instruments in the following lengths:

- 2.6 FT
- 6 FT
- 16 FT
- 32 FT

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

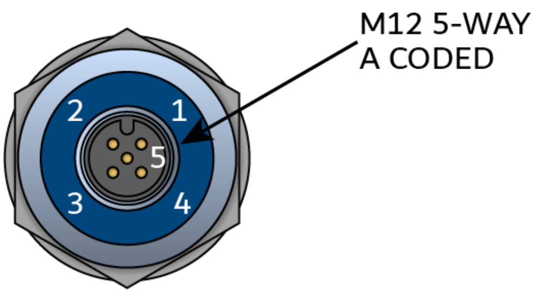


***Figure 3** Sensor Connector Installation*

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

Function	Pin	Wire Color
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 Kahn 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 insure 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 0.5 ft-lbs. The sensor cable used must be a minimum diameter of 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.

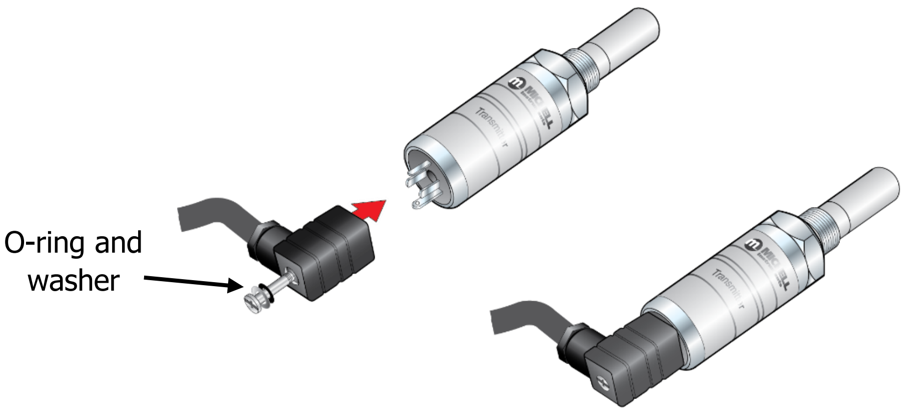


Figure 5 *Connector Installation*

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.

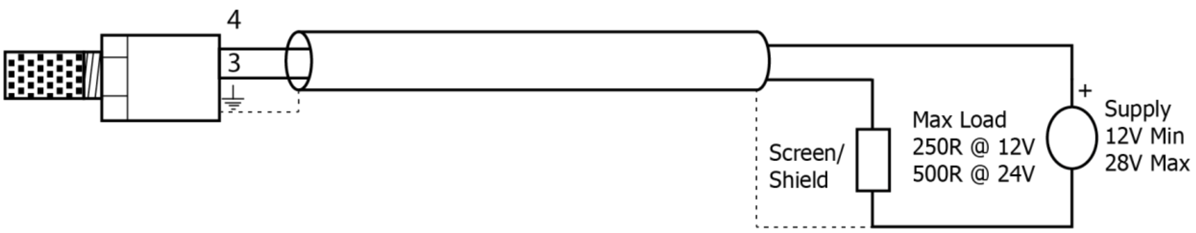


Figure 6 *2-Wire Connection Diagram*

2.4.1. Electrical Boundaries

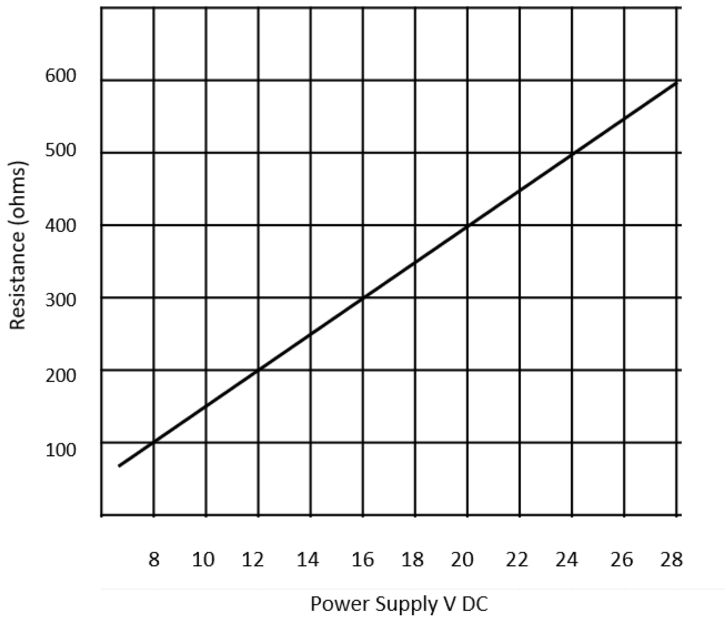


Figure 7 *Maximum Load of SF82 - Including Cable Resistance*

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 Installation

2.5.1. Sampling Considerations

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

- Direct insertion into a pipe
- Mounted in a sample block within a sample system

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

Examples of such environments:

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

The basic considerations for each measurement type are as follows:

Direct Insertion

1. **Dewpoint Sensor Position** – Will the sensor see an 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.

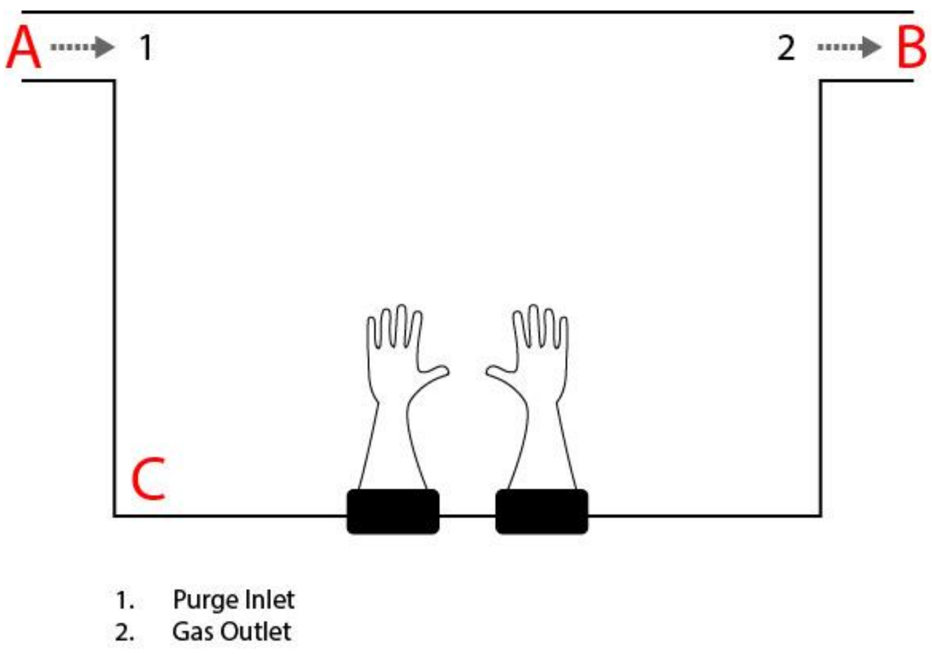


Figure 8 *Installation Location*

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.

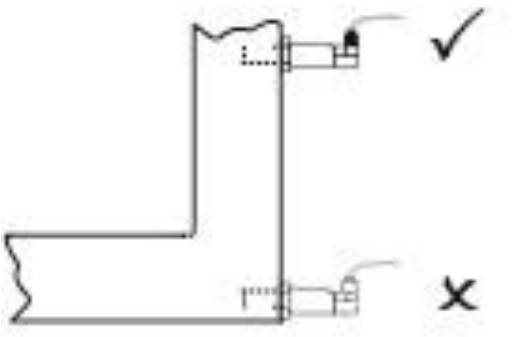


Figure 9 *Installation Location*

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 inches 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 32.8 ft/s (10m/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 or generally large amounts of dust; measurement in a sample system is recommended to accommodate proper in-line filtration.

4. **Sample Temperature** – Although the sensor can be operated at sample temperatures up to 140°F, 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.

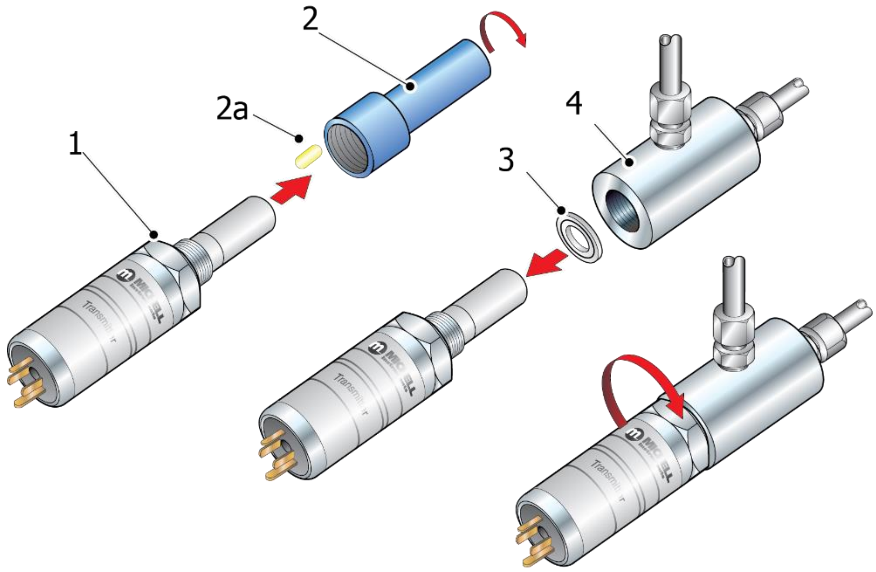


Figure 10 *Transmitter Mounting - Sensor Block*

2.5.2. Good Measuring Practice

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

Sampling Materials – Permeation and Diffusion

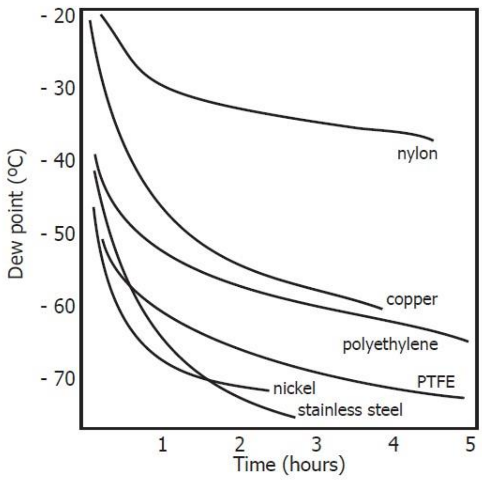


Figure 11 *Material Permeability Comparison*

All materials are permeable to water vapor 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 vapor pressure exerted on the outside of a compressed air line is higher than on the inside, the atmospheric water vapor will naturally push through the porous medium causing water to migrate into the pressurized 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 vapor to ingress into the sample line from outside. This effect is called diffusion and occurs when the partial water vapor 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.

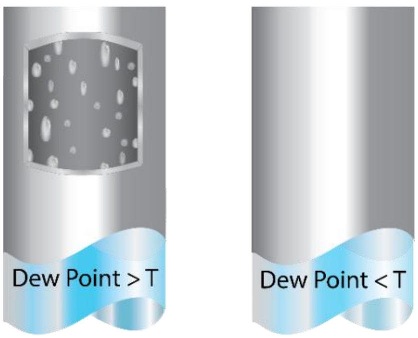
Temperature and Pressure effects

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.

Insuring 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 vapor 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 vapor pressure differential will also allow water vapor 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 insure 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 analyzer 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. For circular pipework, to insure 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.

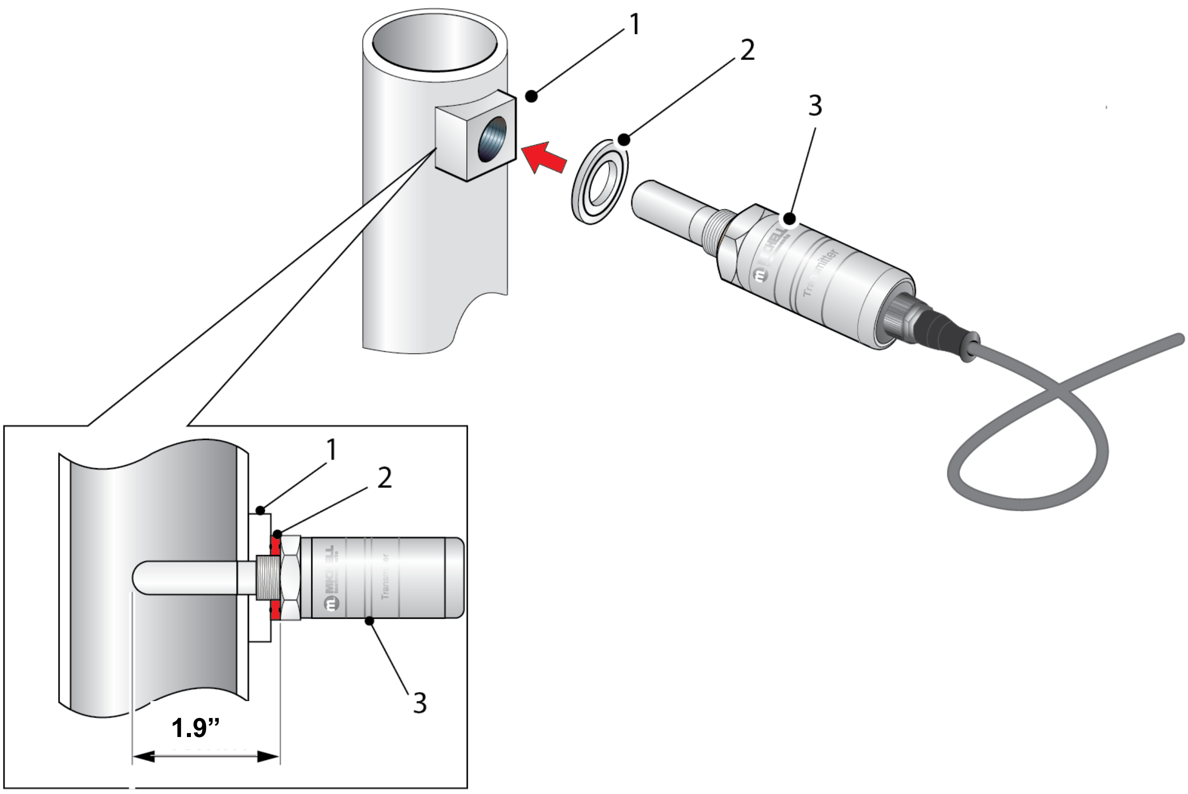


***Figure 12** Transmitter Mounting - Pipe or Duct*

- Do not touch the sensor guard
- Assume the bonded seal washer or o-ring seal is in place prior to screwing in the transmitter
- Screw in the transmitter by hand using the wrench flats only
- If transmitter has a bonded seal washer, torque to 22.5 ft-lbs.
- If equipped with an o-ring seal, torque to 29.5 ft-lbs.
- If using a threaded adapter, tighten as follows:
  6 ½" BSP 41 ft-lbs.
  Pipe adapter 29 ft-lbs.

Calibration

Annual recalibration of the SF82 is recommended to maintain the performance. Calibration services traceable to the US National Institute of Standards and Technology (NIST) are provided by Kahn Instruments.

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 discoloration. 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 Kahn Instruments representative.

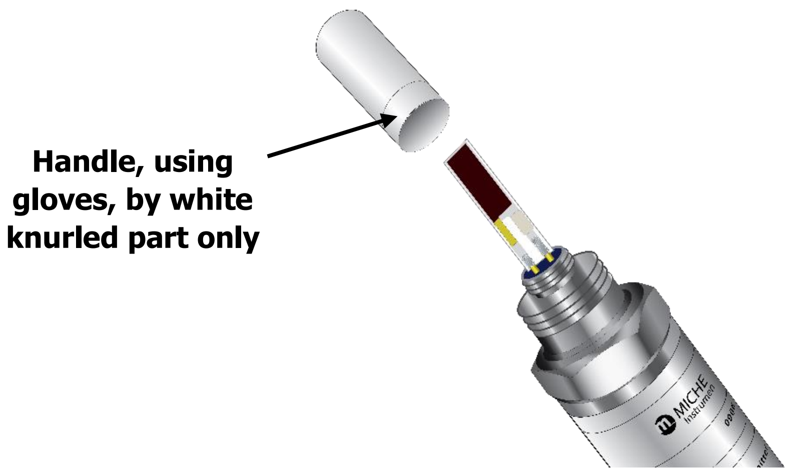


Figure 13 *Replacement HMWPE Guard*

Bonded Seal – O-Ring Seal

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

APPENDIX A
Technical Specifications

Technical Specifications		
Performance		
Product	**SF82 MiniDIN 43650**	**SF82 M12**
Measurement Range (Dew Point)	-76 ºF to +140 ºF (-60 ºC to +60 ºC) dew point	
Accuracy (Dew Point)	±3.6 °F (±2 °C) dew point*	
Response Time	63% at room temperature at 1 bara -76 ºF to +68 ºF (-60 ºC to -20 ºC) dew point: 6 s -4 ºF to -76 ºF (-20 ºC to -60 ºC) dew point: 40 s	
Repeatability	0.9 ºF (0.5 ºC) dew point	
Calibration	9-point calibration certificate traceable to NIST	
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)	-76 °F to +140 °F (-60°C to +60°C) dewpoint -58 °F to +122 °F (-50°C to +50°C) dewpoint -58 °F to +86 °F (-50°C to +30°C) dewpoint -112 °F to +68 °F (-80°C to +20°C) dewpoint -4 °F to +122 °F (-20°C to +50°C) dewpoint (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

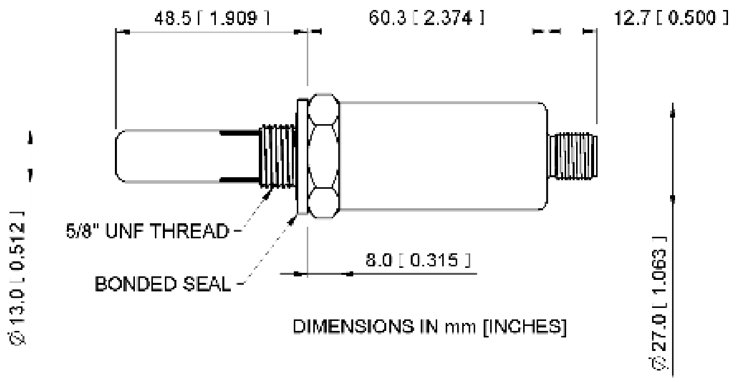
Electrical Safety	IEC61010-1, UL61010-1 & CAN/CSA C22.2 No. 61010	IEC61010-1, UL61010-1 & CAN/CSA C22.2 No. 61010 EN61373 Rail Rolling Stock EN50121-3-2 Rail EMC/RFI
Operating Specifications		
Operating temperature	-4 °F to +140 °F (-20 °C to +60 °C)	
Compensated temperature range	-4 °F to +122 °F (-20 °C to +50 °C)	
Storage Temperature	-40 °F to +140 °F (-40 °C to +60 °C)	
Maximum Operating Pressure	1450 psig (100 barg) maximum	
Flow rate	2-10 scfh (1 to 5 Nl/min) mounted in standard sampling block; 0 to 33 f/s (0 to 10) m/s direct insertion	
Mechanical Specifications		
Ingress protection	NEMA 4 ingress protection in accordance with NEMA 250 (IP66 in accordance with BS EN 60529)	NEMA 12 (IP65)
Housing material	316 stainless steel	
Dimensions	5.25" x 1.77" (with connector cable)	6.2" x 1.77" (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 (optional) 6 1/2" - BSP (optional)	
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 2.6', 6', 16', 32' cable options	Optional 2.6', 6', 16', 32' cable options
Diagnostic conditions	Sensor fault: 23 mA Under-range dew point: mA	

(factory programmed)	Over-range dew point: mA

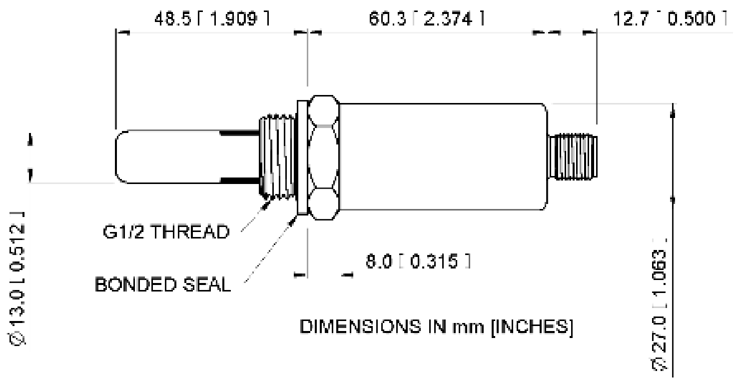
NOTES: * Over Compensated Temperature Range

Product Dimensions

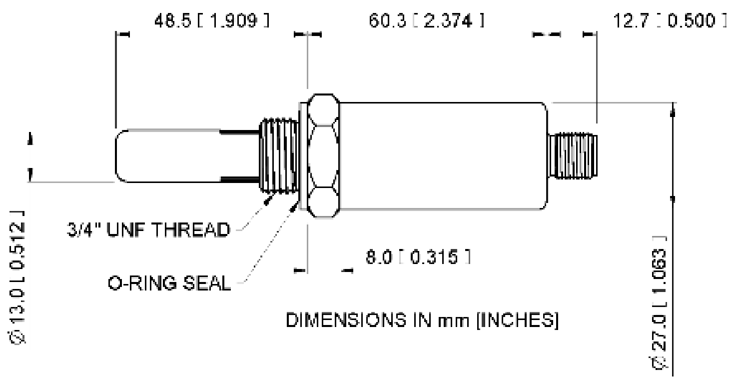
M12, 5/8" UNF



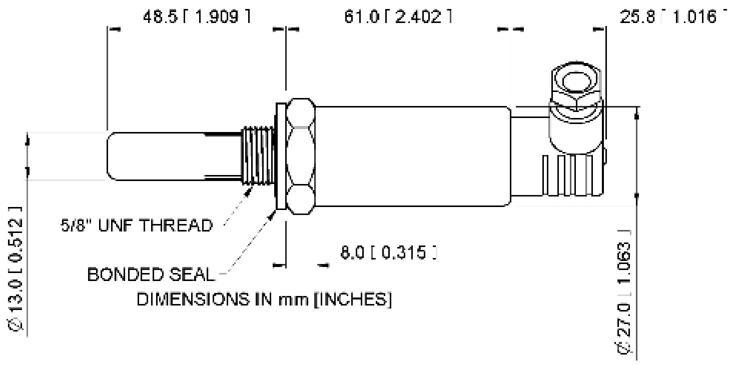
M12, G1/2



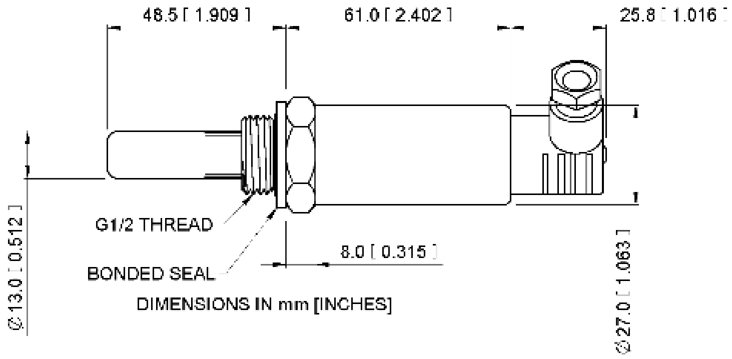
M12, 3/4" UNF



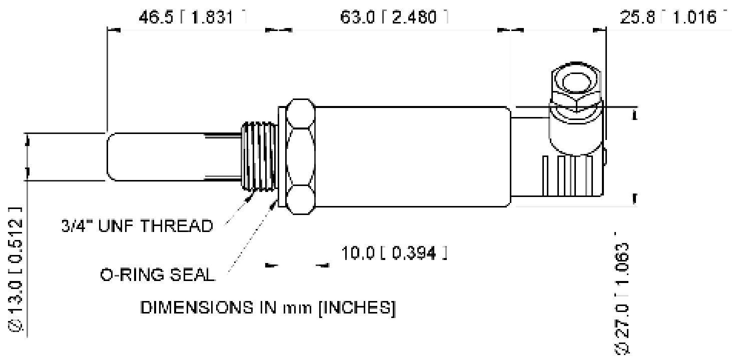
MiniDIN, 5/8" UNF



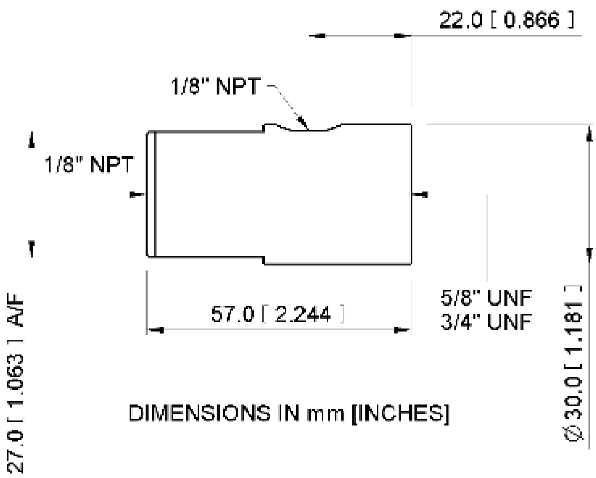
MiniDIN, G1/2



MiniDIN, 3/4" UNF

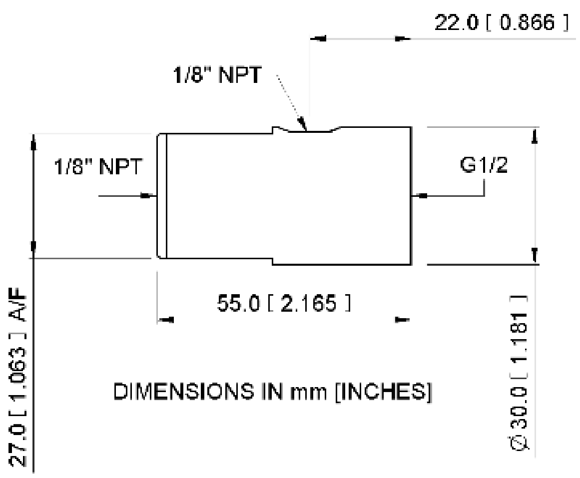


G1/2

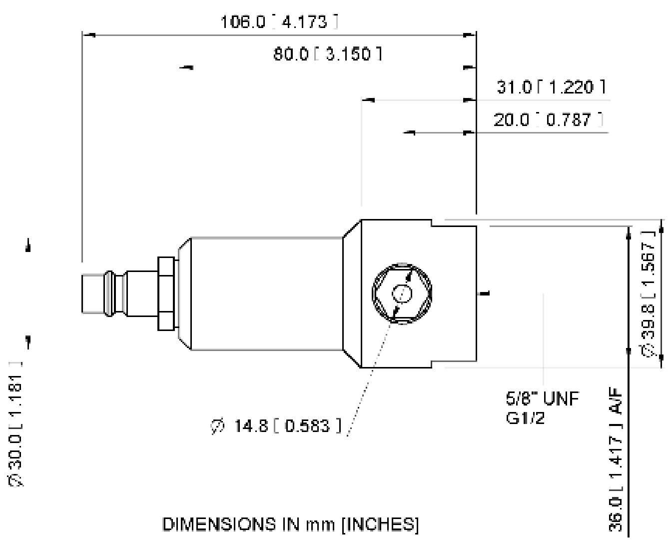


5/8" UNF

3/4" UNF



Quick Connect



APPENDIX B
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

hiip://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.

hiips://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

NOTES: