Humidity and Dew-Point Measurement and Calibration

MICHELL Instruments

Process Measurement & Controls, Inc.
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Tel: 203-792-8686
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Accreditations

UKAS

At Michell Instruments we understand and endorse the need to conform to recognized standards for quality and calibration. Our calibration laboratory maintains full traceability to British (NPL) and American (NIST) Humidity Standards.

UKAS CALIBRATION
0179

Michell Instruments has been accredited to UKAS (United Kingdom Accreditation Service) for the calibration of dew-point hygrometers since 1986 (laboratory number 0179) and our current dew-point calibration range is -90 to +82°C / -130 to 180°F. For full details of our measurement capability please see our Schedule of Accreditation. Our traceability to NIST (National Institute of Standards & Technology) is over the range -75 to +20°C / -103 to 68°F.

Michell Instruments is also UKAS accredited for the calibration of relative humidity instruments. The accreditation covers the relative humidity range of 10 to 98% RH at temperatures from 10 to 82°C / 50 to 180°F and 10 to 73% RH from 82 to 90°C / 180 to 194°F. Uncertainty is 2% of measured relative humidity at temperatures from 20 to 90°C / 68 to 194°F and 2.3% of measured relative humidity from 10 to 20°C / 50 to 68°F (at a coverage factor of k=2). Best measurement uncertainty for temperature is ±0.2°C / 0.36°F.

As a result of the European Accreditation (EA), our UKAS accreditation carries equal validity in any country which is a member of the EA.

NVLAP

Michell's UKAS accreditation is commonly recognized in the USA as equivalent to NVLAP (National Voluntary Laboratory Accreditation Program) accreditation.

ISO 9001:2000

Michell Instruments has been awarded registration to BS EN ISO9001:2008.

BSI
UKAS QUALITY MANAGEMENT 003
Q 06284

These prestigious accreditations and registration give Michell Instruments a unique position within the field of hygrometry - independently audited and commended by National Bodies on both quality and calibration.

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Represented by:

Michell Instruments

Global Leader for Solutions in Moisture, Humidity and Gas Analysis

Established in 1974, the Michell Instruments Group of Companies brings more than 35 years of research, design and state-of-the-art technology to the world of moisture measurement and control. The current products include:

Products

- dew-point transmitters
- chilled mirror hygrometers
- relative humidity (RH) sensors
- process moisture analyzers
- hydrocarbon dew-point analyzers
- moisture in liquid analyzers and
- oxygen analyzers

Technology Centers

Michell's Technology Center of Excellence is in Ely, UK, where many research projects are carried out in association with world-famous, and nearby, Cambridge University. Other R&D facilities are based in Made, The Netherlands and Lyon, France.

Manufacturing

Michell Instruments has three manufacturing locations: Made, The Netherlands; Lyon, France and the main ISO 9001 certified Manufacturing facility in Ely, UK. This location also boasts UKAS accreditation, NIST and NPL, certified calibration traceability, and many other worldwide approvals including Atex, FM, UL, CSA and many more.

Service and Support

Michell prides itself on an extensive network of factory trained application engineers, subsidiaries and distributors stretching across 56 countries. Service centers and calibration laboratories are located on three continents - North America, Europe and Asia. The company, always aware of the importance of after-sales, offers field support and exchange programs to maintain continuous operation at its customers' facilities.

Applications

High-precision capacitive moisture transmitters help customers to measure trace moisture in their process applications and are the No. 1 choice for manufacturers of drying systems worldwide. Relative Humidity transmitters and temperature sensors are widely used in HVAC applications, weather stations, pharmaceutical storage and many other processes where controlled environmental conditions are crucial.

Companies around the world save thousands of dollars using Michell's humidity calibration systems, incorporating the Michell reference chilled mirror dew-point hygrometers. The calibration of portable hygrometers and relative humidity instruments in-house, reduces down-time and cuts expense.

Michell offers the high-speed measurement of oxygen in a range of applications, including combustion optimization for power stations, controlling levels of CO_2 for breweries, and clean-gas processes, such as silicon wafer production and pure gas generation.

Users in the natural gas industry and power plants save millions of dollars in repairs and down-time by using the Condumax II hydrocarbon dew-point analyzers. These instruments ensure transmission of natural gas quality at custody transfer and also prevent gas burner failure and prolong the life of process equipment.

Other analyzers for moisture in hydrocarbon liquids are available in explosion proof, intrinsically safe, as well as laboratory versions, and allow the continuous measurement of the moisture content in a wide range of hydrocarbon liquids, including transformer oil, hydraulic oil, petrochemical fractions and pure hydrocarbons.

Contents

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Product guide

Choosing the best product from this catalog

In this catalogue we offer a wide range of products for a large number of applications. In order to help you find the correct product we have grouped the products in two ways: with product names and colored application groups.

The structure of the product names are as follows:

PC – probe with a connector to the cable

PF – probe with a fixed cable

RM – room monitoring

WM – wall mount

DT – duct mount

WR – wall-mount transmitter with remote probe on a cable

DM – for direct measurement with a hand meter

H – capacitive humidity sensors

I – interchangeable sensor module (Hygrosmart)

SF – dew-point instrument based on capacitive sensor technology

Easidew – dew-point instruments based on ceramic sensor technology, for low dew points.

Colored application groups

The five color levels you will find as a label on each product are based on application structure. For example, complex or accurate applications can be named as precision manufacturing - this group of applications often has demands for precise measurement instruments. Greenhouses, indoor swimming pools and storage of pharmaceutical products are controlled environments. Storage of paper, building automation and humidity control in museums is included in the HVAC category. The colors used in this catalog can be used as a guide for choosing the most suitable instrument for your application.

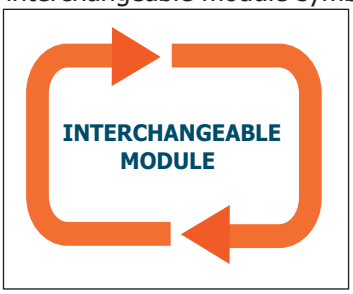
Precision manufacturing
Controlled environment
HVAC
Calibration
Sensors

Chemical tolerance

When moisture levels need to be measured in a gas (or in air), changes in temperature, the composition of the gas and the humidity level will all influence the stability of the measurement. In some cases the gas needs to be analyzed prior to selection of the right product. Michell H-type capacitive humidity sensors have a long track record of good performance in various types of contaminated atmospheres. If you are unsure about your gas composition, we recommend that you contact your sales representative or Michell application engineer to verify the application with our extensive chemical tolerance database.

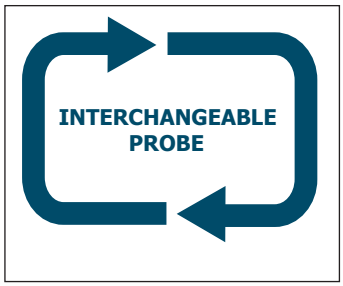
Interchangeable module

A number of products within our product range offer a unique interchangeable module, the I7000. Thanks to this concept there is no need to recalibrate your instrument. Simply replace the module for a factory calibrated module. This plug-and-play system guarantees fast replacement with short down-time and no maintenance. Products presented in this catalog that are equipped with this interchangeable module are marked with the interchangeable module symbol.



Interchangeable probe

In order to achieve better specifications, Michell Instruments has designed some of their products for use with an interchangeable probe. This interchangeable probe is resistant to temperatures of up to 200°C. As with the interchangeable module, the interchangeable probe has a plug-and-play system that guarantees fast replacement with almost no down-time or maintenance. The interchangeable probe can be sent back to the factory for servicing. Products presented in this catalog that are equipped with this interchangeable probe are marked with the interchangeable probe symbol.



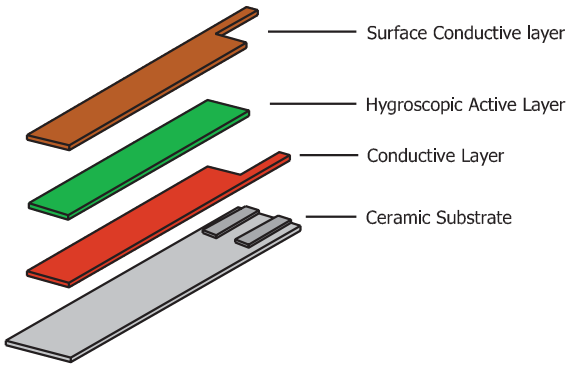
Humidity Sensor Technology

Easidew Advanced Ceramic Moisture Sensor Technology for direct trace moisture and dew-point measurements

Michell Easidew transmitters and instruments are rugged, industrial hygrometers for reliable moisture analysis, from trace levels to ambient air conditions. They can be used on a wide range of gases, including hazardous area applications (flammable or explosive gases), and with many corrosive gases. All Easidew instruments use Michell's Advanced Ceramic Moisture Sensor technology.

The cutting edge Michell Ceramic Sensor is constructed using state-of-the-art thin and thick film techniques. Operation of the sensor depends upon the adsorption of water vapor into a porous non-conducting "sandwich" between two conductive layers built on top of a base ceramic substrate. The active sensor layer is very thin – less than one micron (a millionth of a meter) - and the porous top conductor that allows transmission of water vapor into the sensor is precisely engineered to nano-technology standards, thousandths of a micron thick, in order to ensure precise and repeatable measurement.

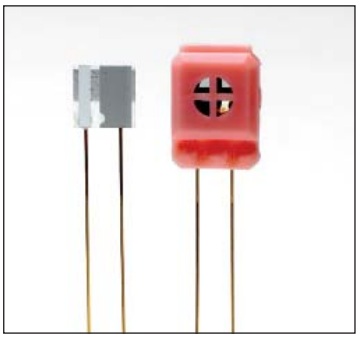
Therefore the sensor responds very rapidly to changes in applied moisture, both when being dried (on process start-up) and when called into action if there is moisture ingress into a process. Despite this extreme sensitivity to changes in moisture content, the Michell Ceramic Moisture Sensor is incredibly rugged, due to the nature of its construction. To protect the sensor further against contaminants and pipe swarf it is housed in a protective HDPE guard that keeps contaminants out, but is porous to water vapor. All Michell Easidew Ceramic Moisture Sensors give 2°C dew point or better accuracy and excellent long-term reliability and stability in process applications.

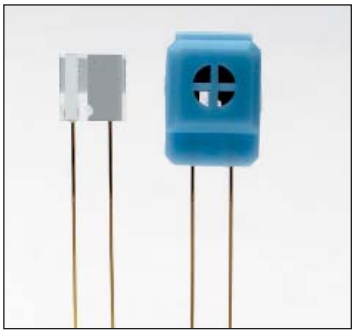


Ceramic sensor tile layers

Relative Humidity Sensors

Michell's H5000 and H6000 Series are capacitive humidity sensors providing fast and accurate measurement of relative humidity in air, gases and other environments.





The H5000 is used to control ambient environments and is suitable for many applications. It can be used under repetitive and prolonged conditions of high humidity (close to saturation). Condensation or wetting do not alter sensor performance.

The H6000 provides enhanced protection from contamination and corrosive environments and can be used in most applications. It can meet the requirements resulting from difficult operations, such as tile, brick and pasta drying. It is protected against chemical contents in air and is very suitable for poultry farms or fruit/vegetable storage environments.

Key features of the H5000 and H6000 series sensors are:

- Suitable for high humidity levels
- Wide operating temperature range
- Withstands condensation or wetting

Operating principle

The H5000 and H6000 relative humidity sensors are polymer film capacitive devices and benefit from extremely fast response, low hysteresis and high long-term stability.

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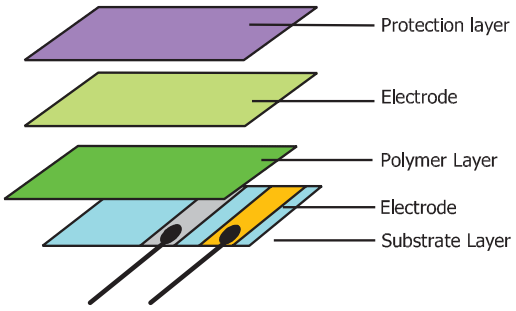
Humidity Sensor Technology

Michell's relative humidity sensors were originally developed by the French company Coreci S.A. In 2008, the Michell Group acquired the technology and the dedicated team of sensor engineers in Lyon, France that have developed the product line and achieved an enviable, world-wide reputation for sensor quality and performance.



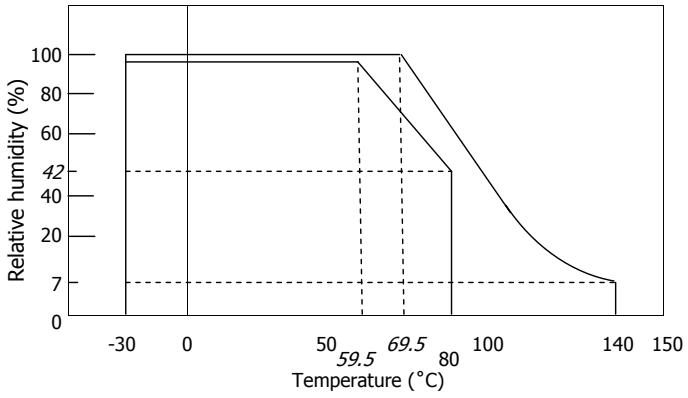
Relative Humidity Sensor tile layers

The key to the sensor's performance is the design and construction of the super-thin hygroscopic polymer material that forms the dielectric of the sensor, sandwiched between two conductive metal electrodes. The outer electrode is engineered to have a porosity specific to water vapor and therefore adapts extremely quickly and reversibly to the prevailing humidity, giving a large capacitance response and therefore high sensitivity.

The sensors and their components have been specially designed and manufactured to provide excellent metrological features while avoiding interference of the measured environment.

Operating range

Michell's H5000 and H6000 series relative humidity sensors have an extremely wide range of operation for temperature and relative humidity measurements, making them suitable for virtually any application.



The maximum upper limit of the operating range is represented by the following water/air mixing ratios:

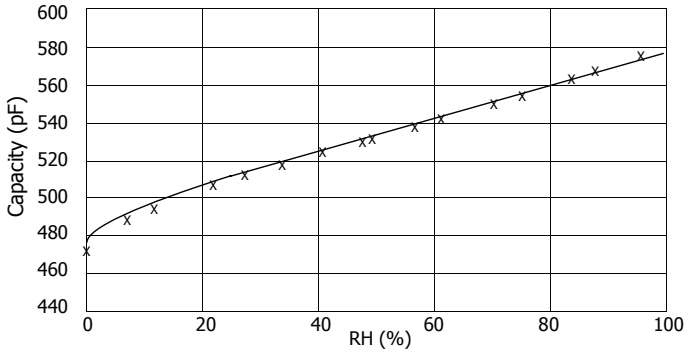
H5000: 250g water/Kg dry air, temperature +200°C / +392°F

H6000: 250g water/Kg dry air, temperature +200°C / +392°F

250g/kg dry air corresponds to 95% RH max at 70°C / 158°F or 21% RH max at 99°C / 210°F

Typical response curve

This curve illustrates the high sensitivity of the sensor in terms of capacitance (pF) change over a 0 to 100% RH measurement range, i.e. a typical variation of approximately 86 pF for a 100% RH variation.



X: Experimental points

Long term measurement stability

The excellent metrological characteristics of the H5000 and H6000 ensure that short- and long-term drift are minimized.

Under extreme and prolonged conditions of high humidity (>95% RH), a drift may be observed, but it is reversible once normal ambient conditions are restored.

Duration (DAYS):	1	7
Reversible deviation (% RH):	2%	3%

Long-term drift is low for a wide range of temperature and RH values. Typically, for a 12-month period the drift is less than 2%, measured at 75% RH and at room ambient temperature.

Calibration of in-service hygrometers should be verified on a 6 to 12 months schedule. Under normal operating conditions, accuracy is excellent, and an adjustment is normally not necessary. Saturated salt and unsaturated salt RH reference elements are available for calibration procedures, as well as more sophisticated automatic

Humidity Sensor Technology

calibrators such as the S503, S904 and OptiCal. Under normal operating conditions, experience has shown that the life expectancy of sensors is longer than 10 years.

Behavior in corrosive environments
H5000 and H6000 sensors use a synthetic polymer as a dielectric that is intrinsically resistant to corrosion and contamination. However, many industrial applications involve a large number of acidic or oxidizing agents, and the long-term sensor reactions to oxidizing environments (such as $S0_2$) with high RH levels are quite interesting. The KESTERNICH test is used to simulate the unit response under these conditions.

The test consists of immersing the products in an aggressive gas. A single testing day corresponds to 1 year under normal operating conditions, which accelerates aging by 365 times. The KESTERNICH test (name of its inventor) meets the DIN 50.018 KF W 0.2 S standards.

Michell's H5000 and H6000 sensors have been subjected to the KESTERNICH test under the supervision of an external laboratory - Laboratoire Central des Industries Electriques (L.C.I.E., n0356502 dated 14 July 1991).

The test results showed:
Appearance: slight alteration after 10 years.
Operation: No measurable effect after 10 years.

Condensation and cleaning
Condensation or occasional wetting have no adverse effects on H Series sensor reliability. H5000 and H6000 revert to their initial metrological features once the liquid water has been thoroughly eliminated.

H5000: at humidities above 98% RH there is a high risk of wetting. In this case the sensor will not be damaged, but 2-3 hours may be necessary before the sensor reverts to its normal condition.

H6000: wetting could occur in close-to-saturation operating conditions but in such cases the sensor will not be seriously damaged and it may take up to 30 minutes before reverting to its initial measuring conditions.

It is recommended not to touch the surfaces of the sensor with mechanical devices or your finger. Do not try to remove particles or deposits as they do not modify the characteristics of the sensor.

Cleaning: may be done by immersing the sensor in clean water and drying naturally in air.

Influence of air velocity on the measurement
H5000 and H6000 sensing elements require some elementary precautions in order to prevent the pollution of the active surface. The H5100 & H6100 cover provides mechanical protection.

The H6000 hydrophobic layer increases dust protection in high air flow and in case of frequent wetting.

In all cases, some form of mechanical protection, such as a slotted, sintered or polymer guard is recommended. It is generally not necessary to force fluid circulation due to the rapid response time of the sensor, however a moving air or gas flow will aid equilibration times in the process itself. Fluid flow velocity up to 66 ft/second (20 m/s) will have no adverse effects on sensors protected by a mechanical cover.

Calibration recommendations
All types of RH generators can be used for short calibration periods or for tests under 24 hours. Nevertheless, Stable Saturated Salt Solutions (S.S.S.S.) are suitable for calibrations and inspection but are not recommended for long-term tests, especially at high humidity.

A stabilization period of 5-60 minutes is recommended for relative humidity sensor calibration or other tests, depending upon the method of RH generation (e.g. a 60 min. period is recommended for (S.S.S.S.). However, it should be noted that the actual stabilization time of some saturated and unsaturated mixtures can be significantly longer. Michell can advise on a calibration timing protocol to suit your exact needs.

PCMini52

Relative Humidity and Temperature Transmitter Mini Probe

The microprocessor control and multi-point calibration gives the PCMini52 RH transmitter excellent performance in terms of accuracy and linearity. The mini probe transmitter can provide two linear analog outputs for temperature and relative humidity, dew point or absolute humidity.

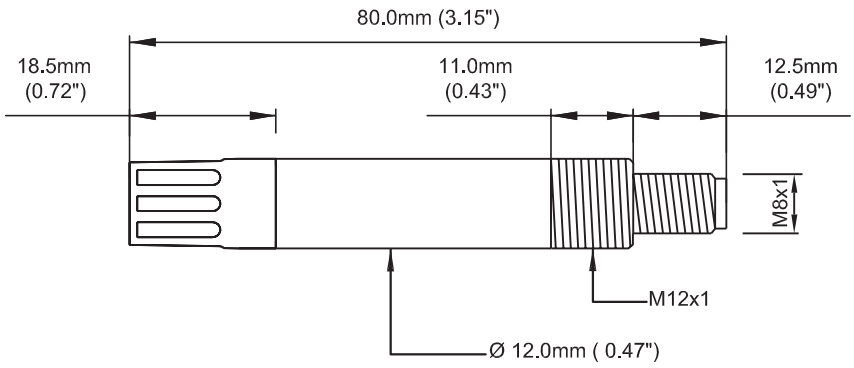
Highlights

- Output can be %RH, calculated absolute humidity, dew point or wet bulb temperature + temperature
- Excellent linearity, microprocessor corrected and temperature compensated
- Low power consumption, fast settling time
- Small size: 3.15" x 0.47"ø / 80mm x ø12mm

Technical Specifications

Performance	
Measurement range (RH)	0–100% RH
Measurement range (T)	-4 to +176°F / -20 to +80°C
RH Accuracy at 23°C / 73°F	<±2% RH (10–90% RH)
Temperature Accuracy	±0.36°F (14 to 122°F) ±0.2°C (-10 to +50°C)
Stability – RH Sensor	±1% RH/year
Response time – RH Sensor	<10 sec typical (for 90% of the step change)
Electrical output / input	
Output signal options	0–1 VDC, 0–5 VDC, 0–10 VDC
Supply voltage	14–35 VDC (for 0–5 & 0-10 VDC) 4.5–35 VDC (for 0–1 VDC) and 14–26 VAC
Operating conditions	
Operating humidity Probe, Housing, Storage	5-95% RH (non-condensing)
Operating temperature Sensing element Housing Storage	 -25 to +185°F / -30 to +85°C -25 to +185°F / -30 to +85°C -40 to +160°F / -40 to +85°C
Mechanical specification	
Ingress protection	IP65
Housing material	Molded polymer housing, or stainless steel
Dimensions	L=3.15" x ø 0.47" / L=80mm, ø12mm
Weight	10g / 0.4oz
Electrical connections	4 pin, H8 connector

Dimensions



PCMini52

Accessories and spare parts

Check your hygrometer with the control kit HKC which is based on the principle of non-saturated salt solutions. Refer to technical data sheet CONTROL KIT.	Control Kit HKC
Connector with 6.5ft / 2m cable	**A000033**
Connector with 16ft / 5m cable	**A000036**
Connector with 32ft / 10m cable	**A000037**
Connector without wire	**A000321**
Slotted protection cap, black	**A000003 (standard)**
PVDF filter	**A000017**
PVDF filter with protection cap	**A000018**
Wire mesh filter with protection cap, black	**A000022**
Stainless steel sintered dust filter	**A000023**
Stainless steel sintered filter 20 µm pore size	**A000028**
½" NPT adj fitting stainless steel. Only to be used with stainless steel probe housing	**A000101**
Aluminum mounting flange	**A000111**

Electrical Connections

Cable	
Brown	Supply voltage V+
White	Output RH, Dew Point, Absolute Humidity or Wet Bulb
Black	Output temperature
Blue	Common ground

Order codes

Relative humidity and temperature mini probe

PCMini52	4	M	X	H	T1	A

Output configuration	
0–10 V (not available with Temp Output Range code X)	3
0–5 V	4
0–1 V	5

Body configuration	
Molded polymer housing	X
Stainless steel	S

Cable length	
No cable	A
6.5ft / 2m with mating connector	B
16ft / 5m with mating connector	C
32ft / 10m with mating connector	D

Temperature output range	
No T output (0-1 & 0-5v out only)	X
-4 to +176°F / -20 to +80°C	T1
Other scaling (pls specify) upon request	TX

Moisture signal configuration	
RH	H
Calculated dew-point temperature & temperature output. Range (Td) -40 to +140°F /-40 to +60°C (only available with temperature range T1)	D
Calculated absolute humidity and temperature output. Range Abs from 0 - 200g/m³ / 87.4gr/ft³ (only available with temperature range T1)	A
Calculated wet bulb temperature and temperature output. Range (Tw) -40 to +140°F /-40 to +60°C (only available with temperature range T1)	W

Example: PCmini52 4 M X H T1 A
Relative humidity and temperature mini probe PCmini52, 0–5 V output, molded polymer housing, 0-100% RH signal, -4 to 176°F / -20 to 80°C temperature range, no cable.

Please note: Michell Instruments adopts a continuous development program which sometimes necessitates specification changes without notice. Please contact us for latest version. Ref: PCmini52_1001US_M

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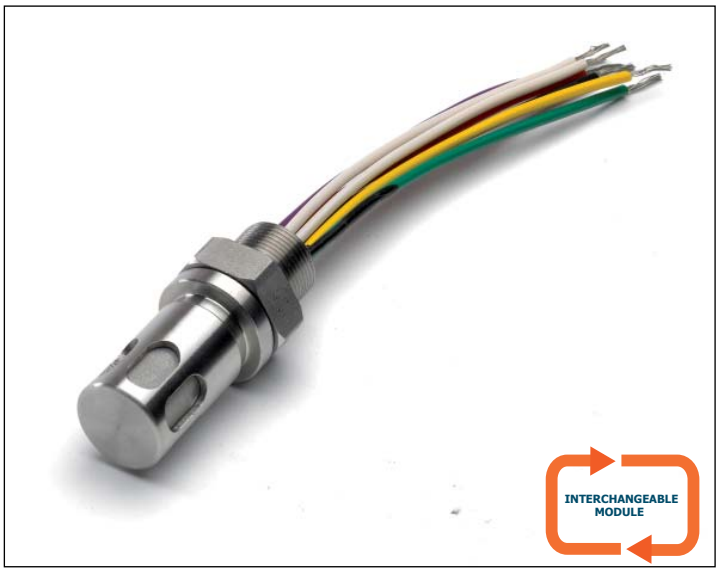
PCMini70

Relative Humidity and Temperature Mini Probe



The PCMini70 is a relative humidity transmitter based on the interchangeable Hygrosmart module.

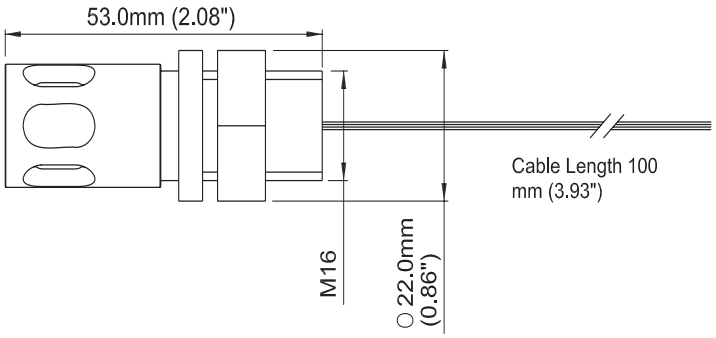
Highlights

- Designed for OEM applications
- Based on the interchangeable Hygrosmart module
- Compact housing

Technical Specifications

Performance	
Measurement range (RH)	0–100% RH
Measurement range (T)	-22 to +185°F / -30 to +85°C
RH Accuracy at 23°C / 73°F	<±2% RH (5–95% RH)
Temperature Accuracy	±0.36°F (14 to +122°F) ±0.2°C (-10 to +50°C)
Stability – RH Sensor	<±1% RH/year
Response time – RH Sensor	<10 sec typical (for 90% of the step change)
Electrical output / input	
Output signal (RH)	0-1 V
Output signal (T)	3-wire 1/3 DIN Pt100 direct
Supply voltage	5 VDC ±5%
Load resistance	R > 5K Ω Digital: CMOS compatible
Current consumption	1.5 mA max
Operating conditions	
Operating humidity Probe, Housing, Storage	0–100% RH
Operating temperature Sensing element Housing Storage	 -22 to +185°F / -30 to +85°C -40 to +185°F / -40 to +85°C -40 to +185°F / -40 to +85°C
Mechanical specification	
Housing material	AISI 316
Dimensions	L=2.08", ø0.86" / L=53mm , ø22mm
Filter	AISI 316 stainless steel mesh
Weight	2.3oz / 65g
Electrical connections	Threaded nipple + nut

Dimensions

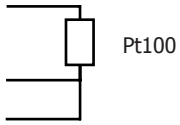


Accessories and spare parts

Hygrosmart without Pt100	**I7 0 00 0**
Hygrosmart with Pt100	**I7 0 00 1**
Stainless steel slotted cap with mesh filter (standard)	**K1**
Stainless steel slotted cap with PTFE filter	**Z1**

Electrical Connections

Cable



Black	0 V	Common ground
Red	+5 V	Supply Voltage V+
Violet	Out V	Output RH (Volt)
Yellow	Out F	Output RH (freq)

Order codes

Relative humidity and temperature mini probe | PCmini70 | 1 | K1

Temperature output signal	
No temperature output	0
Pt100 direct (standard)	1

Filter	
Stainless steel slotted cap with mesh filter (standard)	K1
Stainless steel slotted cap with PTFE filter	Z1

Example: PCmini70 1 K1
Relative humidity and temperature mini probe PCmini70, with Pt100 direct output and stainless steel slotted cap with mesh filter.

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PC33 & 52

Relative Humidity and Temperature Transmitter Analog

The PC series offers a comprehensive range of relative humidity transmitters for accurate, stable and repeatable measurements. Available with analog output signals, the PC series can be installed in a wide variety of applications.

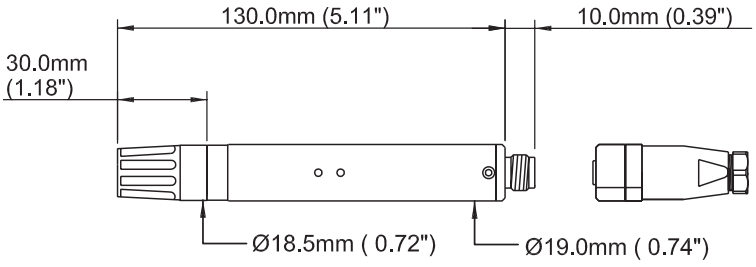
Highlights

- Low cost PC33 with analog output is designed for HVAC applications
- PC52 with analog output is designed for accurate measurement in controlled environments

Technical Specifications

Performance	
Measurement range (RH)	0–100% RH
Measurement range (T)	-4 to +176°F / -20 to +80°C
Accuracy at 23°C (73°F) Humidity	PC52: <±2% RH (10–90 % RH) PC33: <±3% RH (30–80% RH)
Temperature Accuracy	PC52: ±0.36°F (14 to 122°F) ±0.2°C (-10 to +50°C) PC33: ±0.54°F (41 to 104°F) ±0.3°C (5 to +40°C)
Stability – RH Sensor	±1% RH/year
Response time – RH Sensor	<10 sec typical (for 90% of the step change)
Electrical output / input	
Output signal	4–20 mA, 0–1, 0–5, 0–10 VDC
Supply voltage	14–30 VDC (0-5V & 0-10V output) 5–30 VDC (0–1 V & mA output)
Operating conditions	
Operating humidity Probe, Housing, Storage	5-95% RH
Operating temperature Probe,Housing Storage	 -20 to +185°F / -30 to +85°C -40 to +185°F / -40 to +85°C
Mechanical specification	
Ingress protection	IP65
Housing material	Molded polymer or stainless steel
Dimensions	L=5.11", ø0.74" / L=130, ø19mm
Weight	1.1oz / 30g without cable (molded polymer housing version)
Electrical connections	M12

Dimensions



Accessories and spare parts

You can check your hygrometer with the control kit HKC which is based on the principle of non-saturated salt solutions. Refer to technical data sheet CONTROL KIT.	**Control Kit HKC**
Connector, screws	**A000030**
Connector with 6.5ft / 2m cable	**A000031**
Connector with 16ft / 5m cable	**A000032**
Slotted protection cap, black (standard)	**A000002**
PVDF filter	**A000014**
PVDF/Foil filter with protection cap, black	**A000015/44**
Wire mesh filter with protection cap, black	**A000021**
Stainless steel sintered filter 5/10/20µm	**A000025/26/27**
Foil filter 2µm with black protection cap	**A000040**
Aluminum mounting flange	**A000110**
Stainless steel fitting	**A000100**
Molded polymer housing mounting flange	**A000150**
Weather cap, wall ø90.0mm / ø3.54" for ø19mm / ø0.74" probes	**A000120**
Weather cap, wall ø120.0mm / ø4.72" for ø19mm / ø0.74" probes	**A000125**

Electrical Connections

Voltage output		
Cable	**Connector**	
White	Pin 1	Power Supply V +
Green	Pin 4	Output RH +
Yellow	Pin 2	Output temperature +
Brown	Pin 3	Common return

4-20 mA output 2-wire		
Cable	**Connector**	
White	Pin 1	Output RH +
Brown	Pin 3	Output RH -
Green	Pin 4	Output temperature +
Yellow	Pin 2	Output temperature -

Order codes

Relative humidity and temperature probe | PC33 | 4 | XX | T3 | A |

Accuracy and version configuration	
3% accuracy, 1 calibration point (50%)	PC33
2% accuracy, 2 calibration points (20%, 85%)	PC52

Output configuration	
4–20 mA	2
0–10 V	3
0–5 V	4
0–1 V	5

Body configuration	
Molded polymer housing	XX
Stainless steel	SX

Cable length	
No cable	A
Mating connector, no cable	B
6.5ft / 2m cable with mating connector	C
16ft / 5m cable with mating connector	D

Temperature output configuration	
No T output RH only	X
-4 to +176°F / -20 to +80°C temp range	T1
32 to 122°F / 0 to +50°C temp range	T3
Other output scaling available on request	TX

Example: PC33 4 XX T3 A
Relative humidity and temperature probe PC33, 0–5 V output, Molded polymer housing, 32 to 122°F / 0 to 50°C temperature measuring range, no cable.

Please note: Michell Instruments adopts a continuous development program which sometimes necessitates specification changes without notice. Please contact us for latest version. Ref: PC33&52_1001US_M

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Represented by:

PC62 & 62V

Relative Humidity and Temperature Transmitter Digital

The PC series offers a comprehensive range of relative humidity transmitters for accurate, stable and repeatable measurements. Available with analog or digital output signals, the PC series can be installed in a wide variety of applications.

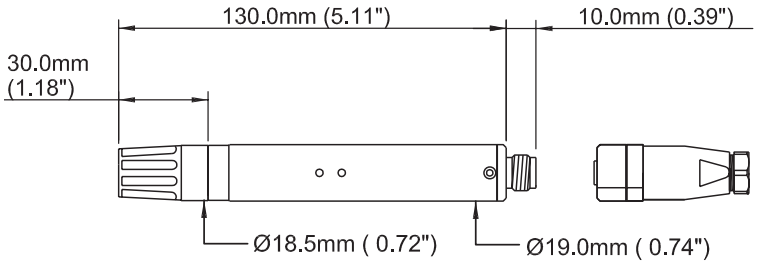
Highlights

- PC62 is designed for high accurate measurements in precision manufacturing applications
- Digital or analog outputs possible
- PC62 available with calculated absolute humidity, dew point or wet bulb temperature output
- Output range on the PC62V is free scalable

Technical Specifications

Performance	
Measurement range (RH)	0–100% RH
Measurement range (T)	-4 to +176°F / -20 to +80°C
Accuracy at 23°C (73°F) Humidity	<±2% RH (10–90 % RH)
Temperature Accuracy	±0.36°F (14 to 122°F) ±0.2°C (-10 to +50°C)
Stability – RH Sensor	±1% RH/year
Response time – RH Sensor	<10 sec typical (for 90% of the step change)
Electrical output / input	
Output signal	0–1, 0–5, 0–10 VDC RS232, RS485
Supply voltage	14–30 VDC, 5–30 VDC (0–1 V output)
Operating conditions	
Operating humidity Probe, Housing, Storage	5-95% RH
Operating temperature Probe,Housing Storage	 -20 to +185°F / -30 to +85°C -40 to +185°F / -40 to +85°C
Mechanical specification	
Ingress protection	IP65
Housing material	Molded polymer housing or stainless steel
Dimensions	L=5.11", ø0.74" / L=130, ø19mm
Weight	1.1oz / 30g without cable (molded polymer housing version)
Electrical connections	M12

Dimensions



Accessories and spare parts

You can check your hygrometer with the control kit HKC which is based on the principle of non-saturated salt solutions. Refer to technical data sheet CONTROL KIT.	**Control Kit HKC**
Connector, screws	**A000030**
Connector with 6.5ft / 2m cable	**A000031**
Connector with 16ft / 5m cable	**A000032**
Slotted protection cap, black (standard)	**A000002**
PVDF filter	**A000014**
PVDF/Foil filter with protection cap, black	**A000015/44**
Wire mesh filter with protection cap, black	**A000021**
Stainless steel sintered filter 5/10/20µm	**A000025/26/27**
Foil filter 2µm with black protection cap	**A000040**
Aluminum mounting flange	**A000110**
Stainless steel fitting	**A000100**
Molded polymer housing mounting flange	**A000150**
Weather cap, wall ø90.0mm / ø3.54", ø19mm / ø0.74" probe	**A000120**
Weather cap, wall ø120.0mm / ø4.72", ø19mm / ø0.74" probe	**A000125**

Electrical Connections

Voltage output (PC62V)

Cable	**Connector**	
White	Pin 1	Power Supply V +
Green	Pin 4	Output RH +
Yellow	Pin 2	Output temperature +
Brown	Pin 3	Common return

Digital Output (PC62)

Cable	**Connector**	**RS232**	**RS485**
White	Pin 1	Power supply V+	Power Supply V +
Green	Pin 4	TX	TX/RX+
Yellow	Pin 2	RX	RX/TX-
Brown	Pin 3	Ground	Common return

Order codes

Relative humidity and temperature probe | PC62 | 4 | XX | TC | A |

Accuracy and version configuration	
2% accuracy, digital probe with RS232 or RS485 output	PC62
2% accuracy, digital probe with voltage output	PC62V

Output configuration	
0–10 V (PC62V only)	3
0–5 V (PC62V only)	4
0–1 V (PC62V only)	5
RS232 (PC62 only)	0
RS485 (PC62 only)	1

Body configuration	
Molded polymer housing	XX
Stainless steel	SX

Cable length	
No cable	A
Mating connector, no cable	B
6.5ft / 2m cable with mating connector	C
16ft / 5m cable with mating connector	D

Temperature output configuration	
-4 to +176°F / -20 to +80°C (std range)	*
PC62 with digital output in °C	TC
PC62 with digital output in °F	TF
PC62V with calculated dew-point temperature & temperature output. Range (Td) -40 to +140°F / -40 to +60°C (only available with std temp range *)	TD
PC62V with calculated absolute humidity and temperature output. Range Abs from 0 - 200g/m³ / 87.4gr/ft³ (only available with std temp range *).	TA
PC62V with calculated wetbulb temperature and temperature output. Range (Tw) -40 to +140°F / -40 to +60°C.	TW

Example: PC62V 4 XX T1 A
Relative humidity and temperature probe PC62V, 0–5 V output, Molded polymer housing, with RH output from 0-100%RH and temperature output -4 to 176F, no cable.

Please note: Michell Instruments adopts a continuous development program which sometimes necessitates specification changes without notice. Please contact us for latest version. Ref: PC62&62V_1001US_M

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Represented by:

PC72V

Relative Humidity and Temperature Transmitter Digital

The PC72V is designed for accurate and stable measurement of relative humidity and temperature. It is equipped with digital technology which enables the user to change settings. This technology also allows for on-site re-calibration, if necessary. The PC72V sensors are protected by Goretex® membrane filters.

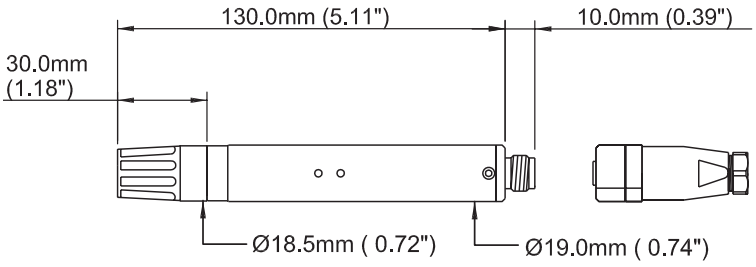
Highlights

- The PC72V is specifically designed for meteorological applications

Technical Specifications

Performance	
Measurement range (RH)	0–100% RH
Measurement range (T)	-40 to +140°F / -40 to +60°C
Accuracy at 23°C (73°F) Humidity	<±2% RH (10–90 % RH)
Accuracy at 23°C (73°F) Temperature	±0.36°F ±0.2°C
Stability – RH Sensor	±1% RH/year (depending on environmental conditions)
Response time – RH Sensor	<10 sec typical (for 90% of the step change)
Electrical output / input	
Output signal	0–1VDC
Supply voltage	8-35 VDC
Operating conditions	
Operating humidity Probe, Housing, Storage	 5-98% RH (non-condensing)
Operating temperature Probe,Housing Storage	 -40 to +140°F / -40 to +60°C -40 to +160°F / -40 to +70°C
Mechanical specification	
Ingress protection	IP65
Housing material	Molded polymer housing
Dimensions	L=5.11", ø 0.74" / L=130, ø19mm
Weight	1.1oz / 30g without cable
Electrical connections	M12

Dimensions



Accessories and spare parts

You can check your hygrometer with the control kit HKC which is based on the principle of non-saturated salt solutions. Refer to technical data sheet CONTROL KIT.	**Control Kit HKC**
Connector, screws	**A000030**
Connector with 6.5ft / 2m cable	**A000031**
Connector with 16ft / 5m cable	**A000032**
Slotted protection cap, black (standard)	**A000002**
PVDF filter	**A000014**
PVDF filter with protection cap, black	**A000015**
Wire mesh filter with protection cap, black	**A000021**
Stainless steel sintered filter 5/10/20µm	**A000025/26/27**
Foil filter 2µm with black protection cap	**A000040**
Foil filter 1.5µm with black protection cap	**A000044**
Aluminum mounting flange	**A000110**
Stainless steel fitting (only in combination with Stainless steel housing)	**A000100**
Molded polymer housing mounting flange	**A000150**
Weather cap, wall mounted, ø3.54" / ø90.0mm for ø0.74" / ø19mm probes	**A000120**
Weather cap, wall mounted, ø4.72" / ø120.0mm for ø0.74" / ø19mm probes	**A000125**
SCI, sensor communication kit	**SCI-DIG-SET**

Electrical Connections

Voltage output		
Cable	**Connector**	
White	Pin 1	Power Supply V +
Green	Pin 4	Output RH +
Yellow	Pin 2	Output temperature +
Brown	Pin 3	Common return

Order codes

Relative humidity and temperature probe | PC72V | 5 | XX | TC | A |

Output configuration	
0–1 V	5

Body configuration	
Molded polymer housing	XX

Cable length	
No cable	A
Mating connector, no cable	B
6.5ft / 2m cable with mating connector	C
16ft / 5m cable with mating connector	D

Temperature output configuration	
-40 to +140°F / -40 to +60°C standard range	TC

Example: PC72V 5 XX TC A
Relative humidity and temperature probe PC72V, molded polymer housing, 0–1 V output, no cable.

Please note: Michell Instruments adopts a continuous development program which sometimes necessitates specification changes without notice. Please contact us for latest version. Ref: PC72V_1001US_M

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Represented by:

PFMini72

Relative Humidity and Temperature Transmitter

PFMini72 relative humidity probes are equipped with the Hygrosmart relative humidity sensor/converter. This interchangeable module has miniaturized electronics and does not require recalibration.

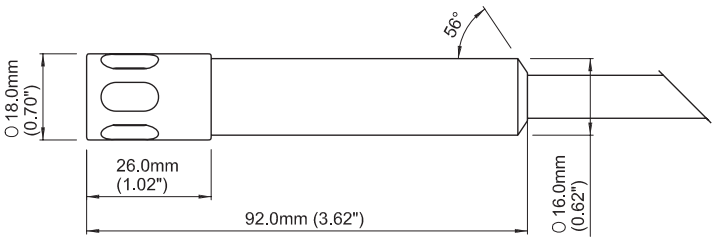
Highlights

- Designed for meteorological applications
- Based on the interchangeable Hygrosmart module

Technical Specifications

Performance	
Measurement range (RH)	0–100% RH
Measurement range (T)	-4 to +176°F / -20 to +80°C
RH Accuracy at 23°C/73°F	<±2% RH (5–95% RH)
Temperature Accuracy	±0.36°F (14 to 122°F) ±0.2°C (-10 to +50°C)
Stability – RH Sensor	<±1% RH/year
Response time – RH Sensor	<10 sec typical (for 90% of the step change)
Electrical output/input	
Output signal (RH)	0–1 V
Output signal (T)	0–1 V 3-wire 1/3 DIN Pt100 direct
Supply voltage	5.5–32 VDC
Current consumption	2 mA max
Operating conditions	
Operating humidity Probe, Housing, Storage	0–100% RH
Operating temperature Probe Housing Storage	 -4 to +175°F / -20 to +80°C -4 to +175°F / -20 to +80°C -40 to +185°F / -40 to +85°C
Mechanical specification	
Ingress protection	IP65
Housing material	316L
Dimensions	L=3.62", ø0.70" / L=92mm, ø18mm
Weight	5.3oz / 150g
Electrical connections	4 or 6-wire output cable, length 6.5ft / 2m

Dimensions



PFMini72

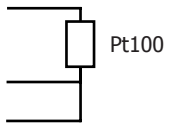
Accessories and spare parts

Mounting clip for PFMini72	**2510367**
Hygrosmart without Pt100	**I7 0 00 0**
Hygrosmart with Pt100	**I7 0 00 1**
Stainless steel slotted cap with mesh filter (standard)	**K1**
Stainless steel slotted cap with PTFE filter	**Z1**

Electrical Connections

4 wire cable	
White	Output RH +
Black	Common return
Red	Power supply V+
Blue	Output temperature +

6 wire cable	
White	Output RH +
Black	Common return
Red	Power supply V+
Blue	Pt100
Yellow	
Green	



Order codes

Relative humidity and temperature probe | PFmini72 | 1 | 1 | 2 | K1 |

Temperature configuration	
No T output	0
Pt100 direct	1
0-1 V, corresponds to -4 to 176°F / -20 to +80°C	B

Body configuration	
Stainless steel	1

Filter	
Stainless steel slotted cap with mesh filter (standard)	K1
Stainless steel slotted cap with PTFE filter	Z1

Cable length	
6.5ft / 2m	2

Example: PFmini72 1 1 2 K1
Relative humidity and temperature probe PFmini72, Pt100 direct output, stainless steel body with stainless steel slotted cap, mesh filter and 6.5ft / 2m of cable.

Please note: Michell Instruments adopts a continuous development program which sometimes necessitates specification changes without notice. Please contact us for latest version. Ref: PFmini72_1001US_M

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Represented by:

PF211

HVAC Relative Humidity Transmitter

PF211 relative humidity transmitters are equipped with the Hygrosmart relative humidity sensor/converter. This interchangeable module has miniaturized electronics and does not require recalibration.

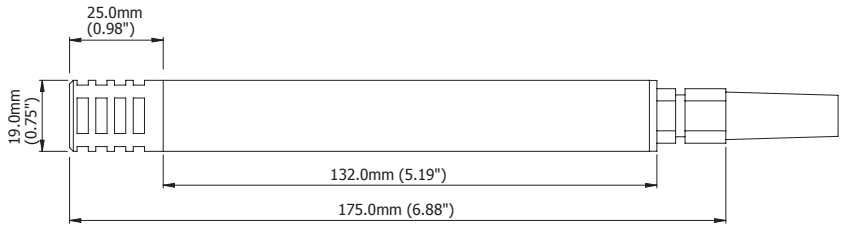
Highlights

- Designed for HVAC applications
- Based on the interchangeable Hygrosmart module

Technical Specifications

Performance	
Measurement range (RH)	0–100% RH
Measurement range (T)	-22 to +158°F / -30 to +70°C
RH Accuracy at 23°C/73°F	<±2% RH (5–95 % RH)
Temperature Accuracy	±0.36°F (14 to +122°F) ±0.2°C (-10 to +50°C)
Stability – RH Sensor	<±1% RH/year
Response time – RH Sensor	<10 sec typical (for 90% of the step change)
Electrical output/input	
Output signal (RH)	4–20 mA, 0–10 V
Output signal (T)	3-wire 1/3 DIN Pt100 direct
Supply voltage	10–32 VDC for 4–20 mA output 15–32 VDC for 0–10 V output 24 VAC ±10% (PF211B)
Load resistance	Output 4–20 mA: Rload < (Uv-9)/0.02 Output 0–10 V: R > 1K Ω
Current consumption	20 mA max
Operating conditions	
Operating humidity Probe, Housing, Storage	0–100% RH
Operating temperature Probe, Housing, Storage	-20 to +160°F / -30 to +70°C
Mechanical specification	
Ingress protection	IP54
Housing material	ABS
Dimensions	L=6.89", ø 0.75" / L=175mm, ø19mm
Weight	6.5oz / 184g
Electrical connections	5 or 6 wire output cable, 9.8ft / 3m

Dimensions



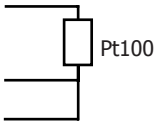
Accessories and spare parts

Hygrosmart w/Pt100 mA output	**I7 4 00 1**
Hygrosmart w/Pt100 V ouput	**I7 0 00 1**
Noryl cap, white, with polyester filter/PTFE	**Z2**
Stainless steel sintered filter	**H4**
Molded polymer housing fitting	**3401135**
Fixing collar	**3420085**
Mounting clip	**2510387**

Electrical Connections

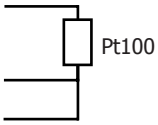
PF 211 A: 4-20 mA output 2-wire

Cable	Connector
Red	Output RH +
Blue	Output RH -
White	Pt100
Yellow	
Green	



PF 211 B: V output (0-10V)

Cable	Connector
Red	Power supply V +
Black	Common return
Blue	Output RH +
White	Pt100
Yellow	
Green	



Order codes

HVAC relative humidity transmitter | PF211 | A | C | Z2

Humidity output configuration	
4–20 mA, 2-wire	A
0–10 V, 3-wire	B

Filter	
Noryl cap, white, with polyester filter/ PTFE	Z2
Stainless steel sintered filter	H4

Cable length	
9.8ft / 3m (standard)	C
16ft / 5m	D
23ft / 7m	E
33ft / 10m	F
49ft / 15m	G

Example: PF211 A C Z2
Relative humidity transmitter PF211, output signal 4–20 mA for humidity, Pt100 direct for temperature, 9.8ft / 3m cable, noryl cap, with polyester filter/ PTFE.

Please note: Michell Instruments adopts a continuous development program which sometimes necessitates specification changes without notice. Please contact us for latest version. Ref: PF211_1001US_M

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Represented by:

SF52
Dew-Point Transmitter

The SF52 dew-point transmitter from Michell Instruments can provide 4–20 mA or voltage signal for either dew point or absolute humidity with excellent accuracy and linearity. The robust housing, together with an operating pressure of up to 300 psi, makes the SF52 ideal for many dew-point and moisture measurement applications.

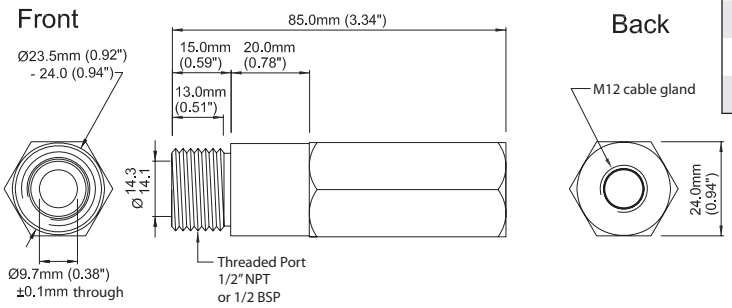
Highlights

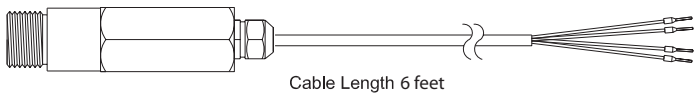
- Designed for OEM applications
- Dew-point or absolute humidity output
- Flush fitting filter disc for minimal flow disturbance
- Excellent linearity and temperature compensation

Technical Specifications

Performance	
Measurement range (dew point temperature)	-40 to +140°F / -40 to +60°C T_d
Measurement range (absolute humidity)	0 to 87.4 gr/ft³ / 0 to 200 g/m³
Accuracy (dew point)	<±3.6°F (-4 to +140°F) <±2°C (-20 to +60°C)
Accuracy (absolute humidity)	0.175 to 1.311 gr/ft³ / 0.4 to 3 g/m³ on value of absolute humidity
Stability	<1.8°F / 1°C T_d per year
Response time	<10 sec typical (90% of the step change)
Electrical output / input	
Output signal	0–1, 0–5, 0–10VDC or 4–20 mA
Supply voltage	8-30 VDC (14-30 VDC for 0–10 V output)
Current consumption	9 mA + load current
Supply voltage influence	±0.005% RH per Volt
Operating conditions	
Operating humidity Probe, Housing, Storage	 0–95% RH (non-condensing)
Operating temperature Probe, Housing Storage	 -20 to +185°F / -30 to +85°C -40 to +185°F / -40 to +85°C
Operating pressure	300 psi maximum
Temperature coefficient	±0.03%/°F, ±0.05 %/°C
Mechanical specification	
Ingress protection	IP65
Housing material	Nickel-coated brass
Dimensions	L=3.34", ø 0.94" / L=85mm, ø24mm (max)
Filter	HDPE front filter
Weight	11.3oz / 320g
Mechanical connections	1/2" NPT or G½" BSP male
Cable	6.5ft / 2m

Dimensions





Accessories and spare parts

HDPE front filter (standard)	**A000019**
Bonded seal, (DIN ISO 228) G½"(BSP)	**A000340**
Sample block (BSP only)	**A000350**
Sample block with filter (BSP only)	**A000351**

Electrical Connections

Cable	Voltage output / mA output
White	Power supply V+
Green	Output Td+
Brown	Common return

Order codes

Dew-point transmitter | SF52 | 4 | X | T1 | N

Output configuration, 3-wire	
4–20 mA	2
0–10 V	3
0–5 V	4
0–1 V	5

Pressure Port	
1/2" NPT male	N
1/2" BSP male	B

Moisture signal configuration	
Dew-point signal, -40 to 140°F / -40 to +60°C	X
Absolute Humidity, g/m³ / gr/ft³	S

Ambient operating temperature range	
-20 to +185°F / -30 to +85°C	T1

Example: SF522 S T1 N
Dew-point transmitter SF52, 4-20mA output, dewpoint signal, -20 to + 185°F / -30 to +85°C operating temperature range, 1/2"NPT pressure port.

Please note: Michell Instruments adopts a continuous development program which sometimes necessitates specification changes without notice. Please contact us for latest version. Ref: SF52_1001US_M

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Represented by:

Easidew Transmitter

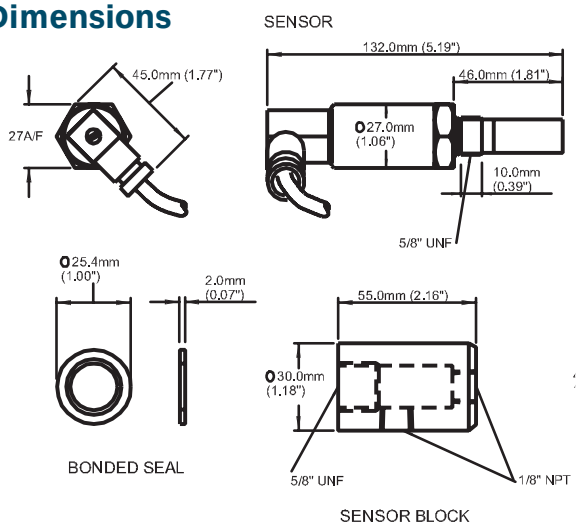
2-Wire Dew-Point Transmitter

The Easidew Transmitter is designed for ease of use, incorporating all the features needed to make installation and operation as simple as possible. For the first time, dew-point measurement is made as accessible as temperature and pressure with this fully configured, calibrated transmitter that can be instantly incorporated into your air or gas management and control system.

Highlights

- 2-wire loop powered connection
- Dew point or ppm moisture content
- IP66 (NEMA 4)
- Excellent sensor protection
- Measurement range -148 to +68°F / -100 to +20°C
- Operating temperature -40 to +140°F / -40 to +60°C
- Fast response

Dimensions



Technical Specifications

Performance	
Measurement range (dew point)	-148 to +68°F / -100 to +20°C dew point
Accuracy (dew point)	±3.6° F / ±2°C dew point
Response time	5 mins to T95 (dry to wet)
Repeatability	0.9°F / 0.5°C dew point
Electrical output / input	
Output signal	4-20 mA (2-wire) current source, configurable over the entire range Dew point -100 to + 20°C -150 to +70°F 0 - 3000 ppm_v ppm_v output or non-standard dew-point range must be specified at time of order
Supply voltage	12–28 VDC
Load resistance	Max 250 Ω @ 12 V 500 Ω @ 24 V
Current consumption	23 mA max (fault condition)
Supply voltage influence	±0.005% RH/V
Operating conditions	
Operating humidity	0–100% RH
Operating temperature	-40 to +140°F / -40 to +60°C
Operating pressure	6500 psi max
Flow rate	<10 SCFH mounted in standard sampling block; <33 ft/sec direct insertion
Temperature coefficient	Temperature compensated across operating temperature range
Mechanical specification	
Ingress protection	IP66 in accordance with standard BS EN 60529:1992, and NEMA 4 in protection accordance with standard NEMA 250-2003
Housing material	Stainless steel
Dimensions	L=5.19" x ø 1.06" L=132mm x ø27mm
Filter	HDPE Guard <10 µm 80µm sintered guard (optional)
Weight	5.3oz / 150g
Electrical connections	See table
Interchangeability	Fully interchangeable transmitters
Fault conditions (factory programmed)	**Condition** — **Output** Sensor fault — 23 mA Under-range dew point — 4 mA Over-range dew point — 20 mA

Easidew Transmitter

Options and accessories

Panel Meter An economical panel or bench-mounted meter with digital display, analog outputs and dual alarm relays. Display and output configurable as dew point (°C or °F) or ppm moisture content.	**EA2-MON**
Easidew Sampler A self-contained sampling system, with filtration and flow control, for measurement of pressure or atmospheric dew point	**EA2-SAM**
Sample Block Stainless Steel sample block to contain Easidew Transmitter, with 1/8" NPT ports	**CSB**
Replacement HDPE Guard Pack of 10 HDPE Guards	**EA2-HDPE-10**
Sintered Guard Stainless Steel sintered guard, for protection of ceramic sensor (in place of standard HDPE Guard)	**9980237**
Easidew Communication Kit For connection to Easidew Transmitter and reconfiguration of range and output via Michell Configuration Software (available free of charge from Michell)	**EA2-CK**

Electrical Connections

4-20mA connections 2-wire	
Pin 1	4-20 mA signal
Pin 3	+Supply (12-28VDC)

Order codes

2-wire dew-point transmitter | EA2-TX | | | | |

Non-standard zero
Dew point at 4 mA output

Non-standard full scale
Dew point at 20 mA output

Engineering Units
Units (C= °Cdp; F= °Fdp; P= ppm_v)

Process Pressure other than atmospheric (if any)
Pressure for ppm_v conversion in psig. Blank = 0 psig

Example:
EA2-TX -120 +50 F 50psig
2-wire dew-point transmitter, Easidew TX with measurement range of -120 to +50F dew point corresponding to 4-20mA output to operate at a process pressure of 50 psig.

Please note: Michell Instruments adopts a continuous development program which sometimes necessitates specification changes without notice. Please contact us for latest version. Ref: Easidew_1001US_M

Process Measurement & Controls, Inc.
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Fax: 203-743-2051

Represented by:

Easidew TX I.S.

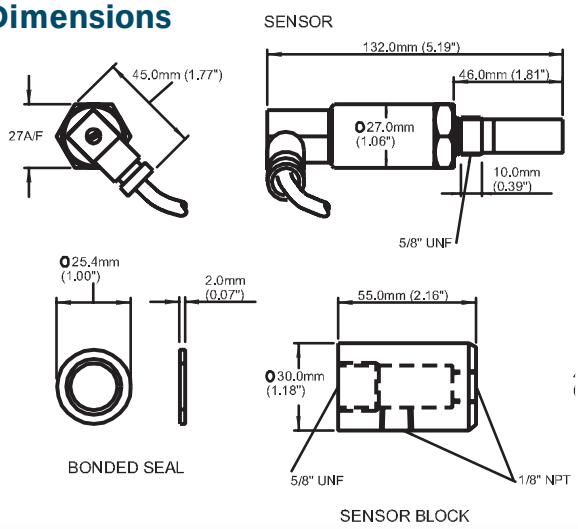
ATEX Certified Dew-Point Transmitter

An ATEX certified, 2-wire, rugged impedance dew-point transmitter for continuous measurement in hazardous area applications.

Highlights

- ATEX FM/CSA certified
- 2-wire loop powered connection
- Dew point or ppm moisture content
- IP66 (NEMA 4)
- Excellent sensor protection
- Wide measurement range, calibrated
- -148 to +68ºF / -100 to +20ºC dew point
- Operating temperature: -40º to +140ºF / -40ºC to +60ºC
- Fast response

Dimensions



Technical Specifications

Performance	
Measurement range (dew point)	-148 to +68°F / -100 to +20°C dew point
Accuracy (dew point)	± 3.6°F / ±2°C dew point
Response time	5 mins to T95 (dry to wet)
Repeatability	0.9°F / 0.5°C dew point
Electrical output / input	
Output signal	4-20 mA (2-wire) current source, configurable over the entire range Dew point -100 to + 20°C -148 to +68°F 0 - 3000 ppm_v ppm_v output or non-standard dew-point range must be specified at time of order
Supply voltage	12–28 VDC
Load resistance	Max 250 Ω @ 12 V 500 Ω @ 24 V
Current consumption	23 mA max (fault condition)
Supply voltage influence	±0.005% RH/V
Operating conditions	
Operating humidity	0–100% RH
Operating temperature	-40 to +140°F / -40 to +60°C
Operating pressure	6500 psi max
Flow rate	<10 SCFH mounted in standard sampling block; <33 ft/sec direct insertion
Temperature coefficient	Temperature compensated across operating temperature range
Mechanical specification	
Hazardous Area Certificates	Ex II 1G EX ia IIC T4 / CSA / FM
Ingress protection	IP66 in accordance with standard BS EN 60529:1992, and NEMA 4 in protection accordance with standard NEMA 250-2003
Housing material	Stainless steel
Dimensions	L=5.19" x ø 1.06" L=132mm x ø27mm
Filter	HDPE Guard <10 µm 80 µm sintered guard (optional)
Weight	5.3oz / 150g
Interchangeability	Fully interchangeable transmitters
Fault conditions (factory programmed)	**Condition** — **Output** Sensor fault — 23 mA Under-range dew point — 4 mA Over-range dew point — 20 mA
Approved galvanic isolators	KFD2-CR-EX1.20200 KFD2-CR-EX1.30200 KFD0-CS-EX1.50P MTL5041 MTL5040

Easidew TX I.S.

Options and accessories

Panel Meter An economical panel or bench-mounted meter with digital display, analog outputs and dual alarm relays. Display and output configurable as dew point (°C or °F) or ppm moisture content.	**EA2-MON**
Easidew Sampler A self-contained sampling system, with filtration and flow control, for measurement of pressure or atmospheric dew point	**EA2-SAM**
Sample Block Stainless Steel sample block to contain Easidew Transmitter, with 1/8" NPT ports	**CSB**
Replacement HDPE Guard Pack of 10 HDPE Guards	**EA2-HDPE-10**
Sintered Guard Stainless Steel sintered guard, for protection of ceramic sensor (in place of standard HDPE Guard)	**9980237**
Easidew Communication Kit For connection to Easidew Transmitter and reconfiguration of range and output via Michell Configuration Software (available free of charge from Michell)	**EA2-CK**

Electrical Connections

4-20mA connections 2-wire	
Pin 1	4-20 mA
Pin 3	+Supply (12-28VDC)

Order codes

2-wire dew-point transmitter | EA2-TX-IS | | | | |

Non-standard zero
Dew point at 4 mA output

Non-standard full scale
Dew point at 20 mA output

Engineering Units
Units (C= °Cdp; F= °Fdp; P= ppm_v)

Process Pressure other than atmospheric (if any)
Pressure for ppm_v conversion in psig. Blank = 0 psig

Example:
EA2-TX-IS -120 +50 F 50psig
2-wire dew-point transmitter, Easidew TX-IS with measurement range of -120 to +50F dew point corresponding to 4-20mA output to operate at a process pressure of 50 psig.

Please note: Michell Instruments adopts a continuous development program which sometimes necessitates specification changes without notice. Please contact us for latest version. Ref: Easidew TX I.S_1001US_M

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Fax: 203-743-2051

Represented by:

Easidew PRO I.S

Intrinsically Safe Dew-Point Transmitter

The Easidew PRO I.S. intrinsically safe dew-point transmitter has been developed to provide a rugged version of the Easidew TX I.S.

The Easidew PRO I.S. shares its electrical design with the Easidew TX I.S. and therefore offers the same features. It has been certified by ATEX for use in hazardous area Zone 0.

Highlights

- 2-wire connection
- ±3.6°F / ± 2°C accuracy
- Output configurable in ppm moisture content
- HDPE Guard
- IP66 / NEMA 4
- Improved measurement resolution and range for temperature compensation
- Configuration by digital communications

Technical Specifications

Performance	
Measurement range (dew point)	-148 to +68°F / -100 to +20°Cdew point
Accuracy (dew point)	±3.6°F / ±2°C dew point
Response time	5 mins to T95 (dry to wet)
Repeatability	0.9°F / 0.5°C dew point
Electrical output / input	
Output signal	4–20 mA (2-wire) current source, configurable over the entire range Dew point -100 to + 20°C -148 to +68°F 0 - 3000 ppm_v ppm_v output or non-standard dew-point range must be specified at time of order
Supply voltage	12-28 VDC
Load resistance	Max 250 Ω @ 12 V 500 Ω @ 24 V
Current consumption	23 mA (depending on output signal)
Operating conditions	
Operating humidity	0–100% RH
Operating temperature	-40 to +140°F / -40 to +60°C
Operating pressure	6500 psi max
Flow rate	<10 SCFH mounted in standard sampling block; <33 ft/sec direct insertion
Temperature coefficient	Temperature compensated across operating temperature range
Mechanical specification	
Hazardous Area Certificates	Ex II 1G EX ia IIC T4
Ingress protection	IP66 in accordance with standard BS EN 60529:1992, and NEMA 4 in protection accordance with standard NEMA 250-2003
Housing material	Stainless steel
Filter	80 µm sintered guard HDPE Guard <10 µm (optional)
Weight	26.5oz / 750g
Electrical connections	Screw terminal

Easidew PRO I.S

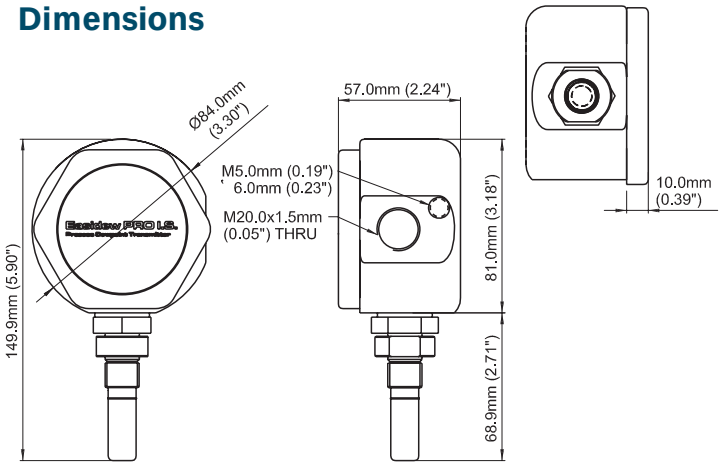
Options and accessories

Panel Meter An economical panel or bench-mounted meter with digital display, analog outputs and dual alarm relays. Display and output configurable as dew point (°C or °F) or ppm moisture content.	**EA2-MON**
Easidew Sampler A self-contained sampling system, with filtration and flow control, for measurement of pressure or atmospheric dew point	**EA2-SAM**
Sample Block Stainless Steel sample block to contain Easidew Transmitter, with 1/8" NPT ports	**CSB**
Optional HDPE Guard Pack of 10 HDPE Guards	**EA2-HDPE-10**
Replacement Sintered Guard Stainless Steel sintered guard, for protection of ceramic sensor	**9980237**
Easidew Communication Kit For connection to Easidew Transmitter and reconfiguration of range and output via Michell Configuration Software (available free of charge from Michell)	**EA2-CK**

Electrical Connections

4-20mA connections 2-wire	
Pin 4	4-20 mA
Pin 2	+Supply (12-28VDC)

Dimensions



Order codes

2-wire dew-point transmitter | EPR-IS | | | | |

Non-standard zero
Dew point at 4 mA output

Non-standard full scale
Dew point at 20 mA output

Engineering Units
Units (C= °Cdp; F= °Fdp; P= ppm_v)

Process Pressure other than atmospheric (if any)
Pressure for ppm_v conversion in barg or psig. Blank = 0 barg / 0 psig

Example:
EPR-IS -120 +50 F 50psig
2-wire dew-point transmitter, Easidew PRO IS with measurement range of -120 to +50F dew point corresponding to 4-20mA output to operate at a process pressure of 50 psig.

Please note: Michell Instruments adopts a continuous development program which sometimes necessitates specification changes without notice. Please contact us for latest version. Ref: Easidew PRO IS_1001US_M

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Fax: 203-743-2051

Represented by:

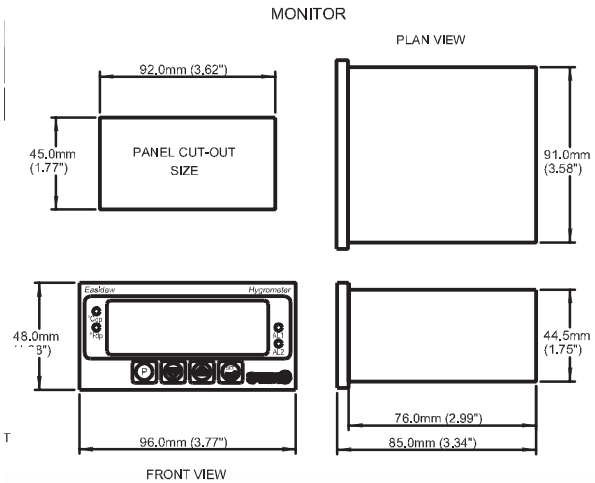
Easidew Online
Dew-Point Hygrometer

A panel- or bench-mounting hygrometer with digital display, analog and digital outputs and dual alarm feature, offering excellent reliability and repeatability.

Highlights

- Dew point or ppm moisture content
- Analog and digital outputs
- IP66 (NEMA 4) Sensor and IP65 (NEMA 12) Monitor (front panel only)
- Excellent sensor protection
- -148 to +68°F / -100 to +20°C total dew-point range
- Dual alarms
- Clear and easy to read display

Dimensions



Technical Specifications

Performance	
Measurement range (dew point)	-148 to +68°F / -100 to +20°C dew point 0–3000 ppm_v ppm_v output or non-standard dew-point range must be specified at time of order
Accuracy (dew point)	±3.6°F / ±2°C dew point
Response time	5 mins to T95 (dry to wet)
Repeatability	0.9°F / 0.5°C dew point
Electrical output / input	
Output signal	4–20 or 0–20 mA signal, maximum load resistance 500 Ω RS232
Supply voltage	85 to 264 VAC, 50/60 Hz
Load resistance	Max 250 Ω @ 12 V 500 Ω @ 24 V
Current consumption	60 mA max
Operating conditions	
Operating humidity	0–100% RH
Operating temperature	-40 to +75°C / -40 to +167°F
Mechanical specification	
Ingress protection	Monitor: IP65 (NEMA 12) front panel only Sensor: IP66 (NEMA 4)
Dimensions	Monitor: 1/8 DIN case, 96 x 48 x 85mm / 3.77 x 1.88 x 3.34" including clearance (W x H x D) Sensor: 132 x 27 A/F mm / 5.13 x 1.06" (length x diameter across hex flats)
Filter	HDPE
Weight	5.3oz / 150g
Electrical connections	Sensor cell supplied
Alarm	Front panel configuration of alarm points
Sensor cable	2.6ft / 0.8m supplied as standard (max 2600ft / 800m)
Power cord	6.5ft / 2m cable supplied

Easidew Online

Options and accessories

Easidew Sampler A self-contained sampling system, with filtration and flow control, for measurement of pressure or atmospheric dew point	**EA2-SAM**
Sample Block Stainless Steel sample block to contain Easidew Transmitter, with 1/8" NPT ports	**CSB**
Replacement HDPE Guard Pack of 10 HDPE Guards	**EA2-HDPE-10**
Sintered Guard Stainless Steel sintered guard, for protection of ceramic sensor (in place of standard HDPE Guard)	**9980237**
Easidew Communication Kit For connection to Easidew Transmitter and reconfiguration of range and output via Michell Configuration Software (available free of charge from Michell)	**EA2-CK**

Electrical Connections

Pin	
1	To sensor Blue cable
3	To sensor Green cable
4	To sensor Red cable
7	Alarm relay contact 2 - N/O
8	Alarm relay contact 2 - N/C
9	Alarm relay contact 2 - com
13	Output mA -
14	Output mA +
16	Alarm relay contact
17	Alarm relay contact
23	Power supply N
24	Power supply L

Order codes

2-wire dew-point transmitter | EA2-OL | | | | | |

Non-standard zero
Dew point at 4 mA output

Non-standard full scale
Dew point at 20 mA output

Engineering Units
Units (C= °Cdp; F= °Fdp; P= ppm_v)

Process Pressure other than atmospheric (if any)
Pressure for ppm_v conversion in psig. Blank = 0 psig

Example:
EA2-OL -120 +50 F 50psig
2-wire dew-point transmitter, Easidew Online with measurement range of -120 to +50F dew point corresponding to 4-20mA output to operate at a process pressure of 50 psig.

Please note: Michell Instruments adopts a continuous development program which sometimes necessitates specification changes without notice. Please contact us for latest version. Ref: Easidew Online_1001US_M

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Represented by:

MDM300

Advanced Dew-Point Hygrometer

The MDM300 Advanced Dew-Point Hygrometer provides the fastest spot check measurement of dew-point or moisture content in a small portable instrument, packed with features and intelligent engineering.

An extremely fast response, and accurate, stable measurement is complemented by an instrument which is easy to use, has data-logging and built in sampling components as standard, and can be supplied with a range of accessories including a stand-alone sampling system and a professional carry case.

Highlights

- Repeatedly fast measurements in less than 10 minutes for T95 down to -94°F / -70°C
- Long battery life with more than 48 hours of typical usage between charges
- Best in its class: 1.8°F / 1°C accuracy
- External device input 4-20 mA for dew-point, temperature or pressure transmitters
- Bluetooth connection means less trouble with missing cables
- Built-in basic sensor protection can be extended to 4 variants of sampling system allowing measurements up to 5800 psi
- Easy, user friendly operation
- Gas wetted materials all 316L

Technical Specifications

Performance	
Measurement technology	Michell ceramic sensor
Accuracy	± 1°C / 1.8°F from -60 to +20°C / -76 to +68°F dew point ± 2°C / 3.6°F from -100 to -60°C / -148 to -76°F dew point ± 0.2°C / 0.3°F temperature
Measurement range	Calibrated -148 to +68°F / -100 to +20°C dew point Readings to +86°F / 30°C dew point
Measurement units	°C, °F, K dew point ppm_v, ppm_w for air, N_2, H_2, CO_2, SF_6 Gas temperature: %RH, gm^{-3}, gkg^{-1} Option: active pressure (bara/g, psig, MPa, KPa)
Resolution (display)	0.1 for all dp derived units and autoranging where appropriate, e.g. ppm
Resolution (measurement)	0.02°F / 0.01°C dew point
Typical response speed	T95 in ≤10 minutes to -94°F / -70°C
Repeatability	Better than 0.2°F / 0.1°C
Stability	0.2°F / 0.1°C
Sensitivity	0.02°F / 0.01°C or better
Hysteresis	0.1°F / 0.05°C
Electrical output / input	
Auxiliary inputs	4-20 mA external input selectable as either dp, temperature or pressure
Battery type	NiMH 4.8V
Battery operating life	More than 48 hours of typical usage between charges
Battery charger	Intelligent charger (supplied)
Operating conditions	
Operating pressure range	5000 psi max
Operating environment	Outdoors 0 to +100% RH condensing
Operating temperature	-4 to +122°F / -20 to +50°C
Storage / transport temp	-40 to + 158°F / -40 to +70°C
Mechanical specification	
Display	Blue LCD graphical display
Enclosure type	Molded high impact grade nylon
IP / NEMA rating	IP66/NEMA 4
Gas connections	1/8" NPT female (other options available)
Flow across sensor	<10 SCFH mounted in standard sampling block; <33 ft/sec direct insertion / 0.2 to 2.0 Nl/min

Technical Specifications (continued)

Filters	50 micron sintered stainless steel in the inlet port (other porosities available)
Gas wetted materials	316 stainless steel
Outline Dimensions	8.6 x 6.7 x 3.5" / 218 x 170 x 90mm (depth x width x height)
Weight	2.9lbs / 1.3kg
	General
Data Logging	8 megabytes; Log interval: 5 to 60 second; Logs per log file: Up to 10,000
Communications	(Wireless) Bluetooth™ range up to 16.5ft / 5m
Languages	English, Spanish, Portuguese, Italian, French, German

Order codes

Order code	Description
MDM300 STD	MDM300 Advanced Dew-Point Hygrometer Standard version
MDM300 IS	MDM300 Advanced Dew-Point Hygrometer I.S. version

Accessories available

Carry bag – for standard and I.S. instruments

Swagelok gas fittings – various sizes available

Cable for external dew-point sensor – various lengths available

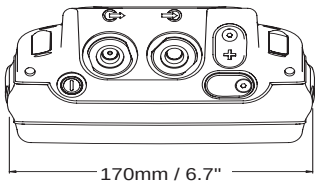
External temperature sensor – various cable lengths available

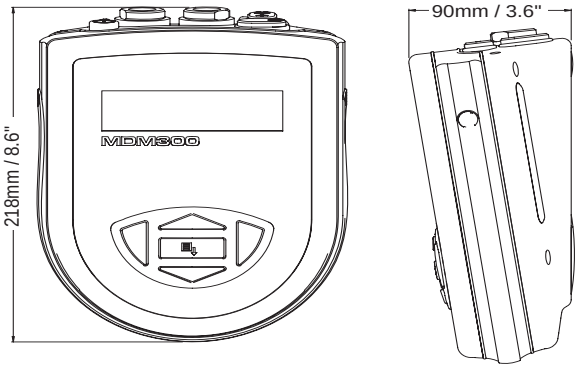
External pressure sensor – various cable lengths available

External dew-point sensor for standard instrument – versions for standard and I.S instruments available

Please contact us for a full list of accessories and spares with order codes and prices

Dimensions





Please note: Michell Instruments adopts a continuous development program which sometimes necessitates specification changes without notice. MDM300_1001US_M

Process Measurement & Controls, Inc.
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Represented by:

RM33 & 52

Relative Humidity and Temperature Transmitter, HVAC Room Mount

The RM series of relative humidity and temperature transmitters offers a comprehensive range of output signals and measurement ranges. The transmitters are housed in a wall mounted enclosure, making these instruments ideal for HVAC and building management applications.

Highlights

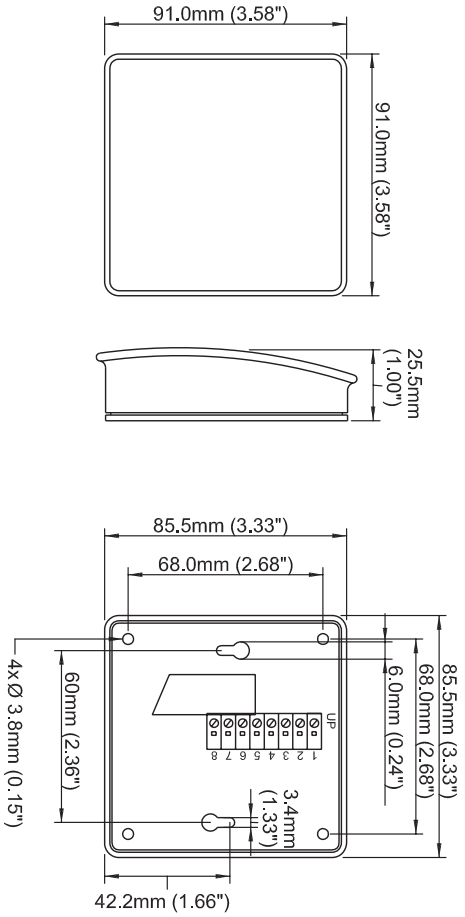
- Designed for low cost HVAC applications
- Quick installation: electrical rear connection with screw terminals
- Superior long term stability

Technical Specifications

Performance	
Measurement range (RH)	0–100% RH
Measurement range (T)	32 to 122°F / 0 to +50°C Pt100, Pt1000
RH Accuracy at 23°C / 73°F	RM52: <±2% RH (10–90% RH) RM33: <±3% RH (30–80% RH)
Temperature Accuracy	RM52: ±0.2°C (-10 to +50°C) ±0.36°F (14 to 122°F) RM33: ±0.3°C (5 to 40°C) ±0.54°F (41 to 104°F)
Temperature influence	±0.027% RH/°F / ±0.05% RH/°C
Stability – RH Sensor	±1% RH/year
Response time – RH Sensor	<10 sec typical (for 90% of the step change)
Electrical output / input	
Output signal	0–1 VDC, 0–5 VDC, 0–10 VDC 4–20 mA (2-wire)
Supply voltage	14–35 VDC (for 0–5 / 10 VDC 4.5–35 VDC (for 0–1 VDC) and 14–26 VAC
Supply voltage influence	±0.01% RH/V typical
Operating conditions	
Operating humidity Probe, Housing, Storage	10-90% RH
Operating temperature Electronics Storage	 32 to 125°F / 0 to +50°C -40 to +170°F / -40 to +75°C
	PRT
Measurement range	Pt100/1000: -60 to +390°F / -50 to +200°C
Accuracy	Pt100/1000: ±0.15%
Mechanical specification	
Ingress protection	N/A
Housing material	White molded polymer housing
Dimensions	3.58 x 3.58 x 1.00 inches / 91 x 91 x 25.5 mm
Filter	N/A
Weight	3oz / 85g
Electrical connections	Screw terminals

RM33 & 52

Dimensions



Electrical Connections

Voltage output			
Pin 1		Pin 1	
Pin 2		Pin 2	
Pin 3		Pin 3	Temperature sensor Pt100/Pt1000
Pin 4	Output temperature		
Pin 5	Output RH	Pin 4	
Pin 6	Common ground	Pin 5	Output RH
Pin 7	Power supply V+	Pin 6	Common ground
Pin 8		Pin 7	Power supply V+
		Pin 8	
		Humidity with temperature sensor	

mA output			
Pin 1	Output RH +	Pin 1	Output RH +
Pin 2	Output RH -	Pin 2	Output RH -
Pin 3		Pin 3	Temperature sensor
Pin 4			
Pin 5		Pin 4	
Pin 6		Pin 5	
Pin 7		Pin 6	
Pin 8		Pin 7	
		Pin 8	
		Humidity with temperature sensor	

Order codes

Relative humidity and temperature transmitter | RM33 | 3 | X | T1 |

Accuracy configuration	
3% accuracy	RM33
2% accuracy	RM52

Output configuration	
4–20 mA analog output	2
0–10 V analog output	3
0–5 V analog output	4
0–1 V analog output	5

Temperature output range and configuration	
No temperature output, RH signal only	X
32 to +122°F / 0 to 50°C (Available with voltage output only)	T3
Pt100: -60 to +390°F / -50 to +200°C class A	T4
Pt1000: -60 to +390°F / -50 to +200°C class A	T5
Other output scaling on request	TX

Example: RM33 3 X T1
Relative humidity and temperature transmitter RM33, HVAC 3% accuracy, 0–10V analog output, and -4 to +176°F / -20 to +80°C temperature range.

Please note: Michell Instruments adopts a continuous development program which sometimes necessitates specification changes without notice. Please contact us for latest version. Ref: RM33&52_1001US_M

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Represented by:

WM33 & 52

Relative Humidity and Temperature Transmitter, Multi Unit

Wall-mounted units that have the ability to display and provide an output signal of % RH, dew point or absolute humidity and temperature. The WM Series offers excellent measurement accuracy and stability wherever a wall-mounted sensor is required.

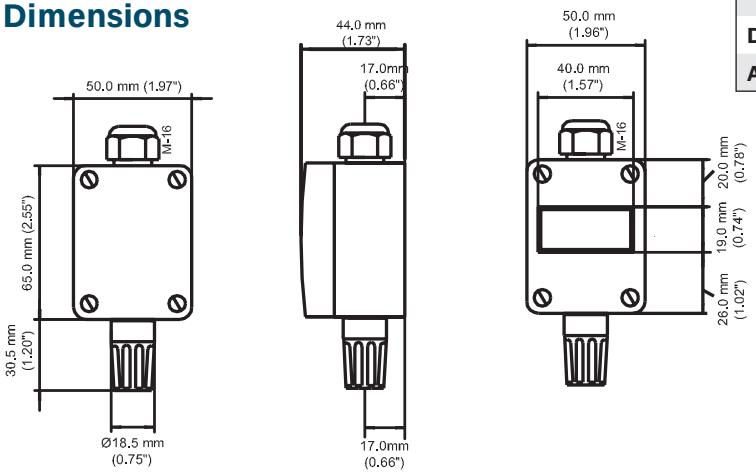
Highlights

- WM33 was designed for low cost HVAC applications
- WM52 has digital technology and is designed for accurate measurements in a controlled environment
- Easy to re-calibrate to maintain high accuracy

Technical Specifications

Performance	
Measurement range (RH)	0–100% RH
Measurement range (T)	-4 to +176°F / -20 to +80°C or Pt100/1000
RH Accuracy at 23°C/73°F	WM52: <±2% RH (10–90% RH) WM33: <±3% RH (30–80% RH)
Temperature Accuracy	WM52: ±0.2°C (-10 to +50°C) ±0.36°F (14 to 122°F) WM33: ±0.3°C (5 to 40°C) ±0.54°F (41 to 104°F)
Stability – RH Sensor	±1% RH/year
Response time – RH Sensor	<10 sec typical without filter (for 90% of the step change)
Electrical output/input	
Output signal	4–20 mA, 0–1, 0–5, 0–10 VDC
Supply voltage	14–30 VDC, 5–30 VDC (0–1 V & mA output)
Operating conditions	
Operating humidity Probe, housing, storage	5–95% non-condensing
Operating temperature Probe, Housing Storage	 -20 to +160°F / -30 to +70°C -40 to +165°F / -40 to +75°C
PRT	
Measurement range	Pt100/1000: -60 to +395°F / -50 to +200°C
Accuracy	Pt100/1000: ±0.15%
Mechanical specification	
Housing material	Molded polymer housing
Weight	2.9oz / 82g
Electrical connections	Screw terminals
Alternative outputs	
Dew point	-40 to +140°F / -40 to +60°C
Absolute humidity	0 - 87.4gr/ft^3 / 0–200g/m^3

Dimensions

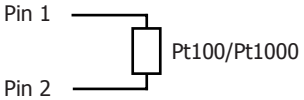


Accessories and spare parts

You can check your hygrometer with the control kit HKC which is based on the principle of non-saturated salt solutions. Refer to technical data sheet CONTROL KIT.	**Control Kit HKC**
Electrical connection	**Standard cable gland**
Slotted protection cap, white	**A000001**
PVDF filter	**A000014**
PVDF filter with protection cap	**A000016**
Wire mesh filter with protection cap, black	**A000021**
Stainless steel sintered filter 5/10/20 µm	**A000025/26/27**
Foil 2µm filter with white protection cap	**A000041**
Foil 1.5µm filter with white protection cap	**A000045**

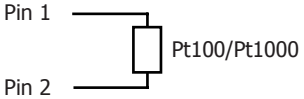
Electrical Connections

3/4 wire VDC power supply voltage output



Pin 2	Output temperature
Pin 3	Common ground
Pin 4	Output RH
Pin 5	Power supply V+

2 wire VDC power supply mA output



Pin 1	Output temperature -
Pin 2	Output temperature +
Pin 3	Output RH +
Pin 4	Output RH -

3/4 wire with display

Pin 1	Output temperature
Pin 2	Common ground
Pin 3	Output RH, Dew Point, Absolute Humidity
Pin 4	Power supply V+

Order codes

Relative humidity and temperature transmitter | WM52 | 5 | DX | D | T3 |

Accuracy and version configuration

3% accuracy	WM33
2% accuracy	WM52

Output configuration 1

4–20 mA analog output (not available with display code DX)	2
0–10 V analog output	3
0–5 V analog output	4
0–1 V analog output	5

Display configuration 1

No display	XX
Display version – WM52 only	DX

Temperature output range and configuration

No temperature output, RH signal only – (not available with display code DX)	X
-4 to +176°F / -20 to +80°C temp range	T1
32 to 122°F / 0 to 50°C temp range	T3
Pt100: -60 to +390°F / -50 to +200°C (not available with display code DX)	T4
Pt1000: -60 to +390°F / -50 to +200°C (not available with display code DX)	T5
Other output scaling on request	TX

Display configuration 2 - only in combination with display

Dew point temperature (Tdew), only available with Temperature code T1	D
Relative humidity	H
Absolute humidity in g/m³ / gr/ft³, only available with Temperature code T1	A

Example: WM52 5 DX D T3
Relative humidity and temperature sensor WM52, 2% accuracy, 0 to 1 V output for relative humidity and 32 to +122°F / 0 to 50°C temperature signal, with display.

Please note: Michell Instruments adopts a continuous development program which sometimes necessitates specification changes without notice. Please contact us for latest version. Ref: WM33&52_1001US_M

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Represented by:

WM261

Relative Humidity Transmitter

The WM261 has been developed for high precision measurement of relative humidity and temperature. This transmitter is available with a range of outputs.

Highlights

- Designed for accurate measurement in a controlled environment
- Output signal configurable on request
- Linearization for a specific isotherm on request

Technical Specifications

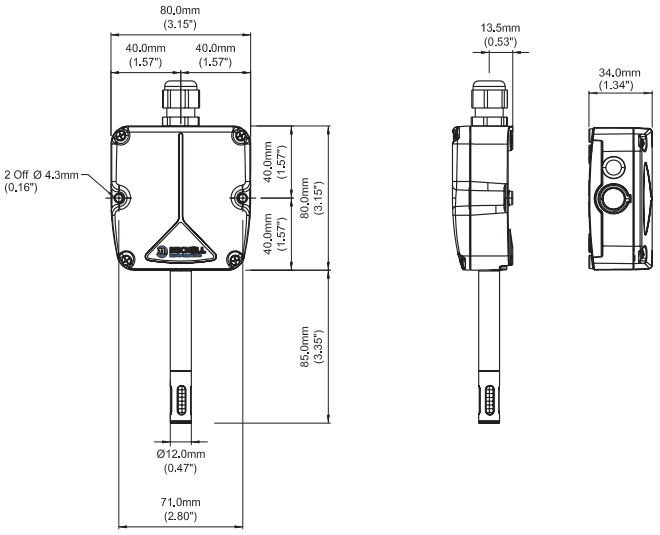
Performance		
Measurement range (RH)	0–100% RH	
Measurement range (T) configurable on request	-22 to +158°F / -30 to +70°C	
RH Accuracy at 73°F / 23°C	<±2% RH (5–95% RH)	
Temperature Accuracy	Pt100 1/3DIN direct ±0.36°F / ±0.2°C Current output ±0.54°F / ±0.3°C	
Stability – RH sensor	<±1% RH/year	
Response time	10 sec typical (for 90% of the step change)	
Electrical output / input		
Output signal (RH) configurable on request	4–20 mA 0–1 V, 0–5 V, 0–10 V	
Output signal (T) configurable on request	4–20 mA 3-wire 1/3 DIN Pt100 direct 0–1 V, 0–5 V, 0–10 V	
Supply voltage	Output 4–20 mA: Output 0–10 V: Output 0–5 V: Output 0–1 V:	E= 12–30 VDC E= 15–30 VDC E= 10–30 VDC E= 8–30 VDC
Load resistance	Output 4–20 mA: Output 0–10 V: Output 0–5 V: Output 0–1 V:	Rload < (Uv-9)/0.02 R > 10 k Ω R > 5 k Ω R > 1 k Ω
Current consumption	2x20 mA max	
Operating conditions		
Operating humidity Sensing element Housing, Storage	 0–100% RH (Non-condensing) 0–98% RH (Non-condensing)	
Operating temperature Measurement head Housing Storage	 -25 to +185°F / -30 to +85°C -25 to +160°F / -30 to +70°C -40 to +160°F / -40 to +70°C	
Mechanical specification		
Ingress protection	IP65	
Housing material	PPO	
Dimensions Housing Probe	 3.15 x 3.15 x 1.34” / 80 x 80 x 34mm L=3.35”, ø 0.47” / L=85mm, ø12mm	
Electrical connection	Screw terminals	
Weight	3.5oz / 100g	

Accessories and spare parts

You can check your hygrometer with the control kit HKC which is based on the principle of non-saturated salt solutions. Refer to technical data sheet CONTROL KIT.	**Control Kit HKC**

WM261

Dimensions



Electrical Connections

Version mA output and Pt100 direct

Pin 1	Output RH +
Pin 2	Output RH -
Pin 3	
Pin 4	Pt100 direct
Pin 5	

Version mA output for RH and Temperature

Pin 1	Output temperature +	
Pin 2	Output temperature -	Warning: Temperature channels Pin 1 and Pin 2 must be powered.
Pin 3	Output RH +	
Pin 4	Output RH -	

Version V output and Pt100 direct		Version V output for RH and Temperature	
Pin 1	Power supply V+	Pin 1	Power supply V+
Pin 2	Common ground	Pin 2	Common ground
Pin 3	Output RH +	Pin 3	Output Temperature +
Pin 4	Pt100 direct	Pin 4	Output RH +
Pin 5			

Order codes

Relative humidity transmitter | WM261 | A | 1 | Z10

Humidity signal output	
4–20 mA	A
0–10 V	B
0–5 V	C
0–1 V	D

Protections and filters	
Polyester mesh + PTFE filter	Z10

Temperature output range and configuration	
No temperature output (standard)	0
Pt100 direct	1
-22 to +158°F / -30 to +70°C Range	3
-22 to +68°F / -30 to +20°C Range	4
32 to +122°F / 0 to +50°C Range	5
Other ranges available - consult factory	TX

Example: WM261 A 1 Z10
Relative humidity transmitter WM261 with 4–20 mA output, Pt100 direct signal, Polyester mesh and PTFE filter.

Please note: Michell Instruments adopts a continuous development program which sometimes necessitates specification changes without notice. Please contact us for latest version. Ref: WM261_1001US_M

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Represented by:

WM281

Digital Relative Humidity/Temperature Transmitter for Wall Mounting

The WM281 relative humidity transmitter includes the interchangeable HYGROSMART module. The interchangeable module lets you recalibrate the transmitter simply by replacing the sensor head with the HYGROSMART module. As a result, maintenance costs are greatly reduced and machine down-time is minimized.

Highlights

- Analog and digital output standard
- Based on the interchangeable Hygrosmart module
- Analog output signals selectable through software
- Metric or imperial measurement units selectable through software

Technical Specifications

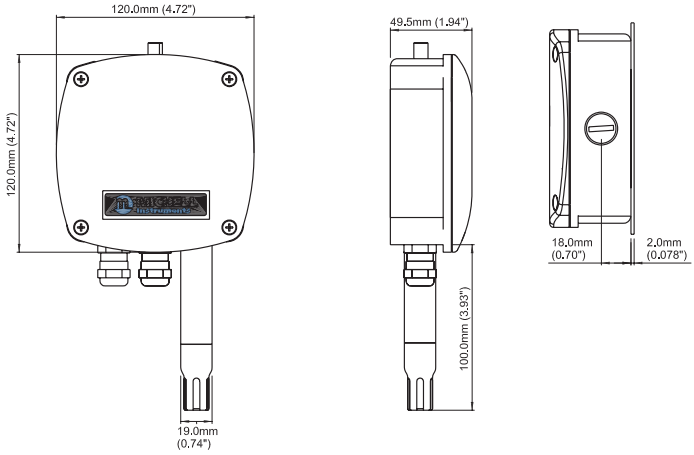
Performance	
Measurement range (RH)	0–100% RH
Measurement range (T)	-22 to +158°F / -30 to +70°C
RH Accuracy at 23°C / 73°F	<±2% RH (5-95% RH)
Temperature Accuracy	±0.72°F (14 to 122°F) ±0.4°C (-10 to +50°C)
Stability – RH Sensor	<±1% RH/year
Response time – RH Sensor	<10 sec typical (for 90% of the step change)
Electrical output/input	
Output signal configurable on request	0–1 VDC, 0–5 VDC, 0–10 VDC 0–20 mA, 4–20 mA, RS485
Supply voltage	15 ≤ VAC ≤ 27 / 18 ≤ VDC ≤ 38
Load resistance	Current output: R ≤ 500 Ω
Power consumption	1.7 W
Operating conditions	
Operating humidity Probe, Housing, Storage	0–100% RH
Operating temperature Probe Housing Storage	 -25 to +185°F / -30 to +85°C -25 to +160°F / -30 to +70°C -40 to +160°F / -40 to +70°C
Mechanical specification	
Ingress protection	IP67
Material Housing Probe	 Aluminum die casting Delrin
Dimensions Housing Probe	 4.72 x 4.72 x 1.94" / 120 x 120 x 49.5 mm L=3.93", ø 0.74" / L=100mm, ø19mm
Weight	15.9oz / 450g
Electrical connections	Screw terminals

Accessories and spare parts

You can check your hygrometer with the control kit HKC which is based on the principle of non-saturated salt solutions. Refer to technical data sheet CONTROL KIT	**Control Kit HKC**
Delrin slotted cap, with stainless steel mesh filter	**K7**
Stainless steel sintered filter	**H2**
Stainless steel sintered filter with teflon coating	**J2**
Delrin slotted cap, with polyester filter/PTFE	**Z7**
Cable USB for configuration "DIGICOR" (USB/TTL)	**F035263**
RS422/485 to PC (RS232) converter	**330185**
Hygrosmart with Pt100 output	**I7000.1**

WM281

Dimensions



Electrical Connections

Pin	
1	Power supply V+
2	Power supply V -
3	RS485 output Ground
4	Ground
5	Output Channel 1 Temperature +
6	Output Channel 1 Ground -
7	Output Channel 2 RH +
8	Output Channel 2 Ground -
9	RS485 Data+
10	RS485 Data-
11	Not connected
12	Not connected
13	Output Channel 3 (not connected)
14	Output Channel 3 Ground (not connected)

Do not connect V - (pin 2) to Ground

Order codes

Relative humidity and temperature transmitter

WM281	A	X	X	K7	N030	P070	F

Temperature and humidity output	
4–20 mA 2-wire	A
0–10 V	B
0–5 V	C
0–1 V	D
0–20 mA	E

Protections and filters	
Delrin slotted cap, with stainless steel mesh filter	K7
Stainless steel sintered filter	H2
Stainless steel sintered filter with teflon coating	J2
Delrin slotted cap with polyester filter/PTFE	Z7

Temperature Units	
Fahrenheit	F
Celsius	C

Maximum temperature
See table A (not to exceed 70C / 160F)

Minimum temperature
See table A

Table A	
-40°	N040
-20°	N020
0°	0000
+40°	P040
+70°	P070
+100°	P100
+120°	P120
+160°	P160
Other values may be specified following the same format	

Example: WM281 A X X K7 N030 P070 F
Relative humidity and temperature transmitter WM281 for high-temperature applications. Temperature measuring range -30°F to +70°F, with 4-20 mA 2-wire temperature and humidity outputs, delrin cover with stainless steel mesh filter. In this example, the 4mA temperature signal is set for -30F and the 20mA is set for +70F.

Please note: Michell Instruments adopts a continuous development program which sometimes necessitates specification changes without notice. Please contact us for latest version. Ref: WM281_1001US_M

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Represented by:

WM291

Relative Humidity/Temperature Digital Transmitter for Wall Mounting

The WM291 relative humidity transmitter includes the interchangeable HYGROSMART module. The interchangeable module lets you recalibrate the transmitter simply by replacing the sensor head with the HYGROSMART module. As a result, maintenance costs are greatly reduced and machine down-time is minimized.

Highlights

- Third output optional
- Analog and digital output standard
- Based on the interchangeable Hygrosmart module
- Analog output signals selectable through software
- Metric or imperial measurement units selectable through software
- Available with calculated absolute humidity, dew-point, frost point, mixing ratio or specific enthalpy output

Technical Specifications

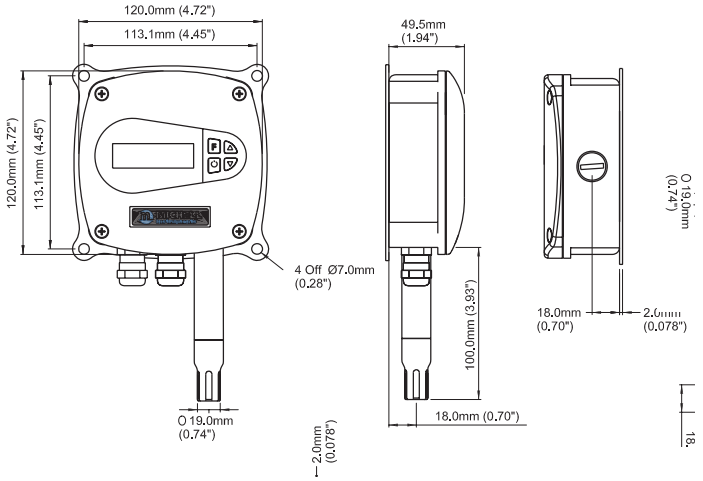
Performance	
Measurement range (RH)	0–100% RH
Measurement range (T)	-22 to +160°F / -30 to +70°C
RH Accuracy at 23°C / 73°F	<±2% RH (5-95% RH)
Temperature Accuracy	±0.72°F (14 to +122°F) ±0.4°C (-10 to +50°C)
Stability – RH Sensor	<±1% RH/year
Response time – RH Sensor	<10 sec typical (for 90% of the step change)
Electrical output/input	
Output signal	0–1 VDC, 0–5 VDC, 0–10 VDC 0–20 mA, 4–20 mA, RS485
Supply voltage	15 ≤ VAC ≤ 27 / 18 ≤ VDC ≤ 38
Load resistance	Current output: R ≤ 500 Ω
Power consumption	1.7 W
Operating conditions	
Operating humidity Probe, Housing, Storage	0–100% RH
Operating temperature Probe Housing Storage	 -25 to +185°F / -30 to +85°C -5 to +160°F / -20 to +70°C -25 to +160°F / -30 to +70°C
Mechanical specification	
Ingress protection	IP65
Material Housing Probe	 Aluminum die casting Delrin
Dimensions Housing Probe	 4.72 x 4.72 x 1.94" / 120 x 120 x 49.5mm L=3.93", ø 0.74" / L=100mm, ø19mm
Weight	15.9oz / 450g
Electrical connections	Screw terminals
Display resolution	LCD, 2 lines x 16 characters

Accessories and spare parts

You can check your hygrometer with the control kit HKC which is based on the principle of non-saturated salt solutions. Refer to technical data sheet CONTROL KIT	**Control Kit HKC**
Cable USB for configuration "DIGICOR" (USB/TTL)	**F035263**
RS422/485 to PC (RS232) converter	**330185**
Hygrosmart with Pt100	**I7000.1**
Delrin slotted cap, with stainless steel mesh filter	**K7**
Stainless steel sintered filter	**H2**
Stainless steel instered filter with teflon coating	**J2**
Delrin slotted cap, with polyester filter/PTFE	**Z7**

WM291

Dimensions



Electrical Connections

Pin	
1	V+
2	V -
3	RS485 output Ground
4	Ground
5	Output Channel 1 Temperature
6	Output Channel 1 Ground
7	Output Channel 2 RH
8	Output Channel 2 Ground
9	RS485 Data+
10	RS485 Data-
11	Not connected
12	Not connected
13	Output Channel 3 (optional)
14	Output Channel 3 Ground (optional)
	Do not connect V - (pin 2) to Ground

Order codes

Relative humidity and temperature transmitter

WM291	A	0	K7	N030	P070	F

Temperature and humidity output	
4–20 mA	A
0–10 V	B
0–5 V	C
0–1 V	D
0–20 mA	E

Optional output	
Dew point: -40 to 148°F / -40 to 100°C Td*	0
Mix ratio: 0-3500gr/lbm / 0-500 g/Kg	1
Absolute humidity: 0–600 g/m³ / 0-262.197gr/ft³	2
Specific enthalpy: 17.21 to 645.32 Btu/lb / -40 to 1500 KJ/Kg	3
Frost point: -58 to +50°F / -50 to +10°C	4

Protections and filters	
Delrin slotted cap, with stainless steel mesh filter	K7
Stainless Steel sintered filter	H2
Stainless steel sintered filter with teflon coating	J2
Delrin slotted cap, with polyester filter/PTFE	Z7

Temperature Units	
Fahrenheit	F
Celsius	C

Maximum temperature
See table A (not to exceed 160F / 70C)

Minimum temperature
See table A

Table A	
-40°	N040
-20°	N020
0°	0000
+40°	P040
+70°	P070
+100°	P100
+120°	P120
+160°	P160
Other values may be specified following the same format	

**Default configuration (Standard)*

Example: WM291 A 0 K7 N030 P070 F
Relative humidity and temperature transmitter WM291, for wall-mounting, with display, dew point calculated, -30° to +70°F temperature range, with 4-20 mA temperature and humidity output signal, and Delrin cap and stainless steel mesh filter. In this example, the 4mA temperature signal is set for -30F and the 20mA is set for +70F.

Please note: Michell Instruments adopts a continuous development program which sometimes necessitates specification changes without notice. Please contact us for latest version. Ref: WM291_1001US_M

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Represented by:

DT262
Relative Humidity Transmitter

The DT262 has been developed for high precision measurement of relative humidity and temperature. This transmitter is available with a range of outputs.

Highlights
- Designed for accurate measurement in controlled environments
- Output signal configurable on request
- Linearization for a specific isotherm on request

Accessories and spare parts

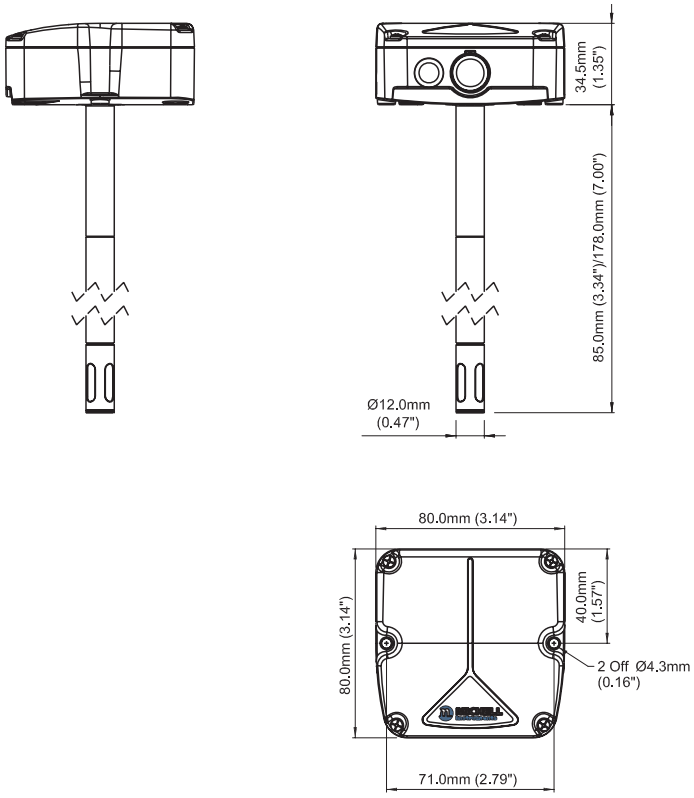
You can check your hygrometer with the control kit HKC which is based on the principle of non-saturated salt solutions. Refer to technical data sheet CONTROL KIT	**Control Kit HKC**
Aluminum mounting flange for fixing probe	**FLA012**

Technical Specifications

Performance		
Measurement range (RH)	0–100% RH	
Measurement range (T) configurable on request	-22 to +176°F / -30 to +80°C	
RH Accuracy at 73°F / 23°C	<±2% RH (5–95% RH)	
Temperature Accuracy	±0.36°F (14 to +122°F) ±0.2°C (-10 to +50°C)	
Stability – RH Sensor	±1% RH/year	
Response time – RH Sensor	<10 sec typical (for 90% of the step change)	
Electrical output / input		
Output signal (RH) configurable on request	4–20 mA 0–1 V, 0–5 V, 0–10 V	
Output signal (T) configurable on request	4–20 mA 3-wire 1/3 DIN Pt100 direct 0–1 V, 0–5 V, 0–10 V	
Supply voltage	Output 4–20 mA: Output 0–10 V: Output 0–5 V: Output 0–1 V:	E= 12–30 VDC E= 15–30 VDC E= 10–30 VDC E= 8–30 VDC
Load resistance	Output 4–20 mA: Output 0–10 V: Output 0–5 V: Output 0–1 V:	Rload < (Uv-9)/0.02 R > 10 k Ω R > 5 k Ω R > 1 k Ω
Current consumption	2 x 20 mA max	
Operating conditions		
Operating humidity Probe Housing, Storage	 0–100% RH 0–98% RH (non-condensing)	
Operating temperature Probe Housing Storage	 -25 to +185°F / -30 to +85°C -25 to +160°F / -30 to +70°C -40 to +160°F / -40 to +70°C	
Mechanical specification		
Ingress protection	IP65	
Material	PPO + POM	
Dimensions Housing Probe	 3.14 x 3.14 x 1.35" / 80 x 80 x 34.5mm L=3.34/7.00", ø 0.47" / L=85/178mm, ø12mm	
Weight	3.6oz / 100g	
Electrical connections	Screw terminals	

DT262

Dimensions



Electrical Connections

Version mA output and Pt100 direct	
Pin 1	Output RH +
Pin 2	Output RH -
Pin 3	Pt100 direct
Pin 4	
Pin 5	

Version mA output for RH and Temperature		
Pin 1	Output temperature +	
Pin 2	Output	Warning: Temperature channels Pin 1 and Pin 2 must be powered.
Pin 3	Output RH +	
Pin 4	Output RH -	

Version V output and Pt100 direct		Version V output for RH and Temperature	
Pin 1	Power supply V+	Pin 1	Power supply V+
Pin 2	Common ground	Pin 2	Common ground
Pin 3	Output RH +	Pin 3	Output Temperature +
Pin 4	Pt100 direct	Pin 4	Output RH +
Pin 5			

Order codes

Relative humidity transmitter | DT262 | A | 2 | 0 | Z10 |

Humidity signal output	
4–20 mA	A
0–10 V	B
0–5 V	C
0–1 V	D

Temperature output range and configuration	
No temperature output (standard)	0
Pt100 direct	1
-22 to +158°F / -30 to +70°C Range	3
-22 to +68°F / -30 to +20°C Range	4
32 to +122°F / 0 to +50°C Range	5
-4 to +176°F / -20 to +80°C Range	6
Other ranges available - consult factory	

Protections and filters	
Polyester mesh + PTFE filter	Z10

Extension	
Length 3.4" / 85.0mm	0
Length 7.0" / 178.0mm	1

Example: DT262 A 2 0 Z10
Relative humidity transmitter DT262 with 4–20 mA humidity signal output, 32 to 212°F / 0 to 100°C temperature range, 3.35" / 85mm extension, with polyester mesh and PTFE filter.

Please note: Michell Instruments adopts a continuous development program which sometimes necessitates specification changes without notice. Please contact us for latest version. Ref: DT262_1001US_M

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Represented by:

DT269
Relative Humidity Transmitter

The DT269 transmitter has a I7000 HYGROSMART sensor. Thanks to this solution, the sensor can be changed on site quickly and simply, providing greatly reduced maintenance costs. The transmitter does not need recalibration after the sensor is changed.

Highlights

- Designed for accurate measurement in a controlled environment
- Based on the interchangeable Hygrosmart module
- Output signal configurable on request
- Linearization for a specific isotherm on request

Accessories and spare parts

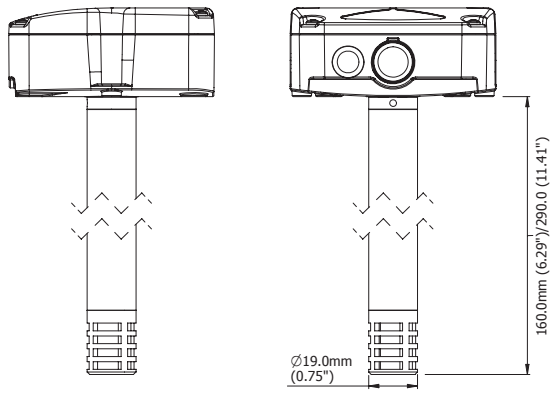
You can check your hygrometer with the control kit HKC which is based on the principle of non-saturated salt solutions. Refer to technical data sheet CONTROL KIT	**Control Kit HKC**
Aluminum mounting flange for fixing probe	**FLA019**
HYGROSMART without Pt100 output	**I7000.0**
HYGROSMART with Pt100 output	**I7000.1**
Stainless steel sintered filter	**H4**
Noryl cap with polyester filter/PTFE	**Z2**

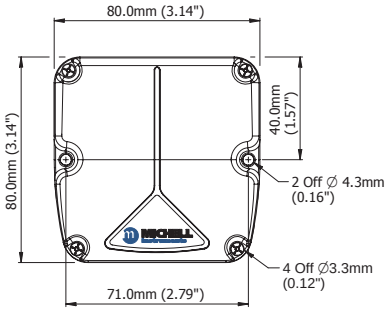
Technical Specifications

Performance		
Measurement range (RH)	0–100% RH	
Measurement range (T) configurable on request	-22 to +176°F / -30 to +80°C	
RH Accuracy at 23°C / 73°F	<±2% RH (5–95% RH)	
Temperature Accuracy	Pt100 1/3 DIN direct ±0.36°F / ±0.2°C Current output ±0.54°F / ±0.3°C	
Stability – RH Sensor	<±1% RH/year	
Response time – RH Sensor	<10 sec typical (for 90% of the step change)	
Electrical output / input		
Output signal (RH) configurable on request	4–20 mA 0–1 V, 0–5 V, 0–10 V	
Output signal (T) configurable on request	4–20 mA 3-wire 1/3 DIN Pt100 direct 0–1 V, 0–5 V, 0–10 V	
Supply voltage	Output 4–20 mA: Output 0–10 V: Output 0–5 V: Output 0–1 V:	E= 12–30 VDC E= 15–30 VDC E= 10–30 VDC E= 8–30 VDC
Load resistance	Output 4–20 mA: Output 0–10 V: Output 0–5 V: Output 0–1 V:	Rload < (Uv-9)/0.02 R > 10 k Ω R > 5 k Ω R > 1 k Ω
Current consumption	2 x 20 mA max	
Operating conditions		
Operating humidity Probe Housing, Storage	 0–100% RH 0–98% RH (non-condensing)	
Operating temperature Probe Housing Storage	 -22 to +185°F / -30 to +85°C -22 to +158°F / -30 to +70°C -40 to +158°F / -40 to +70°C	
Mechanical specification		
Ingress protection	IP65	
Material	PPO + POM	
Dimensions Housing Probe	 3.14 x 3.14 x 1.35" / 80 x 80 x 34.5mm L=3.35/7.01", ø 0.75" L=85/178mm, ø19mm	
Weight	3.6oz / 100g	
Electrical connections	Screw terminals	

DT269

Dimensions





Electrical Connections

Version mA output and Pt100 direct

Pin 1	Output RH +
Pin 2	Output RH -
Pin 3	
Pin 4	Pt100 direct
Pin 5	

Version mA output for RH and Temperature

Pin 1	Output temperature +
Pin 2	Output
Pin 3	Output RH +
Pin 4	Output RH -

Warning:
Temperature channels Pin 1 and Pin 2 must be powered.

Version V output and Pt100 direct		Version V output for RH and Temperature	
Pin 1	Power supply V+	Pin 1	Power supply V+
Pin 2	Common ground	Pin 2	Common ground
Pin 3	Output RH +	Pin 3	Output Temperature +
Pin 4	Pt100 direct	Pin 4	Output RH +
Pin 5			

Order codes

Relative humidity and temperature transmitter | DT269 | A | 4 | 0 | H4 |

Output configuration	
4–20 mA	A
0–10 V	B
0–5 V	C
0–1 V	D

Temperature output range and configuration	
No temperature output (standard)	0
Pt100 direct	1
-22 to +158°F / -30 to +70°C Range	3
-22 to +68°F / -30 to +20°C Range	4
32 to +122°F / 0 to +50°C Range	5
-4 to +176°F / -20 to +80°C Range	6
Other ranges available - consult factory	TX

Protections and filters	
Stainless steel sintered filter	H4
Noryl cap with polyester filter/PTFE	Z2

Extension	
Length 6.3" / 160mm (standard)	0
Length 11.5" / 290mm	1

Example: DT269 A 4 0 H4
Relative humidity and temperature transmitter DT269 with 4–20 mA humidity signal, 6.3" / 160mm extension, filter, -22 to +68°F / -30 to +20°C temperature range.

Please note: Michell Instruments adopts a continuous development program which sometimes necessitates specification changes without notice. Please contact us for latest version. Ref: DT269_1001US_M

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Represented by:

DT722

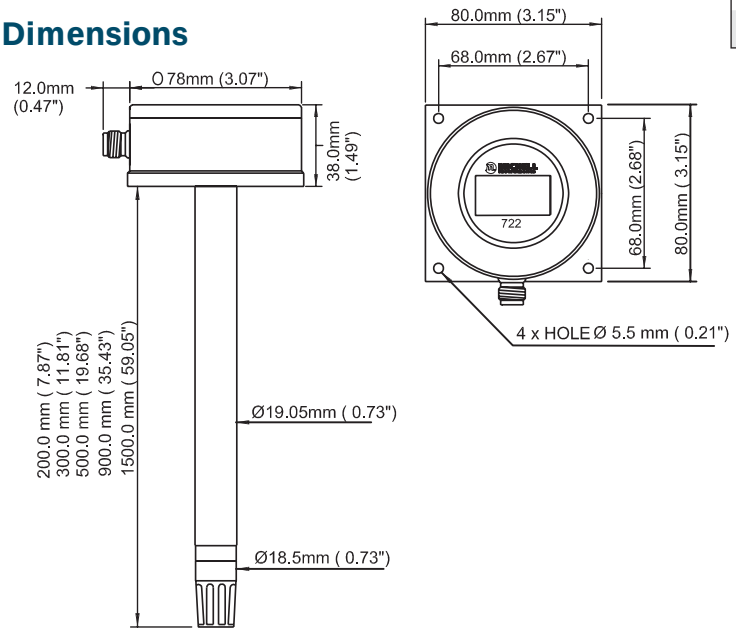
Rugged Industrial Relative Humidity and Temperature Transmitter

The DT722 is a rugged industrial relative humidity and temperature transmitter designed for process applications where accurate, stable measurement and control of humidity and temperature is required.

Highlights

- Designed for accurate measurements in a harsh environments
- Can withstand temperatures up to 300°F / 150°C
- Stainless steel housing

Dimensions



Technical Specifications

Performance	
Measurement range (RH)	0–100% RH
Measurement range (T)	-48 to 302°F / -40 to +150°C
RH Accuracy at 25°C / 77°F	<±2% RH (5-95% RH)
Accuracy at 25°C / 77°F Temperature	±0.36°F / ±0.2°C typical
Stability – RH Sensor	±1% RH/year
Response time – RH Sensor	<10 sec typical (for 90% of the step change)
Electrical output / input	
Output signal	Dual 4–20 mA signals
Supply voltage	8–35 VDC
Supply voltage influence	±0.01 % RH/V typical
Operating conditions	
Operating humidity Probe, Housing, Storage	10–95% RH (non-condensing)
Operating temperature Probe Housing Storage	 -40 to +302°F / -40 to +150°C -22 to +160°F / -30 to +70°C -40 to +170°F / -40 to +75°C
Mechanical specification	
Ingress protection	IP65
Housing material	Stainless Steel
Weight	DT722 8": 29 oz / 200mm: 800g DT722 12": 32 oz / 300mm: 900g DT722 20": 2.3 lb / 500mm: 1040g
Electrical connections	4 pin, M12

Accessories and spare parts

Electrical connector, no cable	**A000030**
Electrical connector, 6.5′ / 2m cable	**A000031**
Electrical connector, 16′ / 5m cable	**A000032**
Slotted protection cap, black (standard)	**A000002**
Wire mesh filter with protection cap, black	**A000021**
PVDF filter	**A000014**
PVDF filter with protection cap, black	**A000015**
Stainless steel sintered filter 5/10/20 µm	**A000025/26/27**
Foil filter 2µm with black protection cap	**A000040**
Foil filter 1.5µm with black protection cap	**A000044**
Aluminum mounting flange	**A000110**
3/4″ NPT Adjustable fitting	**A000100**
You can check your hygrometer with the control kit HKC which is based on the principle of non-saturated salt solutions. Refer to technical data sheet CONTROL KIT	**Control Kit HKC**

Electrical Connections

Connections		
Cable	**Pin**	
White	Pin 1	Output RH +
Brown	Pin 3	Output RH -
Green	Pin 4	Output T +
Yellow	Pin 2	Output T -
Connect RH+ with T+ by user		

Order codes

Relative humidity and temperature transmitter | DT722 | SX | HTS | 03 | A |

Display configuration	
No display	SX
With display	SD

Temperature output range	
-40 to +302°F / -40 to +150°C	HTS
32 to 212°F / 0 to 100°C	HT0
Other output scaling on request	TX

Cable length	
No cable	A
Screw connector no cable	B
6.5′ / 2m cable incl mating connector	C
16′ / 5m cable incl mating connector	D

Extension	
L= 8″ / 200mm	02
L= 12″ / 300mm	03
L= 20″ / 500mm	05
L= 36″ / 900mm	09
L= 50″ / 1500mm	15

Example: DT72 2 SX HT2 03 A
Relative humidity and temperature transmitter DT722, 2% accuracy, -40 to +302°F / -40 to +150°C temperature range, 12″ / 300.0mm probe, no display. No cable.

Please note: Michell Instruments adopts a continuous development program which sometimes necessitates specification changes without notice. Please contact us for latest version. Ref: DT722_1001US_M

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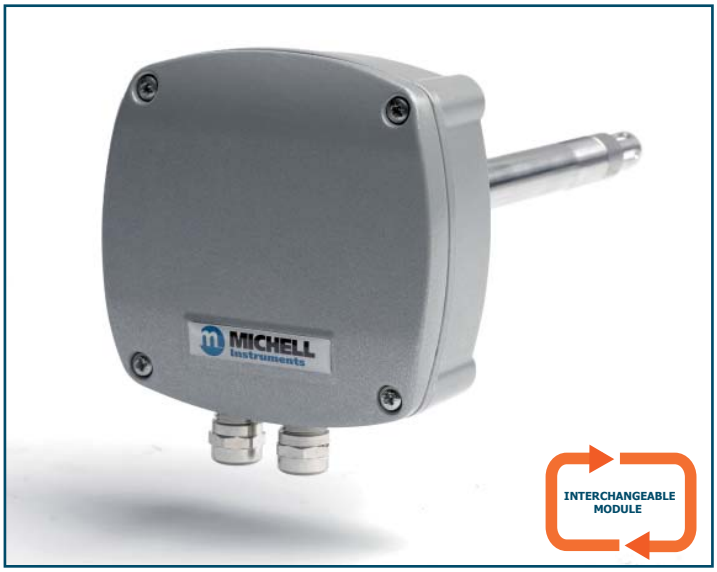
Represented by:

DT282

Digital Relative Humidity and Temperature Transmitter for Duct Installation



The DT282 relative humidity transmitter includes the interchangeable HYGROSMART module. The interchangeable module lets you recalibrate the transmitter simply by replacing the sensor head with the HYGROSMART module. As a result, maintenance costs are greatly reduced and machine down-time is minimized.

Highlights

- Analog and digital output standard
- Based on the interchangeable Hygrosmart module
- Analog output signals selectable through software
- Metric or US measurement units selectable through software

Technical Specifications

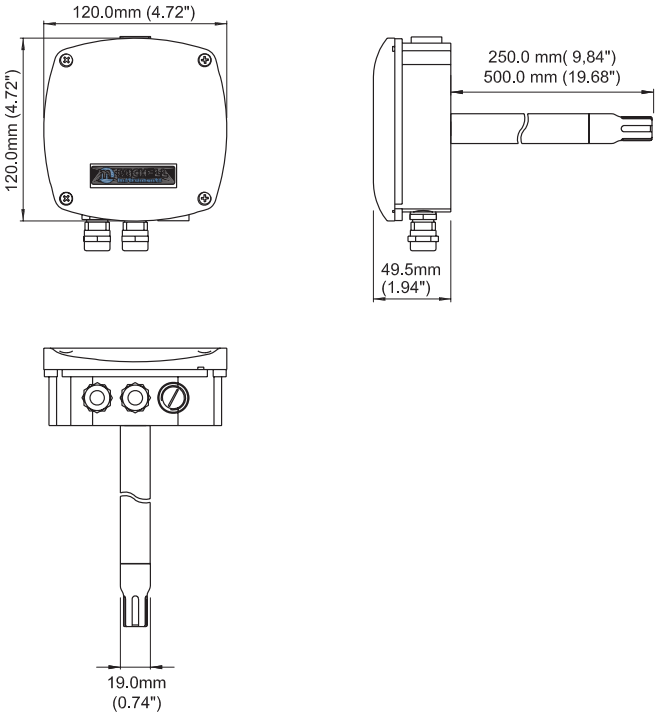
Performance	
Measurement range (RH)	0–100% RH
Measurement range (T)	-22 to +160°F / -30 to +70°C
Accuracy at 23°C / 73°F Humidity	<±2% RH (5–95% RH)
Accuracy at 23°C / 73°F Temperature	±0.72°F / ±0.4°C
Stability – RH Sensor	<±1% RH/year
Response time – RH Sensor	<10 sec typical (for 90% of the step change)
Electrical output / input	
Output signal	0–1 VDC, 0–5 VDC, 0–10 VDC 0–20 mA, 4–20 mA, RS485
Supply voltage	15 ≤ VAC ≤ 27 / 18 ≤ VDC ≤ 38
Load resistance	Current output: R ≤ 500 Ω
Power consumption	1.7 W
Operating conditions	
Operating humidity Probe, Housing, Storage	0–100% RH
Operating temperature Probe Housing Storage	 -25 to +185°F / -30 to +85°C -25 to +160°F / -30 to +70°C -40 to +160°F / -40 to +70°C
Mechanical specification	
Ingress protection	IP67
Material Housing Probe	 Aluminum die casting AISI 316
Dimensions Housing Probe	 4.72 x 4.72 x 1.94" / 120 x 120 x 49.5mm L=3.54", ø 0.71" / L=90mm, ø18mm
Weight	16oz / 450g
Electrical connections	Screw terminals

Accessories and spare parts

You can check your hygrometer with the control kit HKC which is based on the principle of non-saturated salt solutions. Refer to technical data sheet CONTROL KIT	**Control Kit HKC**
Aluminum mounting flange for fixing probe	**FLA019**
Cable USB for configuration "DIGICOR" (USB/TTL)	**F035263**
RS422/485 to PC (RD232) converter	**330185**
Hygrosmart with Pt100	**I7000.1**
AISI 316 cap with stainless steel mesh filter	**K6**
Stainless steel sintered filter	**H2**
Stainless steel sintered filter with teflon coating	**J2**
Stainless steel cap with polyester filter/PTFE	**Z6**

DT282

Dimensions



Electrical Connections

Pin	
1	V+
2	V -
3	RS485 output Ground
4	Ground
5	Output Channel 1 Temperature
6	Output Channel 1 Ground
7	Output Channel 2 RH
8	Output Channel 2 Ground
9	RS485 Data+
10	RS485 Data-
11	Not connected
12	Not connected
13	Not connected)
14	Not connected)
	Do not connect V - (pin 2) to Ground

Order codes

Relative humidity and temperature transmitter

DT282	A	01	K6	N030	P070	F

Temperature and humidity output	
4–20 mA	A
0–10 V	B
0–5 V	C
0–1 V	D
0–20 mA	E

Probe length	
10" / 250mm	01
20" / 500mm	02

Protections and filters	
AISI 316 cap with stainless steel mesh filter	K6
Stainless steel sintered filter	H2
Stainless steel sintered filter, teflon coated	J2
Stainless steel cap with polyester filter/PTFE	Z6

Temperature Units	
Fahrenheit	F
Celsius	C

Maximum temperature
See table A (not to exceed 160°F/70°C)

Minimum temperature
See table A

Table A	
-40°	N040
-20°	N020
0°	0000
+40°	P040
+70°	P070
+100°	P100
+120°	P120
+160°	P160
Other values may be specified following the same format	

Example: DT282 A 01 K6 N030 P070 F
Relative humidity and temperature transmitter DT282 with 4–20 mA 2-wire humidity signal, stainless steel probe 10" / 250mm length, with filter, -30 to +70˚F temperature range. In this example, the 4mA temperature signal is set for -30F and the 20mA is set for +70F.

Please note: Michell Instruments adopts a continuous development program which sometimes necessitates specification changes without notice. Please contact us for latest version. Ref: DT282_1001US_M

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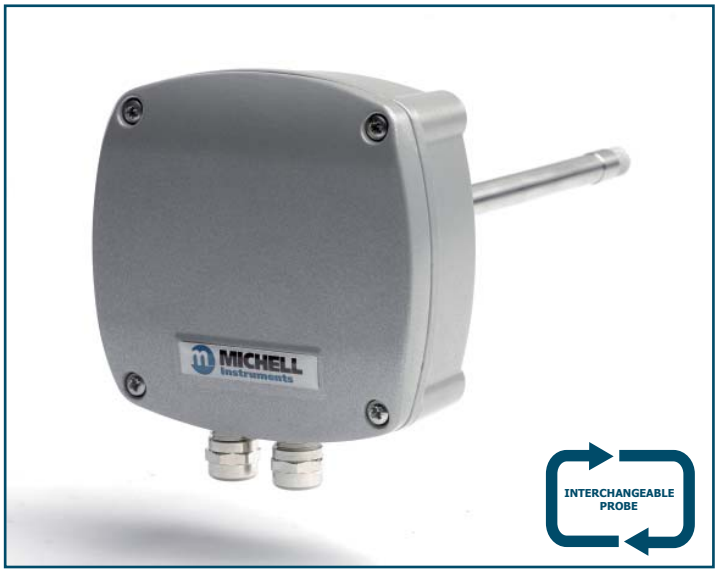
Represented by:

DT284

Digital Relative Humidity and Temperature Transmitter Remote Version



The DT284 relative humidity sensor uses the HYGROSMART module, integrated in the interchangeable probe. This device can be used in high-temperature applications due to the remote placing of the measurement element and its small overall size.

Highlights

- 0.47" / 12mm probe diameter
- Analog and digital output standard
- Interchangeable probe
- Analog output signals selectable through software
- Metric or US measurement units selectable through software

Technical Specifications

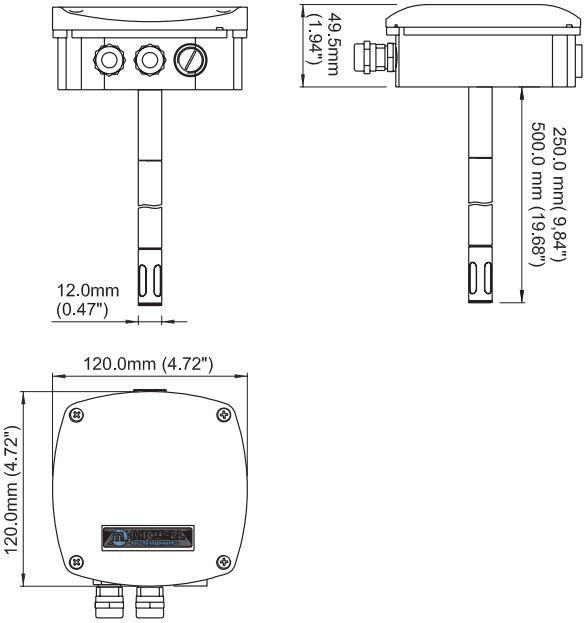
Performance	
Measurement range (RH)	0–100% RH
Measurement range (T)	-22 to +285°F / -30 to +140°C
Accuracy at 23°C / 73°F Humidity	<±2% RH (5–95% RH)
Accuracy at 23°C / 73°F Temperature	±0.72°F / ±0.4°C
Stability – RH Sensor	±1% RH/year
Response time – RH Sensor	<10 sec typical (for 90% of the step change)
Electrical output / input	
Output signal	0–1 VDC, 0–5 VDC, 0–10 VDC 0–20 mA, 4–20 mA, RS485
Supply voltage	15 ≤ VAC ≤ 27 / 18 ≤ VDC ≤ 38
Load resistance	Current output: R ≤ 500 Ω
Power consumption	1.7 W
Operating conditions	
Operating humidity Probe, Housing, Storage	0–100% RH
Operating temperature Probe Housing Storage	 -22 to +285°F / -30 to +140°C -22 to +160°F / -30 to +70°C -40 to +160°F / -40 to +70°C
Mechanical specification	
Ingress protection	IP67
Material Housing Probe	 Aluminum die casting Stainless steel
Dimensions Housing Probe	 4.72 x 4.72 x 1.94" / 120 x 120 x 49.5mm L=10/20", ø 0.47" / L=250/500mm, ø12mm
Weight	16oz / 450g
Electrical connections	Screw terminals

Accessories and spare parts

You can check your hygrometer with the control kit HKC which is based on the principle of non-saturated salt solutions. Refer to technical data sheet CONTROL KIT	**Control Kit HKC**
Aluminum mounting flange for fixing probe	**FLA012**
Cable USB for configuration "DIGICOR" (USB/TTL)	**F035263**
RS422/485 to PC (RD232) converter	**330185**
Stainless steel mesh filter	**K8**
PEEK protection cap with stainless steel mesh filter	**K9**
Stainless steel sintered filter	**H3**
Stainless steel sintered filter, teflon coated	**J3**

DT284

Dimensions



Electrical Connections

Pin	
1	V+
2	V -
3	RS485 output Ground
4	Ground
5	Output Channel 1 Temperature
6	Output Channel 1 Ground
7	Output Channel 2 RH
8	Output Channel 2 Ground
9	RS485 Data+
10	RS485 Data-
11	Not connected
12	Not connected
13	Not connected)
14	Not connected)

Do not connect V - (pin 2) to Ground

Order codes

Relative humidity and temperature transmitter

DT284	A	X	11	N030	P140	F

Temperature and humidity output	
4–20 mA	A
0–10 V	B
0–5 V	C
0–1 V	D
0–20 mA	E

Interchangeable Probe	
Stainless steel probe 10” / 250mm, and stainless steel cover with stainless steel mesh filter (standard)	3
Stainless steel probe 20” / 500mm, and stainless steel cover with stainless steel mesh filter	10
Stainless steel probe 10” / 250mm, and stainless steel sintered filter	11
Stainless steel probe 20” / 500mm, and stainless steel sintered filter	12
Probe 10” / 250mm with Victrex PEEK termination and cover and stainless steel mesh filter	13
Probe 20” / 500mm with Victrex PEEK termination and cover and stainless steel mesh filter	14

Temperature Units	
Fahrenheit	F
Celsius	C

Maximum temperature
See table A (not to exceed 285°F / 140°C)

Minimum temperature
See table A

Table A	
-40°	N040
-20°	N020
0°	0000
+40°	P040
+70°	P070
+100°	P100
+140°	P140
+275°	P275
Other values may be specified following the same format	

Example: DT284 A X 11 N030 P140 F
Relative humidity and temperature transmitter DT284 for high-temperature applications. Temperature range -30°F to +140°F, 4-20 mA 2-wire temperature/humidity signal, interchangeable stainless steel probe 10” /250mm and stainless steel sintered filter. In this example, the 4mA temperature signal is set for -30F and the 20mA is set for +140F.

Please note: Michell Instruments adopts a continuous development program which sometimes necessitates specification changes without notice. Please contact us for latest version. Ref: DT284_1001US_M

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Represented by:

WR283

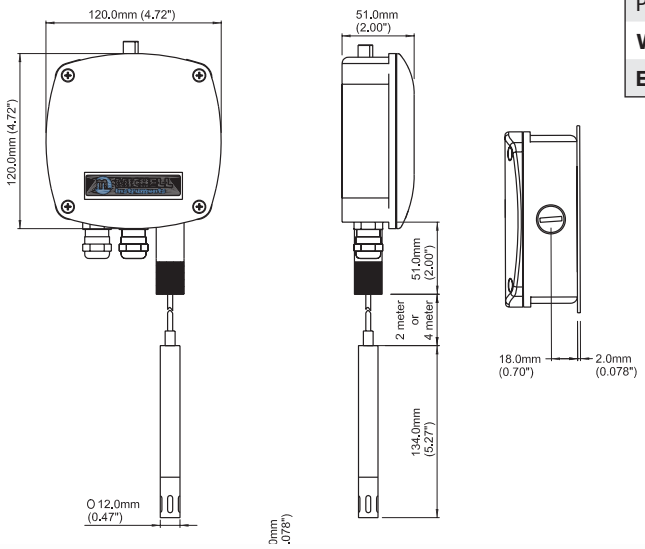
Digital Relative Humidity and Temperature Transmitter Remote Version for High Temperatures

The WR283 relative humidity sensor uses the HYGROSMART module, integrated in the interchangeable probe and cable. This device can be used in high-temperature applications thanks to the remote placing of the measurement element and its small overall size. The interchangeable probe allows for simple recalibration and lower maintenance costs.

Highlights

- Analog and digital output standard
- Interchangeable probe
- Analog output signals selectable through software
- Metric or US measurement units selectable through software

Dimensions



Technical Specifications

Performance	
Measurement range (RH)	0–100% RH
Measurement range (T)	-22 to +390°F / -30 to +200°C
Accuracy at 23°C / 73°F Humidity	<±2% RH (5–95% RH)
Accuracy at 23°C / 73°F Temperature	±0.72°F / ±0.4°C
Stability – RH Sensor	<±1% RH/year
Response time – RH Sensor	<10 sec typical (for 90% of the step change)
Electrical output / input	
Output signal	0–1 VDC, 0–5 VDC, 0–10 VDC 0–20 mA, 4–20 mA, RS485
Supply voltage	15 ≤ VAC ≤ 27 / 18 ≤ VDC ≤ 38
Load resistance	Current output: R ≤ 500 Ω
Power consumption	1.7 W
Operating conditions	
Operating humidity Probe, Housing, Storage	0–100% RH
Operating temperature Probe Housing Storage	 -25 to +390°F / -30 to +200°C -25 to +160°F / -30 to +70°C -40 to +160°F / -40 to +70°C
Mechanical specification	
Ingress protection	IP67
Material Housing Probe	 Aluminum die casting Stainless steel
Dimensions Housing Probe	 4.72 x 4.72 x 2.00" / 120 x 120 x 51mm L=5.3", ø 0.47" / L=134mm, ø12mm
Weight	16oz / 450g
Electrical connections	Screw terminals

Accessories and spare parts

You can check your hygrometer with the control kit HKC which is based on the principle of non-saturated salt solutions. Refer to technical data sheet CONTROL KIT	**Control Kit HKC**
Aluminum mounting flange for fixing probe	**FLA012**
Cable USB for configuration "DIGICOR" (USB/TTL)	**F035263**
RS422/485 to PC (RD232) converter	**330185**
Stainless steel mesh filter	**K8**
PEEK cap with stainless steel mesh filter	**K9**
Stainless steel sintered filter	**H3**
Stainless steel filter, teflon coated	**J3**
SS probe w/ 6.5' / 2m cable, SS cover & SS mesh filter	**USTE002**
SS probe w/ 13' / 4m cable, SS cover & SS mesh filter	**USTE005**
SS probe w/ 6.5' / 2m cable and SS sintered filter	**USTE006**
SS probe w/ 13' / 4m cable and SS sintered filter	**USTE007**
PEEK probe cover w/ 6.5' / 2m cable & SS mesh filter	**USTE008**
PEEK probe cover w/ 13' / 4m cable & SS mesh filter	**USTE009**

Electrical Connections

Pin	
1	V+
2	V -
3	RS 485 output Ground
4	Ground
5	Output Channel 1 Temperature
6	Output Channel 1 Ground
7	Output Channel 2 RH
8	Output Channel 2 Ground
9	RS485 Data+
10	RS485 Data-
11	Not connected
12	Not connected
13	Not connected)
14	Not connected)

Do not connect V - (pin 2) to Ground

Order codes

Relative humidity and temperature transmitter

WR283	A	X	7	N030	P180	F

Output configuration	
4-20 mA	A
0-10 V	B
0-5 V	C
0-1 V	D
0-20 mA	E

Interchangeable Probe	
Stainless steel probe with 6.5' / 2m cable output, plus stainless steel cover with stainless steel mesh filter (standard)	2
Stainless steel probe with 13' / 4m cable output, plus stainless steel cover with stainless steel mesh filter	5
Stainless steel probe with 6.5' / 2m cable output and stainless steel sintered filter	6
Stainless steel probe with 13' / 4m cable output and stainless steel sintered filter	7
Victrex PEEK probe cover with 6.5' / 2m cable output and stainless steel mesh filter	8
Victrex PEEK probe cover with 13' / 4m cable output and stainless steel mesh filter	9

Temperature Units	
Fahrenheit	F
Celsius	C

Maximum temperature
See table A (not to exceed 390°F / 200°C)

Minimum temperature
See table A

Table A	
-40°	N040
-20°	N020
0°	0000
+40°	P040
+70°	P070
+100°	P100
+200°	P200
+390°	P390
Other values may be specified following the same format	

Example: WR283 A X 7 N030 P180 F
Relative humidity and temperature transmitter WR283 with 4–20 mA 2-wire humidity signal, stainless steel probe with 13ft / 4m cable and stainless steel sintered filter, -30 to +180°F temperature range. In this example, the 4mA temperature signal is set for -30F and the 20mA is set for +180F.

Please note: Michell Instruments adopts a continuous development program which sometimes necessitates specification changes without notice. Please contact us for latest version. Ref: WR283_1001US_M

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Represented by:

WR285

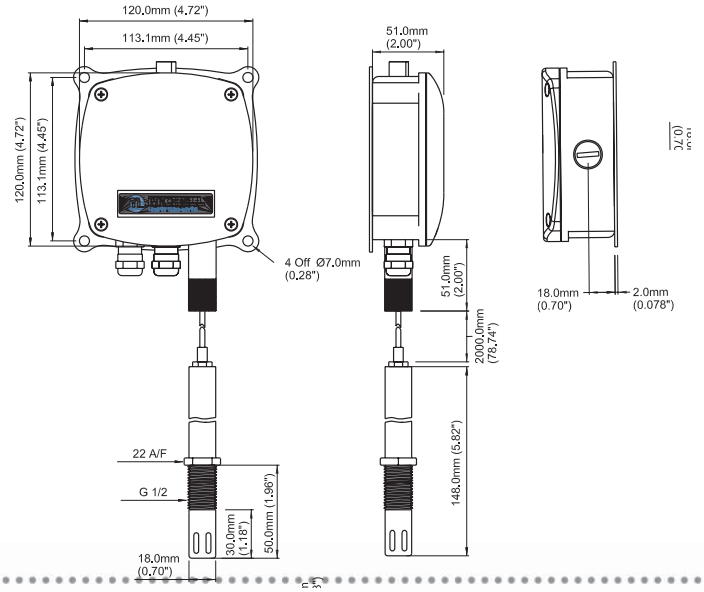
Digital Relative Humidity Transmitter with Remote Probe for Pressurized Areas

The WR285 relative humidity sensor uses the HYGROSMART module, integrated in the interchangeable probe. This device can be used in high-temperature applications due to the remote measurement element and its small overall size. The interchangeable probe allows for simple recalibration and lower maintenance costs.

Highlights

- Up to 450psi / 30 bar pressure
- Analog and digital output standard
- Interchangeable probe
- Analog output signals selectable through software
- Metric or US measurement units selectable through software

Dimensions



Technical Specifications

Performance	
Measurement range (RH)	0–100% RH
Accuracy at 25°C Humidity	<±2% RH (5–95% RH)
Stability – RH Sensor	±1% RH/year
Response time – RH Sensor	<10 sec typical (for 90% of the step change)
Repeatability	
Electrical output / input	
Output signal	0–1 VDC, 0–5 VDC, 0–10 VDC 0–20 mA, 4–20 mA, RS485
Supply voltage	15 ≤ VAC ≤ 27 / 18 ≤ VDC ≤ 38
Load resistance	Current output: R ≤ 500 Ω
Power consumption	1.7 W
Operating conditions	
Operating humidity Probe, Housing, Storage	0–100% RH
Operating temperature Probe Housing Storage	 -25 to +245°F / -30 to +120°C -25 to +160°F / -30 to +70°C -40 to +160°F / -40 to +70°C
Mechanical specification	
Ingress protection	IP67
Material Housing Probe	 Aluminum die casting Stainless steel
Dimensions Housing Probe	 4.72 x 4.72 x 2.00" / 120 x 120 x 51mm L=5.83", ø 0.71" / L=148mm, ø18mm
Weight	16oz / 450g
Electrical connections	Screw terminals

Accessories and spare parts

You can check your hygrometer with the control kit HKC which is based on the principle of non-saturated salt solutions. Refer to technical data sheet CONTROL KIT	**Control Kit HKC**
Interchangeable probe: Stainless steel with 2m / 6.5' cable with stainless steel mesh filter	**USTE015**
Stainless steel slotted cap with mesh filter	**K1**
Stainless steel slotted cap with PTFE filter	**Z1**
Cable USB for configuration "DIGICOR" (USB/TTL)	**F035263**
RS422/485 to PC (RD232) converter	**330185**

Electrical Connections

Pin	
1	V+
2	V -
3	RS485 output Ground
4	Ground
5	N.C.
6	N.C.
7	Output Channel 2 RH
8	Output Channel 2 Ground
9	RS485 Data+
10	RS485 Data-
11	Not connected
12	Not connected
13	Not connected)
14	Not connected)
	Do not connect V - (pin 2) to Ground

Order codes

Relative humidity and temperature transmitter | WR285 | A | X | 15 | K1 |

Humidity output	
4–20 mA	A
0–10 V	B
0–5 V	C
0–1 V	D
0–20 mA	E

Interchangeable probe	
Stainless steel probe with 6.5' / 2m cable, and stainless steel cover with stainless steel mesh filter	15

Filters	
Stainless steel slotted cap with mesh filter	K1
Stainless steel slotted cap with PTFE filter	Z1

Example: WR285 A X 15 K1
Relative humidity transmitter WR285 with 4–20 mA 2-wire humidity output, stainless steel probe with 6.5ft / 2m cable, stainless steel cap with mesh filter.

Please note: Michell Instruments adopts a continuous development program which sometimes necessitates specification changes without notice. Please contact us for latest version. Ref: WR285_1001US_M

Process Measurement & Controls, Inc.
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Represented by:

WR293

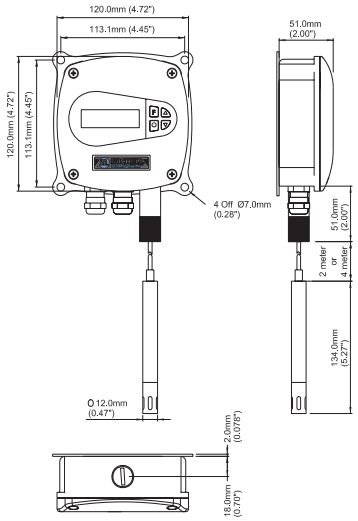
Digital Relative Humidity and Temperature Transmitter, Remote Version

The WR293 relative humidity sensor uses the HYGROSMART module, integrated in the interchangeable probe and cable. This device can be used in high-temperature applications due to the remote measurement element and its small overall size. The interchangeable probe allows for simple recalibration and lower maintenance costs.

Highlights

- Third output, optional engineering units
- Analog and digital output standard
- Interchangeable probe
- Analog output signals selectable through software
- Metric or US measurement units selectable through software
- Available with calculated absolute humidity, dew-point, frost point, mixing ratio or specific enthalpy output

Dimensions



Technical Specifications

Performance	
Measurement range (RH)	0–100% RH
Measurement range (T)	-20 to +390°F / -30 to +200°C
Accuracy at 23°C / 73°F Humidity	<±2% RH (5–95% RH)
Accuracy at 23°C / 73°F Temperature	±0.4°C / ±0.72°F
Stability – RH Sensor	<±1% RH/year
Response time – RH Sensor	<10 sec typical (for 90% of the step change)
Electrical output / input	
Output signal	0–1 VDC, 0–5 VDC, 0–10 VDC 0–20 mA, 4–20 mA, RS485
Supply voltage	15 ≤ VAC ≤ 27 / 18 ≤ VDC ≤ 38
Load resistance	Current output: R ≤ 500 Ω
Power consumption	1.7 W
Operating conditions	
Operating humidity Probe, Housing, Storage	0–100% RH
Operating temperature Probe Housing Storage	 -25 to +390°F / -30 to +200°C -25 to +160°F / -30 to +70°C -40 to +160°F / -40 to +70°C
Mechanical specification	
Ingress protection	IP65
Material Housing Probe	 Aluminum die casting Stainless steel
Dimensions Housing Probe	 4.72 x 4.72 x 2.00" / 120 x 120 x 51mm L=5.27", ø 0.47" / L=134mm, ø12mm
Weight	15.9oz / 450g
Electrical connections	Screw terminals
Display resolution	LCD, lines x 16 characters

Accessories and spare parts

You can check your hygrometer with the control kit HKC which is based on the principle of non-saturated salt solutions. Refer to technical data sheet CONTROL KIT	**Control Kit HKC**
Aluminum mounting flange for fixing probe	**FLA012**
Cable USB for configuration "DIGICOR" (USB/TTL)	**F035263**
RS422/485 to PC (RD232) converter	**330185**
Stainless steel mesh filter	**K8**
PEEK protection cap with stainless steel mesh filter	**K9**
Stainless steel sintered filter	**H3**
Stainless steel filter with Teflon coating	**J3**
SS probe w/6.5' / 2m cable, SS cover and SS mesh filter	**USTE002**
SS probe w/13' / 4m cable, SS cover and SS mesh filter	**USTE005**
SS probe w/6.5' / 2m cable and SS sintered filter	**USTE006**
SS probe w/13' / 4m cable and SS sintered filter	**USTE007**
PEEK probe cover w/6.5' / 2m cable & SS mesh filter	**USTE008**
PEEK probe cover w/13' / 4m cable & SS mesh filter	**USTE009**

Electrical Connections

Pin	
1	V+
2	V -
3	RS485 output Ground
4	Ground
5	Output Channel 1 Temperature
6	Output Channel 1 Ground
7	Output Channel 2 RH
8	Output Channel 2 Ground
9	RS485 Data+
10	RS485 Data-
11	Not connected
12	Not connected
13	Output Channel 3 Signal (optional units)
14	Output Channel 3 Ground (optional units)

Do not connect V - (pin 2) to Ground

Order codes

Relative humidity and temperature transmitter

WR293	A	0	6	N030	P180	F

Temperature and humidity output	
4–20 mA	A
0–10 V	B
0–5 V	C
0–1 V	D
0–20 mA	E

Optional output	
Dew point: -40 to + 212°F / -40 to +100°C*	0
Mix ratio: 0-3500gr/lbm / 0-500 g/Kg	1
Absolute humidity: 265 gr/ft^3 / 0–600 g/m^3	2
Specific enthalpy : -17.21 to 645.32 Btu/lbm / -40 to 1500 KJ/Kg	3
Frost point: -58 to + 50°F / -50 to +10°C	4

Interchangeable probe and cable	
Stainless steel probe with 6.5' / 2m cable output, stainless steel cover with stainless steel mesh filter (standard)	2
Stainless steel probe with 13' / 4m cable output, stainless steel cover with stainless steel mesh filter	5
Stainless steel probe with 6.5' / 2m cable output and stainless steel sintered filter	6
Stainless steel probe with 13' / 4m cable outputand stainless steel sintered filter	7
Victrex PEEK probe cover with 6.5' / 2m cable output and stainless steel mesh filter	8
Victrex PEEK probe cover with 13' / 4m cable output and stainless steel mesh filter	9

** Default configuration (STD)*

Temperature Units	
Fahrenheit	F
Celsius	C

Maximum temperature
See table A (not to exceed 390°F / 200°C)

Minimum temperature
See table A

Table A	
-40°	N040
-20°	N020
0	0000
+40°	P040
+70°	P070
+100°	P100
+200°	P200
+390°	P390
Other values may be specified following the same format	

Example: WR293 A 0 06 N030 P180 F
Relative humidity and temperature transmitter WR 293 with 4–20 mA 2-wire humidity output, dew point calculated, stainless steel probe with 6.5ft / 2m cable, and stainless steel sintered filter, and -30°F to 180°F temperature range. In this example, the 4mA temperature signal is set for -30F and the 20mA is set for +180F.

Please note: Michell Instruments adopts a continuous development program which sometimes necessitates specification changes without notice. Please contact us for latest version. Ref: WR293_1001US_M

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Represented by:

WR295

Digital Relative Humidity Transmitter for Pressurized Applications up to 450 psi

The WR295 relative humidity transmitter includes the interchangeable HYGROSMART module. This interchangeable module allows you to recalibrate the transmitter simply by replacing the sensor head. As a result, maintenance costs are greatly reduced and machine down-time is minimized.

Highlights

- Up to 450 psi / 30 bar pressure
- Analog and digital output standard
- Interchangeable probe
- Analog output signals selectable through software
- Metric or US measurement units selectable through software

Technical Specifications

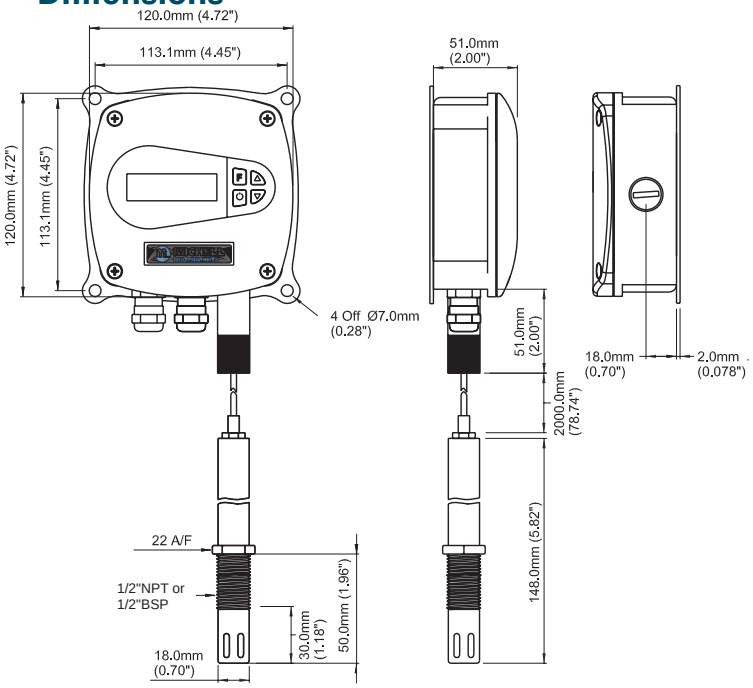
Performance	
Measurement range (RH)	0–100% RH
Accuracy at 23°C / 73°F Humidity	<±2% RH (5–95% RH)
Stability – RH Sensor	<±1% RH/year
Response time – RH Sensor	<10 sec typical (for 90% of the step change)
Electrical output / input	
Output signal	0–1V DC, 0–5 VDC, 0–10 VDC 0–20 mA, 4–20 mA, RS485
Supply voltage	15 ≤ VAC ≤ 27 / 18 ≤ VDC ≤ 38
Load resistance	Current output: R ≤ 500 Ω
Power consumption	1.7 W
Operating conditions	
Operating humidity Probe, Housing, Storage	0–100% RH
Operating temperature Probe Housing Storage	 -25 to +390°F / -30 to +200°C -25 to +160°F / -30 to +70°C -40 to +160°F / -40 to +70°C
Mechanical specification	
Ingress protection	IP65
Material Housing Probe	 Aluminum die casting Stainless steel
Dimensions Housing Probe	 4.72 x 4.72 x 2.00” / 120 x 120 x 51mm L=5.27”, ø0.47” / L=134mm, ø12mm
Weight	16oz / 450g
Electrical connections	Terminals
Display resolution	LCD, 2 lines x 16 characters

Accessories and spare parts

Check your hygrometer with control kit HKC which is based on the principle of non-saturated salt solutions. Refer to technical data sheet CONTROL KIT	**Control Kit HKC**
Cable USB for configuration “DIGICOR” (USB/TTL)	**F035263**
RS422/485 to PC (RD232) converter	**330185**
Stainless steel slotted cap with mesh filter	**K1**
Stainless steel slotted cap with PTFE filter	**Z1**
Stainless steel probe with 2m cable and stainless steel cover with mesh filter	**USTE015**

WR295

Dimensions



Electrical Connections

Pin	
1	V+
2	V -
3	RS485 output Ground
4	Ground
5	N.C.
6	N.C.
7	Output Channel 2 RH
8	Output Channel 2 Ground
9	RS485 Data+
10	RS485 Data-
11	Not connected
12	Not connected
13	Not connected)
14	Not connected)

Do not connect V - (pin 2) to Ground

Order codes

Relative humidity and temperature transmitter | WR295 | A | X | 15 | K1 | N |

Output configuration	
4–20 mA	A
0–10 V	B
0–5 V	C
0–1 V	D
0–20 mA	E

Threaded Connection	
1/2” NPT male	N
1/2” BSP male	B

Filters	
Stainless steel slotted cap with mesh filter	K1
Stainless steel slotted cap with PTFE filter	Z1

Interchangeable probe	
Stainless steel probe with 6.5ft / 2m cable output with stainless steel mesh filter	15

Example: WR295 A X 15 K1 N
Relative humidity transmitter WR295 with 4-20 mA outputs, interchangeable stainless steel probe with 6.5ft / 2m cable, stainless steel cover with mesh filter and 1/2”NPT connection.

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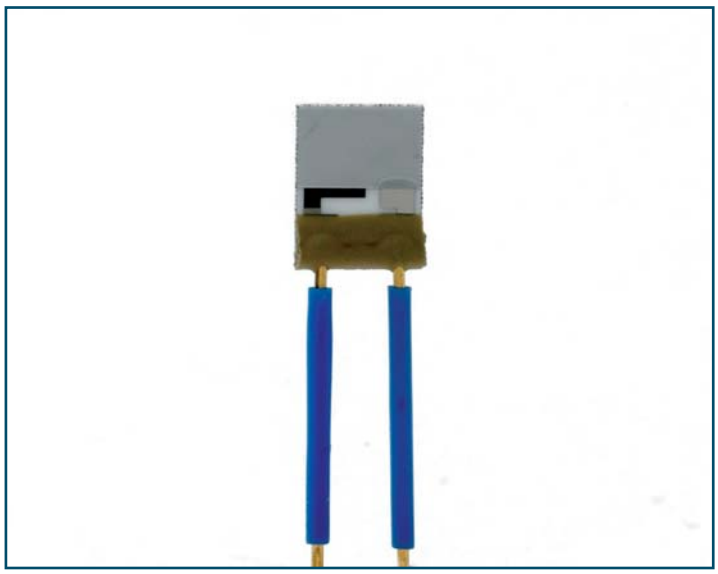
Represented by:

H3000

Capacitive Humidity Sensor



Technical Specifications	
Humidity operating range	5–90% RH
Operating temperature range	-22 to +265°F / -30 to +130°C
Capacitance 30 % RH @ 23°C / 73°F	150 pF ± 50 pF
Sensitivity (15-90 % RH)	0.25 pF/% RH
Loss Factor	< 0.01
Accuracy (15–90 % RH @ 23°C / 73°F, after one point calibration)	< 1.5% RH
Hysteresis	< 1.5% RH
Response Time T_{63}	< 5s (50% to 0% RH)
Frequency Range	1–100 KHz (recommend 10 KHz)
Maximum Operating Voltage	< 12 Vpp AC
Signal Form	alternating signal without DC bias

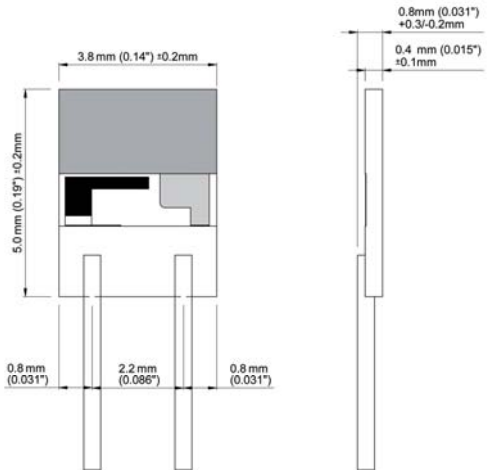
The H3000 humidity sensor can be used in a wide range of HVAC applications. Through the consistent use of state-of-the-art production technologies and our extensive know-how in the field of high performance polymers, we have succeeded in producing a high quality sensor with an almost linear characteristic. The possibility for selecting the electrical connections provides users with ideal opportunities for implementing their own sensor design without limitation.

Order Codes	
H3000	**Minimum order 50 pieces**

Highlights

- Applicable in HVAC products
- Good long term stability
- High resistance to various chemicals
- Wide temperature operating range

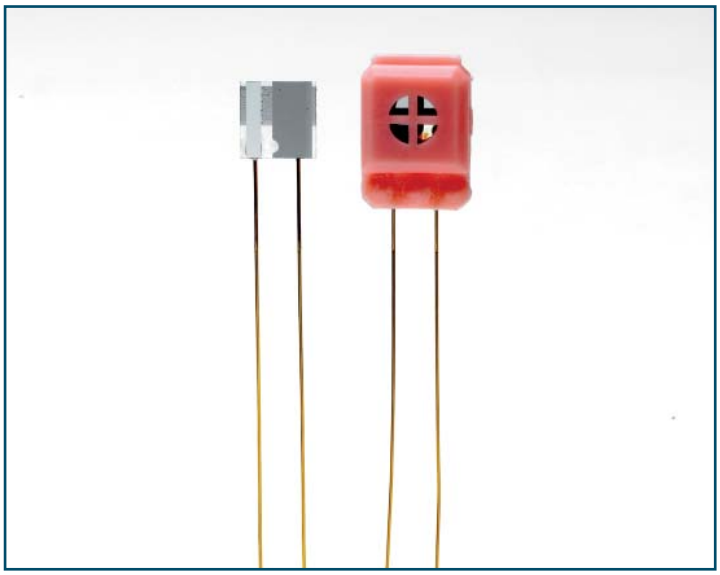
Dimensions



Please note: Michell Instruments adopts a continuous development program which sometimes necessitates specification changes without notice. Please contact us for latest version. Ref: H3000-H5000_1001US_M

H5000 & 5100

Relative Humidity Sensor



The operating principle of these capacitive relative humidity sensors is based on the hygroscopic properties of a polymer coating, which changes capacitance in response to local RH. The polymer reaches equilibrium with the ambient RH quickly and reversibly, and changes its capacitance value depending on the humidity level.

Highlights

- Capacitive thin film sensor
- Measuring range: RH 0–100%, Temp: -25 to +390°F / -30 to +200°C
- Mixing ratio: 250g/Kg of dry air
- Low hysteresis
- Response time: 4 seconds

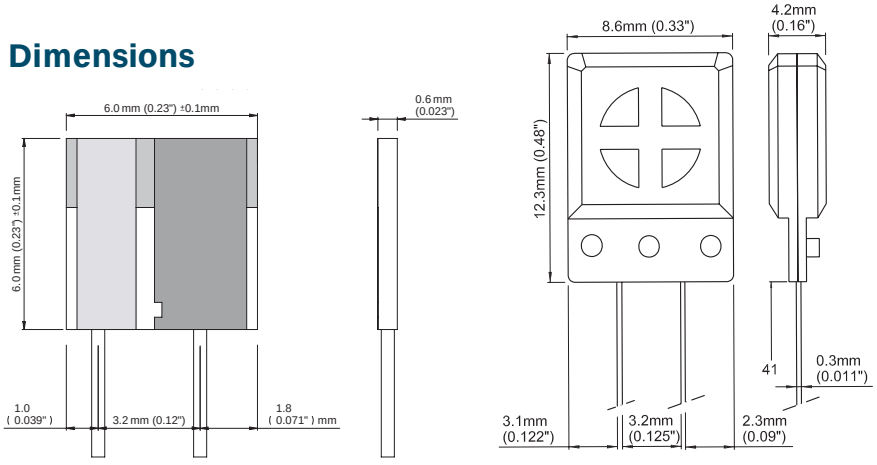
Technical Specifications

	H5000	H5100
Response time 90% of scale for a step change from 11% to 75% RH	4 sec	4 sec
Operating range Humidity Temperature Pressure	 0–100% RH -30 to +200°C / -22 to +392°F 0.04–30 bar / 0.6-400 psi	 0–100% RH -30 to +100°C / -22 to +212°F 0.04–30 bar / 0.6-400 psi
Mixing ratio	250g water/Kg dry air	
Nominal capacitance 75% RH @ 23°C / 73°F	500 pF ± 10%	
Sensitivity 11-75% RH @ 23°C / 73°F	0.86 pF/% RH	
Linearity 11–90% RH @ 23°C / 73°F	± 2.5% RH	
Long term stability (12 months) control @ 11% RH	< 1% at 23°C / 73°F	
Maximum air speed (without protection)	< 20m/sec	
Hysteresis	Typical value = 0.5% RH	
D Factor loss tangent @10 KHz 75% RH @ 23°C / 73°F	Typical value = 0.007	
Supply voltage Peak-to-peak	2.5 VAC DC component < 0.2 V	
Operating frequency range	5–300 KHz	
Protection Cap **Weight**	No 0.1g / 0.0004oz	Yes 1g / 0.035oz

Order Codes

H5000	**Minimum order 50 pieces**
H5100 (with protective cap)	**Minimum order 50 pieces**

Dimensions



Please note: Michell Instruments adopts a continuous development program which sometimes necessitates specification changes without notice. Please contact us for latest version. Ref: H3000-H5000_1001US_M

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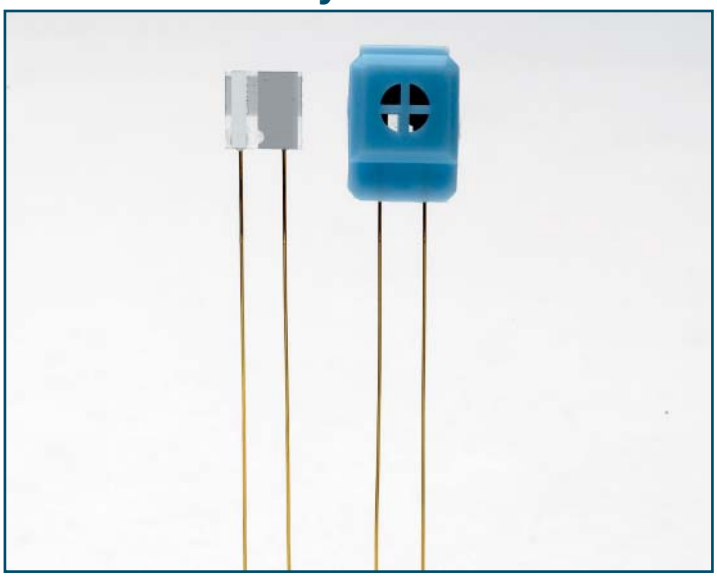
Represented by:

H6000 & 6100

Relative Humidity Sensor



The operating principle of these capacitive relative humidity sensors is based on the hygroscopic properties of a polymer coating, which changes capacitance in response to local RH. The polymer reaches equilibrium with the ambient RH quickly and reversibly, and changes its capacitance value depending on the humidity level.

Highlights

- Suitable for corrosive atmosphere
- Teflon coating
- Capacitive thin film sensor
- Measuring range: 0–100% RH, Temp: -25 to +390°F / -30 to +200°C
- Mixing ratio: 250g/Kg of dry air
- Low hysteresis
- Response time: 20 seconds

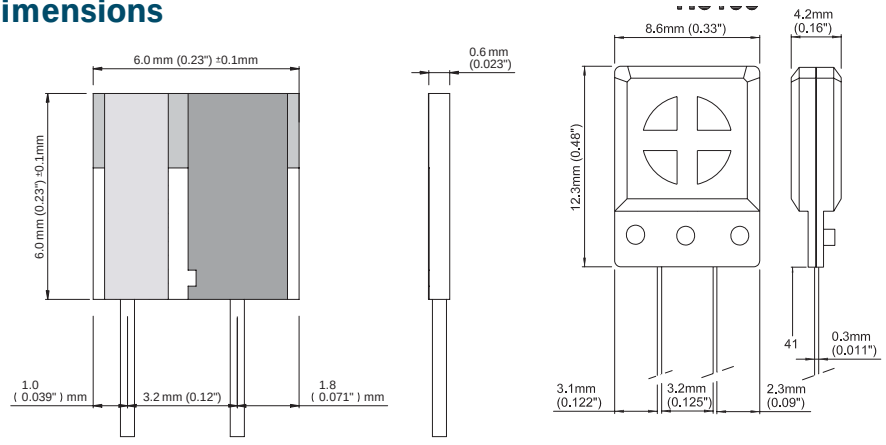
Technical Specifications

	H6000	H6100
Response time 90% of scale for a step change from 11 to 75% RH	20 sec	20 sec
Operating range		
Humidity	0–100% RH	0–100% RH
Temperature	-30 to +200°C / -22 to +392°F	-30 to +100°C / -22 to +212°F
Pressure	0.04–30 bar / 0.6-400 psi	0.04–30 bar / 0.6-400 psi
Mixing ratio	250g/8.82oz water / Kg dry air	
Nominal capacity 75% RH @ 23°C **/ 73°F**	500 pF ± 10%	
Sensitivity 11–75% RH @ 23°C **/ 73°F**	0.86 pF/% RH	
Linearity 11–90% RH) @ 23°C **/ 73°F**	± 2.5% RH	
Long term stability (12 months) control @ 11% RH	< 1% at 23 °C / 73°F	
Max. air speed (without protection)	< 20m/sec	
Hysteresis	Typical value = 0.5% RH	
D Factor loss tangent @10 KHz 75% RH @ 23°C **/ 73°F**	Typical value = 0.007	
Supply voltage Peak-to-peak	2.5 VAC DC component < 0.2 V	
Operating frequency range	5/300 KHz	
Protection Cap	No	Yes
Weight	0.1g	1g

Order Codes

H6000	**Minimum order 50 pieces**
H6100 (with protective cap)	**Minimum order 50 pieces**

Dimensions



Please note: Michell Instruments adopts a continuous development program which sometimes necessitates specification changes without notice. Please contact us for latest version. Ref: H6000_1001US_M

Effects of pressure, temperature and concentration on humidity parameters

In nature, water exists in three different states: gaseous (vapor), liquid (rain, fog) and solid (snow, ice, hail). Water in the gaseous state is invisible. The maximum quantity of water vapor that the air can contain depends on both temperature and pressure. The table below shows how the parameter change influences the measured values.

Simply stated, relative humidity is the ratio of the actual quantity of water vapor that an air sample contains to the maximum quantity of water vapor that such a sample can contain at the sample pressure and temperature.

	Temperature Increase	Temperature Decrease	Pressure Increase	Pressure Decrease	Vapor Increase	Vapor Decrease
% RH	↓	↑	↑	↓	↑	↓
Dew Point	↔	↔	↑	↓	↑	↓
Absolute Humidity	↔	↔	↑	↓	↑	↓
Mix Ratio	↔	↔	↔	↔	↑	↓
Concentration of Water Vapor	↔	↔	↔	↔	↑	↓

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Represented by:

I7000 & 7400 (Hygrosmart)

Interchangeable Sensor Module for Relative Humidity

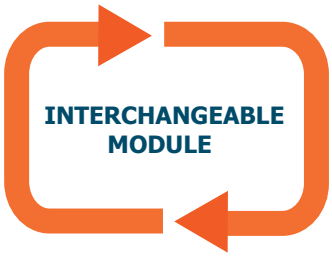
A key feature of the I7000 (Hygrosmart) Series is its interchangeability without the need for recalibration. The small size allows its integration in any equipment while the plug-and-play system allows fast replacement even by non-skilled staff.

Highlights

- Interchangeable without recalibration
- Sensor response time: <10 sec
- Linearization for a specific isotherm on request
- Can be used up to peak temperatures of 200°F / 95°C

Technical Specifications

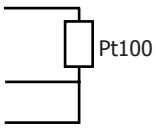
Performance	
Measurement range (RH)	0–100% RH
Measurement range (T)	-40 to +203°F / -40 to +95°C
Accuracy at 23°C / 73°F Humidity	<±2% RH (5–95% RH)
Accuracy at 23°C / 73°F Temperature	±0.36°F / ±0.2°C (Pt100 1/3 DIN direct)
Stability – RH Sensor	<±1% RH/year
Response time – RH Sensor	<10 sec typical (for 90% of the step change)
Electrical output / input	
Output signal (RH)	I7000: 0–1 V I7400: 0.2–1 V Digital, variable frequency output
Output signal (T)	3-wire 1/3 DIN Pt100 direct
Supply voltage	5 VDC ±5%
Power consumption	≤ 1.5 mA max
Operating conditions	
Operating humidity Probe, Housing, Storage	0–100% RH
Operating temperature Probe, Housing Storage	 -22 to +185°F / -30 to +85°C -40 to +185°F / -40 to +85°C
Mechanical specification	
Housing material	NORYL PPo UL 94 V0
Dimensions	L=1.3", ø 0.55" / L=33mm, ø14mm
Weight	0.1oz / 3g
Electrical connections	RH: 3-wire T: 3-wire



Accessories and spare parts

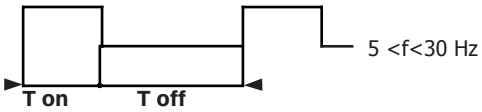
Wall-mounting fixing clamp	**1A01210**
Connecting kit with wires	**6A06350**
Connecting kit for PCBs	**6A05130**

Electrical Connections

Pin	
1	Frequency output
2	Ground
3	V+ 5 VDC
4	Output 0-1 VDC (I7000) / Output 0.2-1 VDC (I7400)
5	
6	
7	

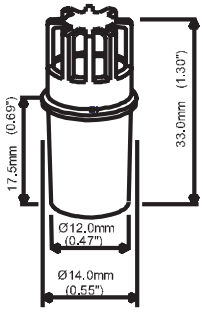
Digital output

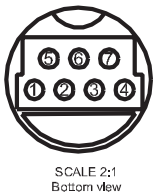
Characterized by a variable frequency pulse train as a function of the relative humidity.



% RH=[(T on/T off)*2049-1]/16.12

Dimensions





SCALE 2:1
Bottom View

Order codes

Relative humidity sensor module | I7 | 4 | 00 | 1 |

Output configuration	
0–1 VDC	0
0.2–1 VDC	4

Temperature configuration	
No temperature signal	0
Pt100 direct (standard)	1

Example: I7 4 00 1
Relative humidity sensor module I7400 with 0.2–1 V RH output, Pt100 direct temperature output.

Note: If you need to exchange the interchangeable element, request the reference information printed on the product label.

Please note: Michell Instruments adopts a continuous development program which sometimes necessitates specification changes without notice. Please contact us for latest version. Ref: I7000_1001US_M

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Represented by:

DM509 & 535

Hand-held Relative Humidity and Temperature Instruments

The DM Series is a range of portable, battery-operated thermohygrometers. Available with a number of different probe configurations and with display of relative humidity, dew point, absolute humidity and temperature, the DM Series is suitable for a wide range of applications.

Highlights

- Displays % RH, dew point, absolute humidity, or temperature
- Available with many probe styles and display configurations
- Lightweight and portable
- Simple to operate
- Long term stability: ±1% RH over 12 months

Technical Specifications

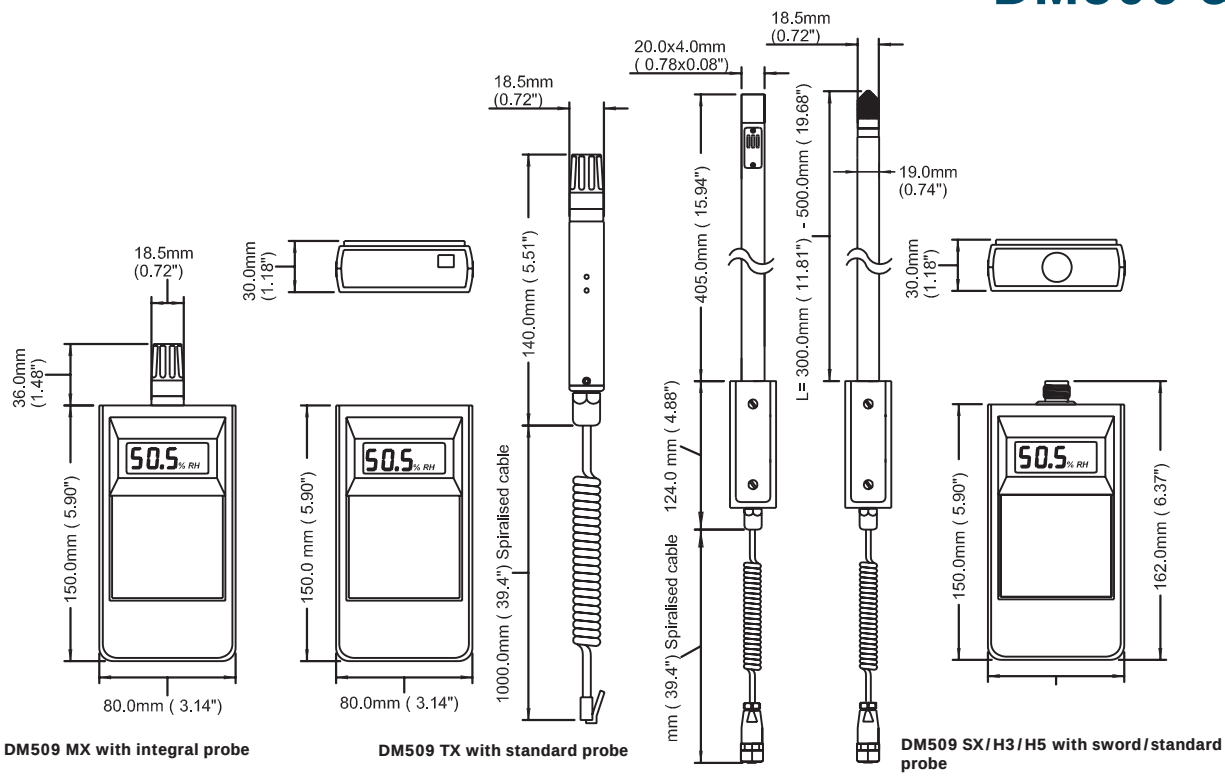
Performance	
Measurement range (RH)	0–100% RH
Measurement and operating range (T)	
Fixed and standard probe	-4 to +140°F / -20 to +60°C
Sword probe	-4 to +212°F / -20 to +100°C
Remote probe	-4 to +302°F / -20 to + 150°C
Accuracy at 25°C / 77°F Humidity	
Fixed probe	±2% RH (10–90% RH)
Remote probe	±2 % RH (5–95% RH)
Accuracy at 25°C/ 77°F Temperature	±0.36°F / ±0.2°C (Pt100 1/3 DIN direct)
Temperature influence	±0.03% RH/°F / ±0.05% RH/°C
Stability – RH Sensor	±1% RH/year
Response time – RH Sensor	<10 sec typical (for 90% of the step change)
Electrical output / input	
Supply voltage	9 VDC alkaline batteries (200 hours battery life approx)
Operating conditions	
Operating humidity	
Probe, Housing, Storage	5–95% RH (non-condensing)
Operating temperature	
Hand meter	-4 to +140°F / -20 to +60°C
Mechanical specification	
Ingress protection	IP32
Housing material: Meter	Molded polymer housing
Weight	DM509 w/remote probe: 9.2oz / 260g DM509 w/fixed probe: 5oz / 140g DM509 w/sword probe: 25oz / 700g DM509 w/20" HT probe: 29oz / 800g
Electrical connections	RH: 3-wire T: 2-wire
Display resolution	3½ digit LCD, 0.39" / 10mm characters % RH, °C, °F, g/m³, °Cdp/°Fdp

Accessories and spare parts

You can check your hygrometer with the control kit HKC which is based on the principle of non-saturated salt solutions. Refer to technical data sheet CONTROL KIT	**Control Kit HKC**
Leather carrying case	**A000160**
PVDF Filter	**A000014**
Protection cap with wire-mesh filter	**A000021**
Stainless steel sintered filter, arrow shape	**A000026**

Dimensions

DM509 & 535



DM509 MX with integral probe

DM509 TX with standard probe

DM509 SX/H3/H5 with sword/standard probe

Order codes

Relative humidity and temperature handheld device 0–100% RH, DM509 | MX | 01

Sensor type configuration	
Fixed integral probe	MX
Standard remote probe	TX
Sword type probe	SX
Remote high temperature probe, 12" / 300.0mm	H3
Remote high temperature probe, 20" / 500.0mm	H5

Temperature configuration	
Temperature display in °C	01
Temperature display in °F	02

Relative humidity and temperature hand-held device 0–100% RH, <2% accuracy with RH, dew point, absolute humidity and temperature readings. DM535 | 02

Temperature configuration	
Temperature display in °C	01
Temperature display in °F	02

Example: DM509 MX 01
Relative humidity and temperature hand-held instrument DM509, with fixed sensor and temperature display in °C

Example: DM535 02
RH, absolute humidity, dew point and temperature handheld meter DM535, with temperatures displayed in °F

Please note: Michell Instruments adopts a continuous development program which sometimes necessitates specification changes without notice. Please contact us for latest version. Ref: DM509 & 535_1001US_M

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Represented by:

S503
Humidity Calibrator

The S503 Humidity Calibrator enables users of humidity sensors, transmitters and portable devices to quickly and accurately generate a stable humidity to validate or calibrate sensors.

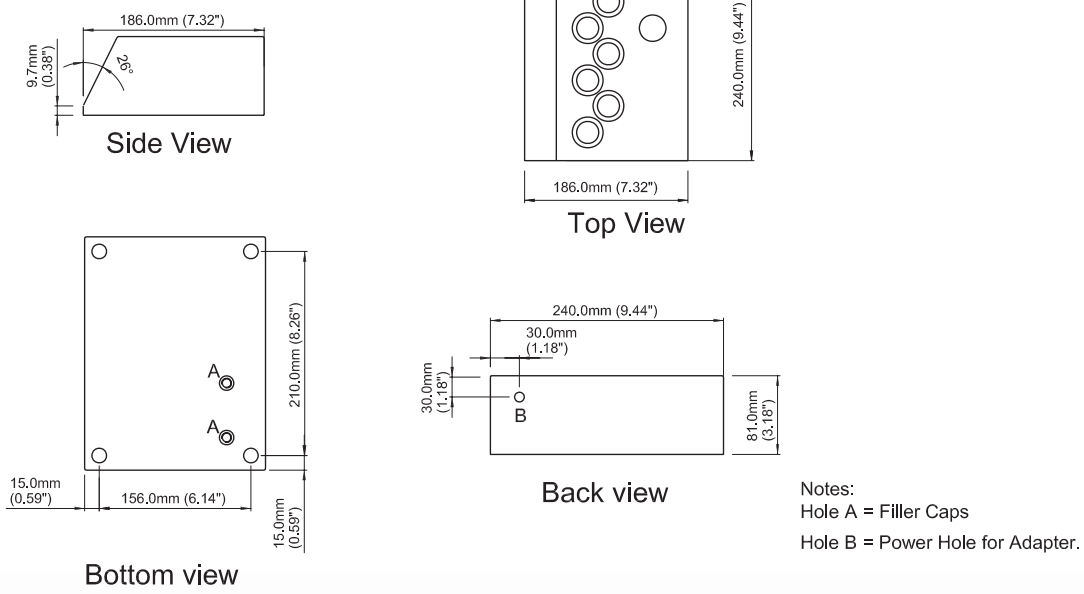
Highlights

- Generates stable humidity levels between 5–95% RH
- Highly portable
- Stabilizes at RH setpoint in minutes
- Independent traceable reference hygrometer – optional
- Multiple sensors can be calibrated at the same time
- Port sizes available to fit almost any RH sensor

Technical Specifications

Humidity	
Generation range	10–90% RH in steps of 0.1% RH
Accuracy	±2% RH or better (5–95% RH)
Stability	Better than ±0.5%
Stabilization time to set point	<10 minutes
Temperature	
Temperature accuracy	±0.3°C / ±0.54°F
Operating temperature (ambient)	15 to 35°C / 59° to 95°F
UUT Monitoring	
Voltage read out	0–1, 0–5, & 0–10 VDC
Current read out	4–20 mA
Voltage supply	15 VDC, ±10% at 30 mA max
General	
Probe ports	7 ports to fit sensor body diameters up to 1" / 25mm accommodated by port adapters
Desiccant chamber	1oz / 25g capacity
Saturation chamber	25ml capacity, distilled water
Display	3½ digit LCD, 13mm / 0.5" characters
Supply	12 VDC (100 - 240 VAC adapter included)
Weight	4.1lb / 1.85kg

Dimensions



Notes:
Hole A = Filler Caps
Hole B = Power Hole for Adapter.

Accessories and spare parts

Molded polymer housing port adapter for 8.0mm / 0.31" probes (fits std ø18.5mm / ø 0.73" ports)	**A000180**
Molded polymer housing port adapter for 12.0mm / 0.47" probes (fits std ø18.5mm / ø 0.73" ports)	**A000190**
Aluminum adapter (M30x1) and plug blank for customer modification (special port adapters are available on request)	**A000280**
Special modified port adapters ø client specific	**A000280X**
ø12.0mm / ø 0.47" port Aluminum (M30x1) with plug	**A000281**
ø13.5mm / ø 0.53" port Aluminum (M30x1) with plug	**A000282**
ø14.0mm / ø 0.55"port Aluminum (M30x1) with plug	**A000283**
ø15.0 mm / ø 0.59"port Aluminum (M30x1) with plug	**A000284**
ø18.5 mm / ø 0.73"port (standard for S-503) Aluminum (M30x1) with plug	**A000285**
ø19.0mm / ø 0.75"port Aluminum (M30x1) with plug	**A000286**
ø24.0mm / ø 0.94"port Aluminum (M30x1) with plug	**A000287**
ø25.0mm / ø 0.98"port Aluminum (M30x1) with plug	**A000288**
Tool for changing M30 Aluminum adapters	**A000265**
Carrying case	**A000230**
Optidew Vision Chilled Mirror reference hygrometer with	**OPT-V-01**
Stainless steel port adapter (M30x1)	**A000272**
Molded polymer housing port adapter ø18.5mm – ø3.0mm / ø 0.73 – ø0.19" prt probe for Optidew Vision	**A000273**
0.25kg / 0.55lb desiccant (orange)	**A000171**
Port plug 18.5mm / ø 0.73"	**A000200**
Water bottle	**A000242**
Control sensor	**HX-757**

Order codes

Digital Humidity Generator, including desiccant, 7 port adapters, power adapter, calibration certificate and adaptor tool	**S503-DIG**
S503-DIG with extended chamber (0.54 liter extra)	**S503-DIG-LC**
S503 Calibration Kit, including DM-509-TX reference hygrometer with calibration certificate, 5 pcs ø12.0mm / ø 0.47" adapter, 2 pcs ø8.0mm / ø 0.31" adapter and carrying case, dessicant, distilled water and adaptor tool	**S503-DIG-SET**
S503 Calibration Kit, including carrying case, Optidew adapters (A-000272 & A000273) and 5 port adapters to be specified.	**S503-DIG-OPT**

Note: S-503 is supplied with seven ø18.5mm / ø0.73" ports unless specified otherwise by customer

S503-DIG-SET calibration kit

S503 with extended chamber

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Represented by:

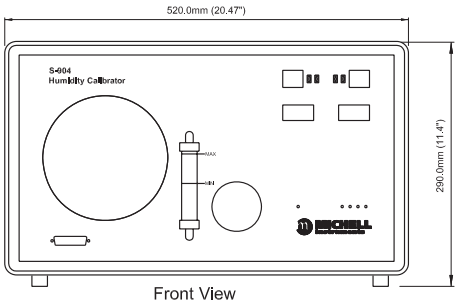
S904
Climate Chamber

The S904 Climate Chamber generates a stable and accurate RH at various temperatures, permitting calibration and verification of relative humidity sensors and transmitters. With a chamber temperature range of 10 to 50°C / 50 to 122°F, a uniformity of ±0.1°C / 0.02°F and the ability to generate 10–90% RH, accurate and repeatable calibrations are made easy.

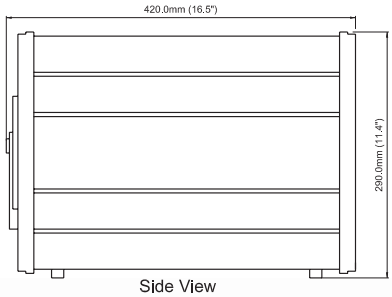
Highlights

- Excellent stability within chamber: ±0.2% RH, Temp. ±0.1°C / 0.18°F
- Optional in-built data-logging for reference probe and probes under calibration
- Probes up to ø 1" / ø 25 mm can be accomodated

Dimensions



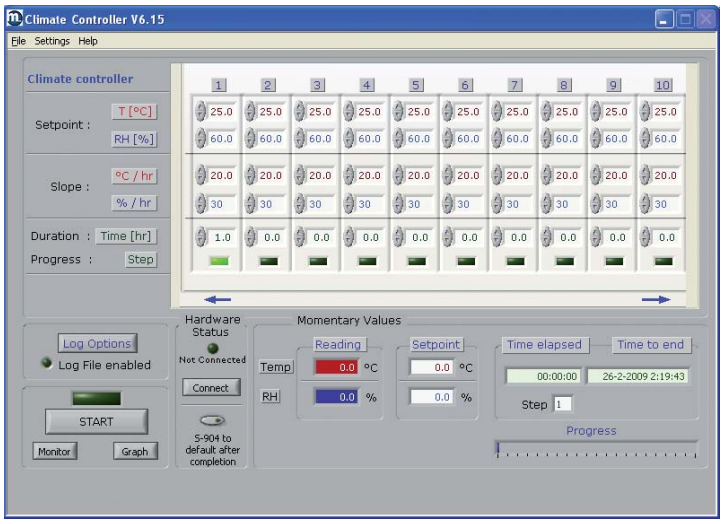
Front View



Side View

Technical Specifications

Humidity	
Generator range	10–90% RH
Accuracy	±2% RH
Stability	±0.2% RH (20–80% RH)
Temperature	
Generator range	10 to 50°C / 50 to 122°F (lowest T set point = 10°C / 18°F below ambient)
Accuracy	±0.1°C / ±0.2°F
Stability	±0.1°C / ±0.2°F
Chamber	
Ramp rate from 20 to 40°C / 68 to 104°F	1.5°C/minute / 2.7°F/minute
40 to 20°C / 104 to 68°F	0.7°C minute / 1.2°F/minute
Control element	Removable relative humidity sensor
General	
Probe ports	up to 5 – sensor body diameters up to 25mm / 98" accommodated by port adapters
Chamber volume	122 in^3 / 2000 cm^3
Chamber dimensions	4.13 x 4.13 x 6.3" / 105 x 105 x 160mm (w x h x d)
S-904 dimensions	20.5 x 11.4 x 16.5" / 520 x 290 x 420mm (w x h x d)
Set point resolution	0.1 for humidity and temperature
Displays	3 digit LED, 0.39" / 10mm characters
Supply	85–264 VAC, 47–63 Hz, 150 VA
Weight	44lb / 20kg



LabVIEW logging software

Accessories and spare parts

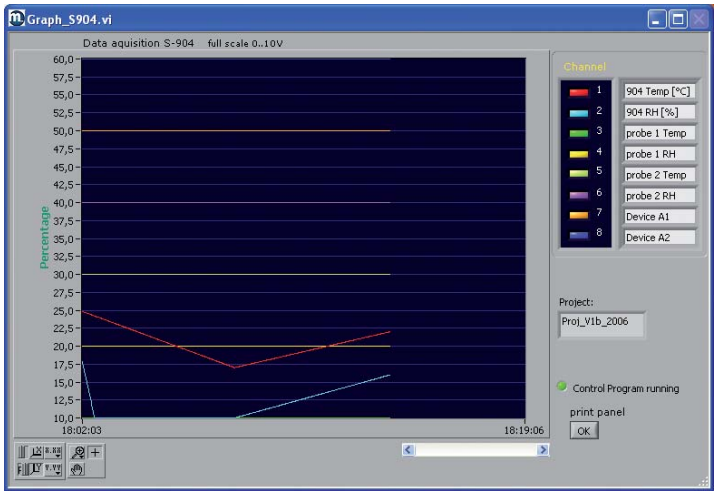
Door kit with 1 x ø19.0mm / ø0.79" port	**A000260**
Door kit with 5 ports. 5 adapters to be specified	**A000263**
Door kit with 5 ports and 25 port adaptors: 5x ø19.0mm / ø 0.75"; 4x ø12.0mm / ø 0.47"; 4 x 13.5mm /0.53", 4 x 15.0mm/0.59", 4 x 18.5mm/0.73", 4 x 24.0mm/ 0.94" adapters and plugs. Adapter tool included.	**A000264**
Door with clear window - no ports	**A000266**
Door without ports	**A000268**
Door kit for use with MI Optidew. Optidew dew-point sensor port adapter, PRT port adapter, 4 standard port adapters (ø19.0mm / ø 0.75"). Adapter tool included.	**A000269**
Molded polymer housing port adapter & plug blank (for customer modification)	**A000290**
Special modified port adapters ø client specific	**A000290X**
ø12.0mm / ø 0.47" port Molded polymer port (M30x1) & plug	**A000291**
ø13.5mm / ø 0.53" port Molded polymer port (M30x1) & plug	**A000292**
ø14.0mm / ø 0.55" port Molded polymer port (M30x1) & plug	**A000293**
ø15.0mm / ø 0.59" port Molded polymer port (M30x1) & plug	**A000294**
ø18.5mm / ø 0.73" port Molded polymer port (M30x1) & plug	**A000295**
ø19.0mm / ø 0.75" port Molded polymer port (M30x1) & plug	**A000296**
ø24.0mm / ø 0.94" port Molded polymer port (M30x1) & plug	**A000297**
ø25.0mm / ø 0.98" port Molded polymer port (M30x1) & plug	**A000298**
Tool for M30X1 Aluminum Ports	**A000265**
Control sensor	**HT961**

Order codes

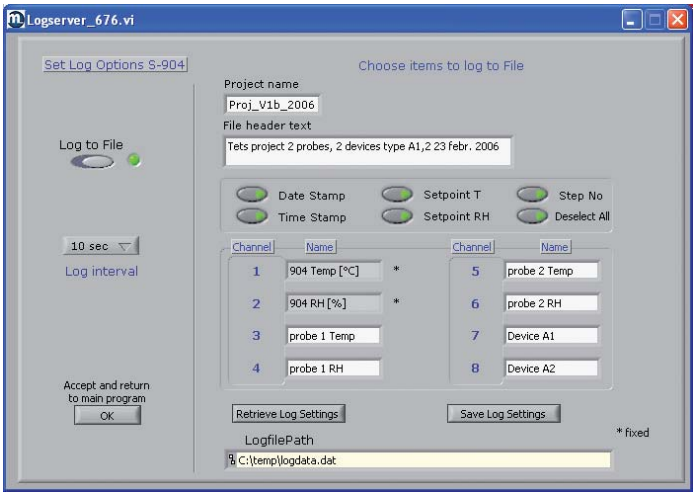
Calibrator with humidity and temperature controlled chamber.	**S904**
S904 calibrator with RS232 / USB interface, data-logging software for PC (6 channel data-logger)	**S904-D**

1. S904 set point temperature (0 to 10 V = 0 to 100°C / 32 to 212°F)
2. S904 set point RH (0 to 10 V = 0 to 100% RH)
3. Free to use (0 - 10 V)
4. Free to use (0 - 10 V)
5. Free to use (0 - 10 V)
6. Free to use (0 - 10 V)
7. Free to use (0 - 10 V)
8. Free to use (0 - 10 V)

The acquisition system only measures 0 to 10 V on every channel so the 4 to 20 mA signals from the Optidew are converted to a 0 to 10 V signal. Channels 1 and 2 are not available for logging signals. A 500Ω resistor must be used.



LabVIEW logging software



LabVIEW logging software

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Represented by:

OptiCal

Climate Chamber with Chilled Mirror Reference Hygrometer

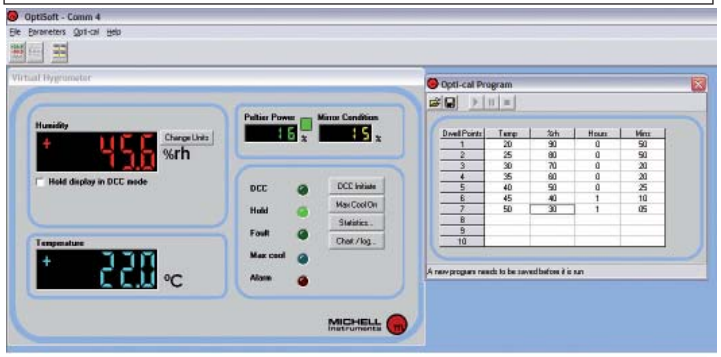
The OptiCal is a bench-top, fully self-contained humidity/ temperature calibrator. The system comprises a humidity and temperature controlled chamber that can house up to five or more humidity sensors, depending on their physical dimensions. The humidity and temperature within the chamber are closed-loop controlled and continuously monitored by a precision chilled mirror reference hygrometer. The OptiCal works by time-proportioning the flows of dry and saturated air according to the pre-selected relative humidity value. The chamber temperature is controlled by a four-zone Peltier heat pump arrangement for maximum stability and minimum temperature gradient. The saturator assembly can be filled easily with the distilled water reservoir at the front of the unit and the easily accessible desiccator can be re-charged by heating when required. No other maintenance is necessary. The only external service required is a single phase power supply.

Highlights

- Precision relative humidity and temperature calibrator
- Generate 10 to 90% RH over 10 to 50°C / 50 to 122°F temperature
- Integral chilled mirror reference hygrometer
- Humidity and temperature profile generation for unattended verification of sensors
- Transportable calibrator enables on-site calibrations
- Built-in RH control sensor and reference probe use different technologies for reduced uncertainty

Technical Specifications

Reference Hygrometer	
Type	Optidew chilled mirror dew-point transmitter
Humidity	
Generator range	10–90% RH
Accuracy	≤±1% RH (10–70% RH) ≤±1.5% RH (70–90% RH)
Stability	±0.2% RH (20–80% RH)
Temperature	
Generator range	10 to 50°C / 50 to 122°F (lowest T set point = 10ºC below ambient)
Accuracy	±0.1°C / ±0.2°F
Stability	±0.1°C / ±0.2°F
Chamber	
Ramp rate from 20 to +40°C / 68 to 104°F	1.5°C/minute / 2.7°F/minute
40 to 20°C / 104 to 68°F	0.7°C/minute / 1.2°F/minute
Control element	Removable relative humidity sensor
General	
Probe ports	up to 5 – sensor body diameters up to 25mm / 98" can be accommodated
Chamber volume	122in^3 / 2000 cm^3
Chamber dimensions	4.13 x 4.13 x 6.3" / 105 x 105 x 160mm (w x h x d)
OptiCal dimensions	20.5 x 11.4 x 16.5" / 520 x 290 x 420mm (w x h x d)
Set point resolution	0.1 for humidity and temperature
Displays	High definition 2-line alpha numeric
Measurement units	ºC, ºCdp, % RH g/kg, g/m^3, (t-t$_d$), a$_w$
Outputs	
Analog	Two channels 4-20 mA or 0-20 mA
Digital	RS232 (RS485 optional)
Alarm	Volt free contact, 2A @ 30 VDC
Supply	85–264 VAC, 47–63 Hz, 150 VA
Weight	44lbs / 20kg



Logging and profiling software

OptiCal

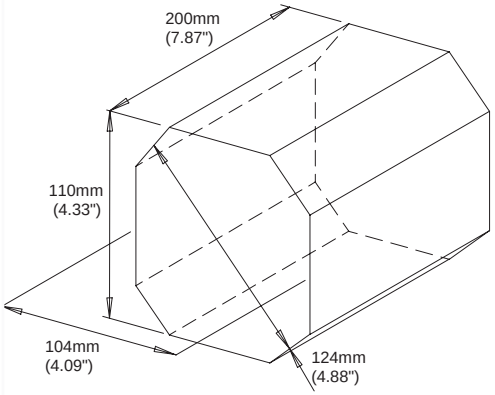
Accessories and spare parts

Door kit with 1x ø19.0mm port	**A000260**
Door kit with 5 ports. 5 adapters to be specified	**A000263**
Door kit with 5 ports and 25 port adaptors: 5x ø19.0mm / ø 0.75"; 4x ø12.0mm / ø 0.47"; 4 x 13.5mm /0.53", 4 x 15.0mm/0.59", 4 x 18.5mm/0.73", 4 x 24.0mm/ 0.94" adapters and plugs. Adapter tool included.	**A000264**
Door with clear window – no ports	**A000266**
Molded polymer housing port adapter & plug blank (for customer modification)	**A000290**
Special modified port adapters ø client specific	**A000290X**
ø12.0mm / ø 0.47" port Molded polymer port (M30x1) & plug	**A000291**
ø13.5mm / ø 0.53" port Molded polymer port (M30x1) & plug	**A000292**
ø14.0mm / ø 0.55" port Molded polymer port (M30x1) & plug	**A000293**
ø15.0mm / ø 0.59" port Molded polymer port (M30x1) & plug	**A000294**
ø18.5mm / ø 0.73" port Molded polymer port (M30x1) & plug	**A000295**
ø19.0mm / ø 0.75" port Molded polymer port (M30x1) & plug	**A000296**
ø24.0mm / ø 0.94" port Molded polymer port (M30x1) & plug	**A000297**
ø25.0mm / ø 0.98" port Molded polymer port (M30x1) & plug	**A000298**
Tool for M30x1 aluminum adapters	**A000265**
Control sensor	**HT961**
Transport case	**OCAL-TC**

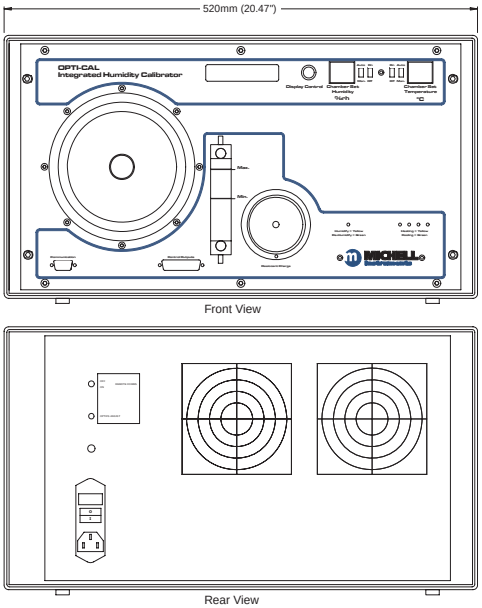
Order codes

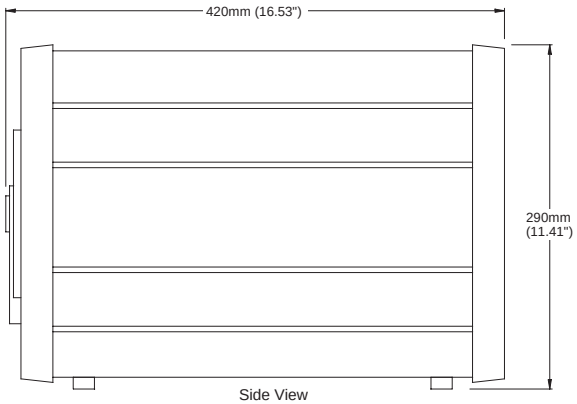
Basic model:	
Precision Humidity Calibration system with temperature control. Includes 5 port door and integrated chilled mirror reference hygrometer with 3 point NIST/UKAS RH calibration	**OptiCal**

Chamber Dimensions



Unit Dimensions





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Represented by:

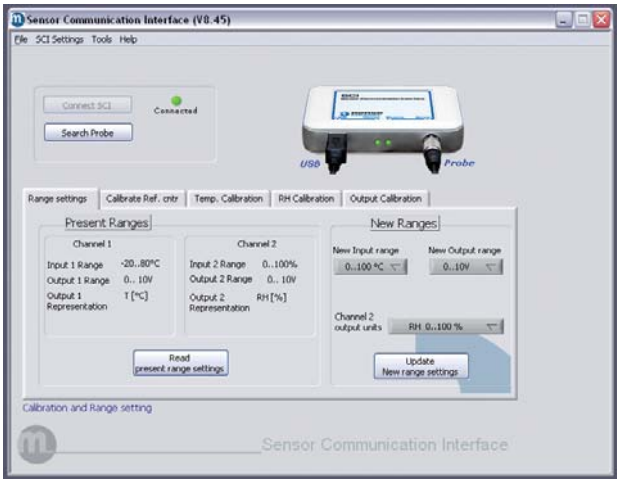
SCI

Sensor Communication Interface

The Sensor Communication Interface is designed to easily access the settings of Michell Relative Humidity transmitters. Using a USB connection means that there is no need for an external power supply. The SCI features an on-board AD-converter which enables checking the analog output of almost any RH-transmitter. When connecting a Humidity probe with a µ-Processor, the changing of many settings, as well as the re-calibration of a relative humidity device, will become an easy job. Together with the interface software the SCI is a very powerful tool.

Highlights

- USB digital interface, no additional power is required
- Offers easy re-calibration
- Diagnostics and logging
- Read-out of digital and analog signals
- User selectable input/output ranges
- 4- and 5-wire probe compatible



Technical Specifications

Hardware	
Interface port	USB
Power supply	USB powered
Compatibility	4 and 5 wire probes
Input ranges	Analog and digital probes Volt outputs: 0 to 10 V (3-wire) mA outputs: 0 to 20 mA and 4 to 20 mA
Converter	24 bits ADC for monitoring transmitter output signals
Software	
Type	Labview® based software
Functions	• Diagnosis & troubleshooting • Calibration parameters analysis • User selectable input and output ranges • Read-out of internal measured values • Read-out of analog output signals probe • Selecting different output dimensions • Re-calibrating RH and temperature inputs • Logging of measured values to disk

Order Codes

Description	Code
SCI, sensor communication interface kit. Includes:	**SCI-DIG-SET**
Carrying Case	
SCI Unit plus software on CD-ROM	
USB and Instrument Cable (see options below)	

Accessories and spare parts

Cable SCI - M-12	**A000310**
Cable SCI - M-8	**A000311**
Cable SCI USB	**A000312**
Cable SCI - Header 4P	**A000313**
Cable SCI - 4 wire Cable	**A000314**

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Control Kit

For the Calibration of Relative Humidity Sensors

Technical Specifications

The control kit consists of:

- 5 vials of the same humidity value
- 7 paper test strips
- 1 control chamber with version HKCxxCxx, without control chamber with version HKCxxS00
- Box dimensions: 100 x 140 x 40mm / 3.93 x 5.51 x 1.57”
- Weight: 1.0kg / 2.2lb

Accuracy

An accuracy of ±3% RH can be achieved with strict adherence to test procedure.

Operating Conditions

- Reference temperature: 23°C ±1°C / 73°F ±2°F
- Environmental humidity stabilized ±10%
- Set up conditions:
  Temperature between 0 and 50°C / 32 and 122°F with correction to be applied according to the instruction manual.
  Ambient RH between 40 and 60% RH
- The instrumentation should be set up and the control kit must be kept in the same environment at least 10 hours before the procedure is started
- Shelf life of the solutions:
  In vial: unlimited
  In the control chamber: 2 hours

Order Codes

Control Kit for relative humidity | HKC | 2 | 5 | C12 |

Test Value	
25% RH	2 5
35% RH	3 5
50% RH	5 0
80% RH	8 0

Test Chamber	
Without chamber	S00
With chamber ø12mm	C12
With chamber ø19mm	C19
With chamber ø22mm	C22

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Represented by:

Accessories

	Item	Associated products
	**A000001** Slotted cap, white	WM33 & 52
	**A000002** Slotted protection cap, black	PC33, 52, 62 & 62V DT722
	**A000003** Slotted protection cap, black	PCMini52
	**A000014** PVDF filter	PC33, 52, 62 & 62V WM33 & 52 DT722 DM509 DM535
	**A000015** PVDF filter with protection cap, black	PC33, 52 & 62 DT722
	**A000016** PVDF filter with protection cap, white	WM33 & 52
	**A000017** PVDF filter	PCMini52
	**A000018** PVDF filter with slotted protection cap	PCMini52
	**A000019** HDPE filter	SF52
	**A000021** Wire mesh filter with protection cap, black	PC33, 52 & 62 WM33 & 52 DT722 DM509 DM535

	Item	Associated products
	**A000022** Wire mesh filter with protection cap, black	PCMini52
	**A000023** Stainless steel sintered dust filter Flat	PCMini52
	**A000025** Stainless steel sintered filter 5µm Arrow shape	PC33, 52, 62 & 62V WM33 & 52 DT722
	**A000026** Stainless steel sintered filter 10µm Arrow shape	PC33, 52, 62 & 62V WM33 & 52 DT722 DM509 DM535
	**A000027** Stainless steel sintered filter 20µm Arrow shape	PC33, 52, 62 & 62V WM33 & 52 DT722
	**A000028** Stainless steel sintered filter 20µm Arrow shape	PCMini52
	**A000040** Foil filter 2µm with protection cap, black	PC33, 52, 62 & 62V DT722
	**A000041** Foil filter 2µm with protection cap, white	WM33 & 52
	**A000044** Foil filter 1.5µm with protection cap, black	PC33, 52, 62 & 62V DT722
	**A000045** Foil filter 1.5µm with protection cap, white	WM33 & 52

Accessories

	Item	Associated products
	**H2** Stainless steel sintered filter	WM281 WM291 DT282
	**H3** Stainless steel sintered filter	WR283 WR293 DT284
	**H4** Stainless steel sintered filter	PF211 DT269
	**J2** Stainless steel filter with Teflon coating	WM281 WM291 DT282
	**J3** Stainless steel filter with Teflon coating	WR283 WR293 DT284
	**K1** Stainless steel slotted cap with mesh filter	PCMini70 PFMini72 WR285 WR295
	**K6** Aisi 316 cap with stainless steel mesh filter	DT282
	**K7** Delrin slotted cap, with stainless steel mesh filter	WM281 WM291
	**K8** Stainless steel mesh filter	WR283 WR293 DT284
	**K9** PEEK protection cap with stainless steel mesh filter	WR283 WR293 DT284

	Item	Associated products
	**Z1** Stainless steel slotted cap with PTFE filter	PCMini70 PFMini72 WR285 WR295
	**Z2** Noryl cap with polyester filter/PTFE	DT269 PF211
	**Z6** Stainless steel cap with polyester filter/PTFE	DT282
	**Z7** Delrin slotted cap, with polyester filter/PTFE	WM281 WM291
	**EA2-HDPE-10** Replacement HDPE guard. Pack of 10	Easidew Easidew IS Easidew PRO IS Easidew Online
	**9980237** Stainless steel sintered guard (in place of standard HDPE guard)	Easidew Easidew IS Easidew PRO IS Easidew Online
	**I7000.0** Hygrosmart without Pt100 output	PCMini70 PFMini72 WM281 WM291 DT269/DT282 PF211.B
	**I7000.1** Hygrosmart with Pt100 output	PCMini70 PFMini72 WM281 WM291 DT269/DT282 PF211.B
	**I7400.0** Hygrosmart without Pt100 output	
	**I7400.1** Hygrosmart with Pt100 output	PF211.A

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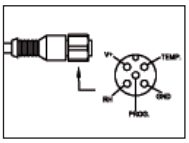
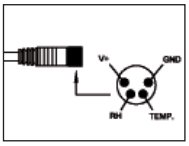
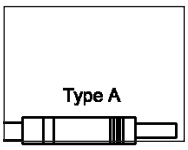
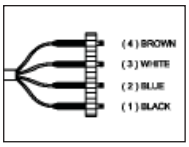
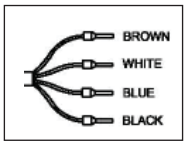
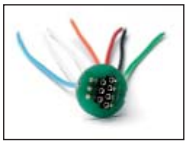
Accessories

	Item	Associated products
	**A000030** Connector, no cable	PC33, 52, 62 & 62V DT722
	**A000031** Connector with 2m / 6.5′ cable	PC33, 52, 62 & 62V DT722
	**A000032** Connector with 5m / 16′ cable	PC33, 52, 62 & 62V DT722
	**A000033** Connector with 2m / 6.5′ cable	PCMini52
	**A000036** Connector with 5m / 16′ cable	PCMini52
	**A000037** Connector with 10m / 32′ cable	PCMini52
	**A000321** Connector without a wire	PCMini52
	**A000310** Cable SCI - M-12	SCI
	**A000311** Cable SCI - M-8	SCI
	**A000312** Cable SCI USB	SCI

	Item	Associated products
	**A000313** Cable SCI - Header 4P	SCI
	**A000314** Cable SCI - 4 wire cable	SCI

Accessories



Item	Associated products
1A01210 Mini flange	I7000 I7400
6A05130 Connecting kit for PCB	I7000 I7400
6A06350 Connecting kit with wires	I7000 I7400
A000100 ¾" NPT adj fitting, stainless steel. Only to be used with SS probe housing	PC33, 52, 62 & 62V DT722
A000101 ½" NPT adj fitting, stainless steel. Only to be used with SS probe housing	PCMini52
A000110 Aluminum mounting flange ø19.0mm / ø 0.75", outside ø 80.0mm / ø 3.15". To be used with SS probes.	PC33, 52, 62 & 62V DT722
A000111 Aluminum mounting flange ø12.0mm / ø 0.47", outside ø40.0mm / ø 1.57". To be used with SS probes.	PCMini52
FLA012 Aluminum mounting flange for ø12.0mm / ø 0.47" SS probes	DT262 DT284 WR283 WR293
FLA019 Aluminum mounting flange for ø19.0mm / ø 0.75" SS probes	DT269 DT282
A000150 Mini flange, Molded polymer flange for ø19.0mm / ø 0.75" molded polymer probes	PC33, 52, 62 & 62V

Item	Associated products
34280085 Fixing collar	PF211
3401135 Molded polymer housing fitting	PF211
A000340 Bonded seal, (DIN ISO 228) G½" (BSP) (standard)	SF52
2510367 Mounting clip	PFMini72
2510387 Mounting clip	PF211
A000120 Weather protection cap. Wall mount ø90.0mm / ø 3.54" for use with ø19.0mm / ø 0.75" probes. In combination with A000111 the weather cap can be used with ø12.0mm / ø 0.47" probes.	PC33, 52, 62 & 62V PCMini52
A000125 Weather protection cap. Wall mount ø120.0mm / ø4.72" for use with ø19.0mm / ø 0.75" probes. In combination with A000111 the weather cap can be used with ø12.0mm / ø 0.47" probes.	PC33, 52, 62 & 62V PCMini52

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Accessories

Item	Associated products
EA2-MON Panel meter	Easidew Easidew IS Easidew PRO IS
EA2-CK Easidew communication kit	Easidew Easidew IS Easidew PRO IS Easidew Online
F035263 Digicor configuration kit	WM281, WM291 DT282, DT284 WR283, WR285 WR293, WR295
330185 RS422/485 to PC (RS232) converter	

Accessories

Item	Associated products
EA2-SAM Easidew sampler	Easidew Easidew IS Easidew PRO IS Easidew Online
CSB Sample block	Easidew Easidew IS Easidew PRO IS Easidew Online
A000350 Sample block without filter	SF52
A000351 Sample block with filter	SF52

Accessories

	Item	Associated products
	**A000180** Molded polymer housing port adapter for ø8.0mm / ø 0.31″ probes. Outside ø18.5mm / ø 0.73″	S503
	**A000190** Molded polymer housing port adapter for ø12.0mm / ø 0.47″ probes. Outside ø18.5mm / ø 0.73″	S503
	**A000280** Aluminum adapter and plug blank for customer modification. (Specials on request)	S503
	**A000281** Molded polymer housing port adapter for ø12.0mm / ø 0.47″ probes. M30x1 aluminum adapter and plug	S503
	**A000282** Molded polymer housing port adapter for ø13.5mm / ø 0.53″ probes. M30x1 aluminum adapter and plug	S503
	**A000283** Molded polymer housing port adapter for ø14.0mm / ø 0.55″ probes. M30x1 aluminum adapter and plug	S503
	**A000284** Molded polymer housing port adapter for ø15.0mm / ø 0.59″ probes. M30x1 aluminum adapter and plug	S503
	**A000285** Molded polymer housing port adapter for ø18.5mm / ø 0.73″ probes. M30x1 aluminum adapter and plug	S503

	Item	Associated products
	**A000286** Molded polymer housing port adapter for ø19.0mm / ø0.75″ probes. M30x1 aluminum adapter and plug	S503
	**A000287** Molded polymer housing port adapter for ø24.0mm / ø 0.95″ probes. M30x1 aluminum adapter and plug	S503
	**A000288** Molded polymer housing port adapter for ø25.0mm / ø0.98″ probes. M30x1 aluminum adapter and plug	S503
	**A000290** Molded polymer housing port adapter (M30x1) and plug blank – for customer modification	S904 OptiCal
	**A000291** Molded polymer housing port adapter for ø12.0mm / ø 0.47″ probes. (M30x1) and plug	S904 OptiCal
	**A000292** Molded polymer housing port adapter for ø13.5mm / ø 0.53″ probes. (M30x1) and plug	S904 OptiCal
	**A000293** Molded polymer housing port adapter for ø14.0mm / ø 0.55″ probes. (M30x1) and plug	S904 OptiCal
	**A000294** Molded polymer housing port adapter for ø15.0mm / ø 0.59″ probes. (M30x1) and plug	S904 OptiCal

Accessories

	Item	Associated products
	**A000295** Molded polymer housing port adapter for ø18.5mm / ø 0.73" probes. (M30x1) and plug	S904 OptiCal
	**A000296** Molded polymer housing port adapter for ø19.0mm / ø 0.75" probes. (M30x1) and plug	S904 OptiCal
	**A000297** Molded polymer housing port adapter for ø24.0mm / ø 0.94" probes. (M30x1) and plug	S904 OptiCal
	**A000298** Molded polymer housing port adapter for ø25.0mm / ø 0.98" probes. (M30x1) and plug	S904 OptiCal
	**A000260** Door kit with 1x ø19.0mm / ø 0.75" port	S904
	**A000263** Door kit with 5 ports. 5 adapters to be specified	S904
	**A000264** Door kit with 5 ports. 5x ø19.0mm / ø 0.75" adapters, 4x ø12.0mm / ø 0.47"; 13.5mm /0.53", 15.0mm/0.59", 18.5mm/0.73", 24.0mm/ 0.94" adapters and plugs. Adapter tool included.	S904
	**A000266** Door with clear window – no ports	S904

	Item	Associated products
	**A000268** Door without ports	S904
	**A000269** Door kit for use with MI Optidew. 4 x ø19.0mm / ø 0.75" adapters. Optidew dew point sensor and prt ports and plugs. Adapter tool included.	S904
	**A000200** Plug ø18.5mm / ø 0.73"	S904
	**A000272** Stainless steel port adapter for Optidew	S503 S904 OptiCal
	**A000273** Molded polymer housing port adapter ø18.5mm– ø3mm / ø 0.73" - ø 0.19". Adapts Optidew Vision PRT probe for use with S503, S904 and OptiCal	S503 S904 OptiCal
	**A000265** Port adapter tool	S503 S904 OptiCal
	**A000171** 0.25 kg / 0.55lbs desiccant (orange)	S503 S904 OptiCal
	**A000242** Water bottle	S503 S904 OptiCal

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Accessories

Item	Associated products
A000243 PRT sensor	S904
A000240 Drying module	S904 OptiCal
HT-961 Control sensor	S904 OptiCal
HX-757 Control sensor	S503
OPT-V-01 Optidew vision reference hygrometer with sensor	S503
S904-LS Labview logging software	S503
A000160 Leather carrying case	DM509 DM535
A000230 Carrying case for S503	S503

Item	Associated products
OCAL-TC Transport Case for OptiCal	OptiCal

Applications for Humidity Sensors

Michell humidity sensors are used in hundreds of applications, including:

Agriculture
- Agricultural and Crop Research
- Agrochemical
- Environmental Testing
- Poultry/Meat/Egg/Dairy
- Greenhouses

Aerospace
- MIL Spec Welding
- Cabin Environment
- Environmental Testing
- Coatings
- Parts Storage
- Space Purge Systems
- Weather Monitoring

Automotive
- HVAC Manufacturing
- Dynamometer/Engine Test Cells
- Paint Booths
- In-Vehicle Air Quality
- Environmental Testing
- Metrology – Cal Lab
- Maintenance Alarms
- Compressed Air Dew Point

Bricks/Ceramics
- Ceramic Greenware Drying
- Product Quality
- Glaze Application
- Environmental Testing
- Concrete Curing

Chemical/Petroleum
- Polymerization
- Raw Material Testing and Storage
- Manufacturing Drying Processes
- Optimizing Production Costs
- Intermediates Storage
- Environmental Conditions
- Natural Gas Quality
- Environmental Testing

Coatings
- Powder Coating
- Adhesive Curing
- Adhesive Tape
- Application Test
- Maintenance Alarms
- Environmental Testing

Atmospheric
- Environmental Research
- Snowmaking Machines
- Soil Moisture
- Plant Growth Chambers
- Climatology
- Hydrometeorology

Environmental Chamber
- Electronics Test
- Climatic Stability Evaluation
- Product Testing on Animals
- Plant Growth Chambers
- Equipment Cabinet

Food/Beverage
- CO_2 Drying
- Drying Process
- Energy cost savings
- Environmental Testing

Fuel Cell
- Manufacturing
- Testing
- Fuel Monitoring
- Maintenance Alarms

Healthcare
- Stop Contamination
- Dental Casting Formulation
- Pill Coating
- Extend Shelf Life
- Environmental Testing
- Respiratory Therapy

High Tech
- Optical Coating
- Waveguide Pressurization
- Maintenance Alarms

HVAC
- Indoor Swimming Pool
- Control
- Climate Control
- Energy Use
- BMS, DCV and IAQ
- Hazardous Locations
- Outdoor Measurement

Industrial Applications
- Heat Treating
- Welding Hoods
- Adhesives
- Maintenance Alarms
- Environmental Testing

Leather/Textile
- Dyeing/Printing
- Process Control
- Product Quality
- Storage & Transportation
- Maintenance Alarms

Applications

Marine
- Inert Gas Systems
- Lubrication Oil Monitoring
- Weather Observation
- Maintenance Alarms

Metallurgy
- Furnace Gas
- Lubrication and Quench Oil
- Dry Air Storage
- Sintering Furnace
- Maintenance Alarms
- Environmental Testing

Meteorology
- Professional Forecasting
- Agricultural and Forest
- Emergency Management
- Fire Hazard Warning
- Airport Weather monitoring
- Road and Rail Weather

Metrology
- Direct Calibration
- Indirect Calibration
- HVAC
- Standards Storage

Military
- Vehicle Air Quality
- Dry Air Storage
- Drive-in Chambers
- Weapons Test Chambers
- Torpedo Environmental testing
- Rocket Environmental testing
- Maintenance Alarms
- Environmental Testing

Museums
- Artifact Storage and Display
- Transportation
- HVAC
- Maintenance Alarms

Nuclear
- Containment vessel
- Dry Air Storage
- Assembly/Disassembly
- Encapsulation Research
- Maintenance Alarms

Packaging
- Product Storage
- Printing Labelling
- Development
- Environmental Testing

Paint
- Long Term Testing Outdoors
- Water Based Paint Booths
- Solvent Based Paint Booth
- Accelerated Life Testing
- Maintenance

Paper
- Process Air Exiting Hood
- Compressed Air
- Conversion/Storage Rooms
- Lubrication Oil
- Roof Protection
- Storage
- Distribution
- Pad Air/Gas
- Quality Control

Pharmaceutical
- Bioreactors
- Clean Rooms
- Compressed Air
- Incubators
- Stability Testing
- Packaging
- Storage & Transportation
- Production Areas
- Animal Test Facilities
- Tablet Coating
- Environmental Testing

Moulded polymer housings
- Blow Molding PET
- Compressed Air
- Hopper Humidity
- HVAC – Manufacturing
- Extrusion
- Blown Film
- Printing & Labelling
- Pellet Storage
- Production Area
- Product Storage
- Injection Mold Preparation
- Shipping & Supply Chain

Power/Energy
- Dew Point in SF6
- Compressed Air
- Gas Turbine Inlet Air
- Lubrication Oil
- H_2 Cooling Loop
- Bag Houses
- Transformer Maintenance
- Maintenance Alarms

Applications

Process
- Monitor Environments
- Adhesives
- Prevent Corrosion
- Prevent Contamination
- Preserve Texture
- Conserve Energy
- Environmental Testing

Rubber
- Natural Rubber Storage
- Tire Cord Storage
- Maintenance Alarms

Semi Conductor
- Clean Rooms
- Compressed Air
- Environmental Compensations
- Glove Boxes
- Lithium Battery Manufacturing
- Environmental Chambers
- Photo Resist Operations
- IC Packaging
- PCB Manufacturing
- Extended Life Testing

Storage
- Warehousing
- Museums
- Movement of Goods
- Container Testing
- Wine Barrel
- Fruit

Tobacco
- Tobacco Conditioning
- Cigarette Making
- Packaging
- Storage & Transportation
- Maintenance Alarms

Transportation
- Containers
- Storage
- Shipping
- Live Animal Shipments
- Cabin Monitoring
- Bulk Products
- Highway Icing
- Airport Weather

Wood
- Kiln Drying
- Laminates/By-product Drying
- Dry Air Storage
- Adhesive Research

A Guide to the Measurement of Humidity

The following text is reproduced with kind permission from the National Physical Laboratory. It was originally published in a booklet, *A Guide to the Measurement of Humidity.*

1. What is humidity?

The word 'humidity' denotes the presence of water vapor in air or other gases. Water vapor is the gaseous form of water, and can be thought of much like any other kind of gas. It is normally transparent, and makes up about one percent of the air around us.

Humidity arises in practice because, in the same way that hot water gives off steam, water at lower temperatures – including ice – also gives off water vapor. Wherever there is water or ice, there is evaporation (or its opposite, condensation) or sublimation. The extent to which this happens depends upon a number of factors, the most important of which is temperature. Similarly, other liquid or solid materials – most of which have some water content – will give off (or sometimes soak up) water vapor. Of course, water vapor can also be found in places where there is no liquid or solid nearby, for example in remote parts of the Earth's atmosphere.

Air (or empty space, or any other gas) has a given capacity to absorb water vapor. This capacity depends mainly on temperature. Generally speaking, the warmer the air, the more water vapor it can hold. The graph in Figure 1 illustrates this. At any particular temperature, air that contains its full capacity of water vapor is said to be saturated. The **relative humidity** of the air expresses how fully saturated it is with water vapor. A variety of other engineering units can also be used to express how much water vapor is actually present. Definition and explanations of the most important of these terms are given in the next Section.

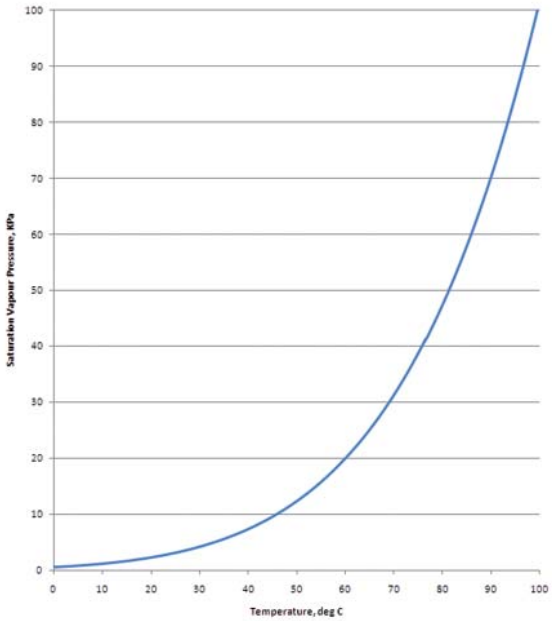

Figure 1. Saturation vapor pressure of water increases with temperature

1.1 Glossary of terms and definitions

Some common terms relevant to humidity and moisture measurement, with specialized meanings in this context, are as follows:

Absorption (of water vapor) – retention (of water vapor) by penetration into the bulk of a material

Adsorption (of water vapor) – retention (of water vapor) as a surface layer on a material

Condensate – condensed material, e.g. liquid water or ice

Desorption – release of adsorbed or absorbed substance

Desiccant – any substance which exerts a drying action by chemically absorbing water vapor

Dry-bulb temperature – air temperature as measured with a thermometer. See also the definition for 'wet-bulb' temperature.

Humidity – the presence of water vapor in air or in other gas. Some people use 'humidity' to mean relative humidity only. Strictly speaking, 'humidity' also refers to moisture content expressed in other engineering units. For very low humidity, other terms such as dew point tend to be more commonly used

Hygrometer – any instrument for measuring humidity

Hygrometry – the subject of humidity measurement

Hygroscopic – tending to absorb water vapor

Inert gas – chemically non-reactive gas, such as, helium, argon, neon, etc. Term is sometimes used with non-oxidizing diatomic gases such as nitrogen (N_2).

Moisture – commonly used to refer to liquid water or water vapor in any form, 'moisture' is also the term particularly used to mean water that is absorbed or bound into any material

A Guide to the Measurement of Humidity

Probe – the part of an instrument that houses the sensor remotely from the main body of the instrument, e.g. at the end of a connecting electrical lead. In some situations the word 'probe' may be used to refer to an entire hygrometer. Also loosely used interchangeably with 'sensor' and 'transmitter'. 'Probe' may also refer to a tube used to extract gas for measurement.

Sensor – the active or sensing part of a measuring instrument. There are some cases where a whole hygrometer is referred to as a 'sensor'. Also loosely used interchangeably with 'probe' and 'transmitter'.

Transmitter – instrument which normally gives an electrical output (analog or digital) rather than a displayed result. The sensing head may be an integral part of the transmitter or may be connected via an external cable. Also loosely used interchangeably with 'probe' and 'sensor'.

Wet-bulb temperature – temperature indicated by a thermometer sheathed in wet wicking, and influenced by the rate of evaporation from the wicking. Usually paired with a 'dry-bulb' temperature to derive a value of relative humidity.

1.2 Definitions of measured quantities

The following terms and definitions are based on generally accepted and recognized language used by international standards labs such as NIST (USA), NPL (UK) and NMi (Netherlands). In practice, the usage of some terms varies according to the context and industry: for example the terms in the field of air-conditioning are sometimes different from the terms used in meteorology for the same quantities. In each case a preferred term is given below, but qualifying notes indicate where there are common alternatives in use.

Units of measurement for expressing the quantities are given, and may have alternative forms, e.g. 'grams per cubic meter' is given by 'g m^{-3}', alternatively written 'g/m^3'. Both metric (SI) and US units are referenced in most sections, since even in the US the metric system is often used in the scientific and metrological communities.

Absolute humidity – The mass of water vapor present in unit volume of moist air of a given temperature and pressure. SI (metric) units are grams of water per cubic meter of air (g m^{-3}). Older references may be in terms of pounds per million cubic feet (lb$10^{-6}ft^{-3}$) or in grains per cubic foot (gr ft^{-3}).

NOTE: In chemical engineering the preferred term for this concept is 'volumetric absolute humidity', while 'absolute humidity' is used to denote the quantity referred to in this document as 'mixing ratio'. In meteorology the preferred term is 'vapor concentration'. Other terms such as 'vapor density', 'mass concentration' and 'moisture content by volume' are also sometimes used to mean the same thing.

USAGE: It is important not to confuse the particular quantity 'absolute humidity' with the general category of 'absolute measurements of humidity'.

Dew point (or dew-point temperature) – The temperature at which dew, or condensation, forms, on cooling a gas. This is, in effect, the temperature at which air becomes saturated in equilibrium with water. Expressed in degrees Celsius or in degrees Fahrenheit. See also frost point.

USAGE: Negative dew points, with respect to super-cooled water below 0°C, are always shown with a minus (-) sign. Where there is any risk of ambiguity, a plus (+) sign may also be used for positive dew points:

e.g. *'a range of dew points between -5 °C and +5 °C'*

The term 'dew point' is often used generally to include 'frost point' (sec below). However in the range just below 0 °C, where either frost or dew (super-cooled water) can form, the values of dew point and frost point differ.

The use of initials (e.g. 'dp') is not a recognized abbreviation, but it occurs widely, and is used to distinguish clearly between dew-point temperatures and other values of (air) temperature. For example a dew-point value might be expressed in the form '1.0°C dp'

Enthalpy (of humid gas) – Measure of the total energy in a humid gas. Enthalpy is a function of the gas temperature and pressure, and of the moisture content, since water absorbs energy on changing from condensed state to vapor. Enthalpy is a useful concept in air conditioning, where it is important to know how much of the 'stored' energy will be consumed, or released, when the temperature or water content is raised, or lowered. Enthalpy of a gas can be defined as the sum of 'sensible' and 'latent' heat for each component in the gas. (See below for definitions of sensible heat and latent heat.) Values of enthalpy are conventionally expressed relative to a datum point (i.e. a zero or base line). For a dry gas, this is normally the heat content at 0°C / 32°F. For water

A Guide to the Measurement of Humidity

vapor, the enthalpy is usually expressed relative to the heat content of liquid water at 0.01°C.

Expressed in terms of energy per quantity of dry gas, i.e. kilojoules per kilogram (kJ kg^{-1}) or British Thermal Units per pound mass (BTU/lbm).

Equilibrium Relative Humidity (ERH) (over a substance) – The value of relative humidity of the air, at which there is no net exchange of moisture with any nearby substance. This is used for indirectly indicating or controlling the condition of moisture-sensitive substances such as paper. Expressed as a percentage (%). (See also water activity.)

Frost point (or frost-point temperature) – The temperature at which frost forms on cooling a gas. This is, in effect, the temperature at which air is saturated in equilibrium with ice. It is the exact counterpart to dew point (though values differ). Expressed in degrees Celsius, (°C) or in degrees Fahrenheit (°F). (See also dew point.)

Humidity ratio – Mixing ratio.

Latent Heat – Heat stored in a substance as a result of its phase rather than its temperature. For example, heat is stored in a gas because this energy was originally required to convert liquid water to vapor. 'Latent' means 'hidden'. Expressed in energy per unit mass of substance, i.e. joules per kilogram (7 kg^{-1}) or BTU/lbm. (See also enthalpy, sensible heat.)

Mixing ratio – Mass of water vapor per unit mass of dry air with which it is associated. It is a dimensionless ratio, but is often expressed in grams of water per kilogram of dry gas (g kg^{-1}) or in grains per pound mass (gr lbm^{-1}).

For low levels of moisture content, this may be expressed in parts per million by weight, i.e. mass of water vapor per million parts mass of dry gas (ppm_w or ppm(w).

NOTE: In chemical engineering this quantity is normally termed 'absolute humidity' – but must not be confused with the definition of 'absolute humidity' given above. Mixing ratio is also alternatively known as 'humidity ratio'.

Moisture content – A humidity term best reserved for general descriptive or qualitative use only. Use of this term to identify a measured quantity should be avoided, as there is a risk of confusion because 'moisture content' has been used in the past to mean both mixing ratio and specific humidity. Moisture content is also a term particularly used to refer to the proportion of water held in liquids or solids.

Mole – Amount of substance, which contains as many elementary entities as there are atoms in 12 grams of carbon 12. Expressed in moles (symbol, mol).

NOTE: When the mole is used, the elementary entities must be specified as atoms, molecules, etc.

Mole fraction – The mole fraction of a component is the ratio of the amount (number of moles) of that component to the total amount of substance present. Expressed as a dimensionless ratio.

Partial pressure (of water vapor) – The portion of the overall pressure exerted by the water vapor component in a gas. Expressed in units of pressure such as pascals (Pa), millibar (mbar), millimeters of mercury (mmHg), or pounds per square inch (psi)

Parts per million – Abbreviated as 'ppm', it must always be stated whether this is by mass (weight) or by volume, and whether the figure is the ratio of water vapor to dry gas, or to total (moist) gas.

Parts per million by volume (ppm_v, ppm(v)) – Volume of water vapor per total volume of gas, for an ideal gas. Sometimes expressed relative to the total volume of moist gas (mole fraction times one million) or sometimes relative to the total dry gas. For small numbers of parts per million, the two are almost identical; at higher humidity they become significantly different.

Parts per million by weight, or mass (ppm_w, ppm(w)) – Sometimes used to express the amount (mass) of water vapor relative to the total dry gas (mixing ratio times one million), but sometimes to express the amount relative to the total moist gas (specific humidity times one million). For small numbers of parts per million, the two are almost identical; at higher humidity they become significantly different.

Percentage saturation – The ratio of the actual mixing ratio to the saturation mixing ratio at the same temperature, expressed as a percentage (%).

NOTE: Under ordinary climatic conditions the percentage saturation is almost identical to the relative humidity.

Relative humidity – The ratio of the actual vapor

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pressure to the saturation vapor pressure over a plane liquid water surface at the same temperature, expressed as a percentage. This is commonly understood when the term 'X percent relative humidity' is used. For actual vapor pressure, e, and saturation vapor pressure, e_s

$$\text{relative humidity (in \%)} = \frac{e}{e_s} \times 100 \qquad (1)$$

USAGE: The phrase 'relative humidity' is commonly abbreviated RH although this is not an officially recognized abbreviation. Values of relative humidity are commonly expressed in units of percent relative humidity (% RH).

Care must be taken when expressing uncertainties, changes or fractional differences in relative humidity. For example, the difference between 50% RH and 52% RH is 2% RH. This can also be expressed as a difference of 4% of value. It is important to distinguish clearly between these two kinds of statements.

Saturation vapor pressure (of water) – Maximum pressure of water vapor that can exist at a given temperature. Expressed in units of pressure e.g. in pascals (Pa), millibars (mbar) millimeters of mercury (mm Hg) or pounds per square inch (psi).

Sensible heat (of a gas) – Energy that resides in a gas according to its temperature. Expressed in terms of energy per mass of gas, e.g. in joules per kilogram ($J\ kg^{-1}$), or equivalent units. (See also enthalpy, latent heat.)

Specific humidity – Mass of water vapor per unit mass of humid air. May be expressed as a dimensionless ratio, or in grams of water per kilograms of humid gas ($g\ kg^{-1}$) or in kilograms per kilogram ($kg\ kg^{-1}$)

Vapor pressure – That part of the total pressure contributed by the water vapor. Expressed in units of pressure e.g. in pascals (Pa), millibars (mbar) or millimeters of mercury (mm Hg) or pounds per square inch (psi).

Water activity (of a substance) – Water activity (a) is equilibrium humidity reached in a closed space where a hygroscopic substance, such as a foodstuff, has been placed. It is the same as equilibrium relative humidity (ERH) except that it is expressed on a scale of 0 to 1 (no units), instead of 0% to 100%. Water activity is particularly used in connection with foodstuffs. (See also equilibrium relative humidity.)

2. Significance of temperature and pressure for humidity measurement

2.1 The effects of temperature on humidity measurement

The effect of temperature on humidity is highly significant. Failure to take this into account can often lead to errors so large that the measurement is meaningless. In many situations, the largest single source of uncertainty in a humidity measurement is the effect of temperature differences from place to place in the process, room or chamber. The importance of considering the temperature effects carefully cannot be overstated when relative humidity is the parameter of interest.

Temperature and condensation
One common cause of error in humidity measurement is the occurrence of unwanted condensation. Condensation can occur at cold spots, which are below the dew point of the gas. In sampling systems, any condensation totally invalidates the sampling process, since it changes the water vapor content of the gas. To prevent condensation, sample systems should always be kept at a temperature above the maximum dew point, by heating them if necessary.

Temperature and absorption or desorption of water
Many materials contain moisture as part of their structure; particularly organic materials, salts, and anything which has small pores. The quantity of water in these materials depends on the humidity of the surrounding gas, and on the temperature. When the temperature changes, water migrates from the material to the surrounding gas or vice versa. Like condensation, this can cause changes in the measured humidity. However, unlike condensation, there is not usually a critical temperature. Whenever the temperature changes, water moves between the material and the gas.

When measuring low dew points, desorption or absorption of water vapor as the temperature changes can produce very large errors in measurement. Even in normal ambient conditions, absorption or desorption can begin to be significant, depending on the type of material.

Temperature and saturation vapor pressure of water
The saturation vapor pressure, e_s, of water depends strongly on temperature. Near room temperature, the air's capacity to hold water vapor doubles for every 10°C / 18°F increase in temperature. The steepness of this variation gradually changes across the temperature range. At 80°C the

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Table 1. Effect of a temperature change of 1°C / 1.8°F at various levels of temperature and relative humidity. The change in the relative humidity levels is not symmetric.

Relative humidity	Temperature					
	10°C	20°C	30°C	40°C	50°C	60°C
10% RH	±0.7% RH	±0.6% RH	±0.6% RH	±0.6% RH	±0.5% RH	±0.5% RH
50% RH	±3.5% RH	±3.2% RH	±3.0% RH	±3.0% RH	±2.6% RH	±2.3% RH
90% RH	±6.3% RH	±5.7% RH	±5.7% RH	±5.4% RH	±4.6% RH	±4.1% RH

saturation vapor pressure doubles for every 20°C rise. At -60°C the saturation vapor pressure doubles for only a 5°C rise in temperature.

Temperature and relative humidity
Relative humidity is highly dependent on temperature – especially so because vapor pressure appears twice in the formula for relative humidity,

$$\text{relative humidity (in \%)} = \frac{}{} \times 100 \qquad (2)$$

(e is the water vapor pressure, and e_s is the saturation vapor pressure at the prevailing ambient temperature.)

As a rule of thumb, at room temperature, a change in dewpoint of 1°C / 1.8°F corresponds to a change in relative humidity of 6 percent of the actual RH value. For example at 50% RH, an uncertainty in dew point of ±1°C corresponds to an uncertainty of ±3% RH.

A change of 1°C in the measurement of the ambient temperature has almost exactly the same significance. The size of the effect under different conditions is illustrated in Table 1.

Overall, a useful rule of thumb is that ±1°C uncertainty in either dew point or temperature leads to an uncertainty of ±6 percent of the measured relative humidity value.

A note on temperature measurement in air
A thermometer indicates its own temperature. It is important to note this because a thermometer may not always be at the same temperature as its surroundings. Thermometers can be influenced by the temperatures of other objects nearby (not the ones which are intended to be measured). Thermometers can also suffer from time lags, and self-heating may affect electrical resistance thermometers. All these effects are at their worst when a measurement is undertaken in air as opposed to in liquid. Errors from these sources can easily amount to several tenths of a degree, so the effects on relative humidity can be significant, as shown above.

2.2 The effects of pressure on humidity measurement

Since all measurements of humidity stem from the measurement of a vapor pressure of water, it follows that variations in overall pressure of the gas system may have an effect an the measured humidity. Throughout this document, the values of pressure are given in absolute terms (atmospheric pressure being 101325 Pa, or 1013 mbar), and not in 'gauge' pressures (where atmospheric pressure would have a value of zero).

In a gas mixture such as room air, the total pressure $P_{(total)}$ of the system can be expressed as the sum of partial pressures:

$$p_{(total)} = p_{(nitrogen)} + p_{(oxygen)} + p_{(water)} + p_{(others)} \qquad (3)$$

It therefore follows that if any of the partial pressures of the component gases varies, the total pressure $p_{(total)}$ will vary. Also, if the total system pressure is changed, either by compression or expansion, each of the component partial pressures will BE changed by a similar factor to $p_{(total)}$.

This basic rule can be applied to any measure of humidity to predict the effect of changes in either component or overall pressures. Below are some simple examples showing the effect of pressure change.

Effect of doubling absolute pressure on a relative humidity of 40% RH at constant temperature, without changing composition
Relative humidity is expressed as a ratio of vapor pressures (the actual vapor pressure relative to the saturation vapor pressure). Doubling $p_{(total)}$ will yield a similar doubling of $p_{(water)}$. If the saturation vapor pressure remains unchanged

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(i.e. if temperature is unchanged) then a relative humidity of 40% RH would be doubled to 80% RH.

As a general approximate rule, the actual relative humidity value can be multiplied by the fractional change in total absolute pressure to give the resultant value of relative humidity. NOTE: Where the result exceeds 100% RH, condensation WILL occur.

This rule is similar for other measures of concentration in terms of mass per unit volume, such as absolute humidity (g m^{-3}).

Effect of doubling system pressure on mixing ratio, without changing composition
The mixing ratio of water in a gas system is simply the ratio of the mass of the water vapor to the mass of the dry gas.

If any gas is compressed or expanded without adding or removing components, then the mass of all components is unchanged. Therefore the mixing ratio is unaltered by the pressure change. This can also be deduced from the fact that the definition of mixing ratio does not involve pressure or temperature.

The rule is similar for other dimensionless measures of concentration (those expressed in mass per unit mass, or volume per unit volume), such as mole fraction and specific humidity, including cases where these are expressed in terms of parts per million.

Effect of doubling system pressure on dew-point temperature, without changing composition
The dew-point temperature of a System is directly related to the water vapor pressure of that system. From equation (2) it can be seen that a doubling of total pressure $p_{(total)}$ will yield a doubling of the water vapor pressure, $p_{(water)}$. Reference to vapor pressure tables will allow the new dew-point temperature to be calculated.

For example, for a system of pure water vapor with a dew point of +10°C, the water vapor pressure is about 1228 Pa. If the system pressure is doubled, the resultant water vapor pressure will be 2 x 1228 = 2456 Pa, which equates to a dew-point temperature of about +20.8°C.

For dew points in the presence of air or other gases (rather than pure water vapor alone), a correction may need to be made for the water vapor enhancement factor (see below).

Water vapor enhancement factor
The examples above assume that all the component gases exhibit 'ideal gas' behavior. In practice a small, pressure-dependent correction may be required: the 'water vapor enhancement factor'.

In air, this numerical correction is less than 1% of value when pressure is doubled from atmospheric pressure. For a tenfold increase from atmospheric pressure, the effect is between about 1% and 10% of value, depending on the dew point of the gas.

3. Selection of a type of hygrometer

3.1 Identifying measurement needs

To ensure 'fitness for purpose' it must be clear first of all what is the purpose. Is a humidity measurement needed at all? If so, what use is it to the business or process? To be useful, how should the results be expressed? Is the measurement to meet a practical need, or to comply with a documented specification, and is the specification meaningful and realistic? Once the need and aim of making the measurement is clear, it is important to decide what factors are relevant to achieving this aim. The user should consider the following issues:

3.2 Measurements required

Relative or absolute – Which unit or scale of measurement? The quantity of interest may be relative humidity, dew point, or some other measure of the concentration of water vapor.

It is best to select a method of measurement which intrinsically detects the quantity of interest. Many hygrometers display results in terms of two or more engineering units. This is often useful, but it should be understood that normally only two parameters are being measured, and the other values are the result of numerical conversions. Because of this, an instrument might give a reliable indication of only one of the moisture parameters shown, while providing a less good indication of the other parameters.

Range (humidity and other variables) – Different types of measurement are suited to different ranges of humidity. It is best to avoid using an instrument at the upper or lower extreme of its range of measurement. Ranges of temperature, flow rate, and pressure or vacuum also need to be specified in order to select the best instrument.

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For example, where use at elevated pressure is planned, the construction of the instrument may be as important as the operating principle. On the other hand, for some types of measurement, a correction may have to be applied to the results if the pressure varies.

Performance – It is worth deciding if any particular performance characteristics are important for the application in question. There may be a need to set criteria for sensitivity, stability (in terms of repeatability or reproducibility), uncertainty, response time, resolution, linearity or hysteresis.

Output, readout – The humidity result may simply be shown as a number on a digital display, or on a numbered scale. It may be given as an electrical voltage or current signal (analog output). Several parameters or units of humidity may be shown, together with temperature. Readings may be given continuously, or at intervals.

3.3 Instrument format and usage

Sampling – Sampling is an important issue in all humidity measurement. The sampling approach may be that of 'immersion', where the instrument sits wholly or partly in the environment to be measured; or the gas may be 'sampled' by extracting it to the instrument through a tube. Some immersion sensors benefit from being in still air, some from being in moving air, and for some the flow rate of air is critical. When measuring gases with very low water content, the quality of the sampling pathway is critical; hygroscopic materials in the pathway can change the water content of the sample. Also, care must be taken with certain types of hygrometer, which may themselves affect the environment, by giving off either water or heat. Indeed any instrument introduced at the wrong temperature will influence its environment, affecting the measurement result. Conversely, moisture and heat from the operator may affect measurements using hand-held hygrometers.

Type of gas – In gases other than air, chemical compatibility may be an issue. Calibration specific to the gas in question may be required.

Materials of construction – Aside from considering the hygroscopic nature of materials, other aspects of suitability may need to be addressed. Some materials may be chemically incompatible with the environment of interest. Materials may be unacceptable for other reasons, such as avoidance of molded polymer housings and glass for reasons of hygiene or safety.

Ease of use – Some hygrometers are straightforward to use. Others require some skill.

Use for control or monitoring – In some gases the user simply needs to measure humidity. In others, the humidity measurement is fed into a process to control humidity. If so, then access to the electrical output in some form is usually necessary. For use in control of humidity, the response time and the degree of hysteresis are usually important.

Hazardous areas – In areas where there is some hazard, such as an explosive atmosphere, suitable precautions must be taken. For example, extraction of sample gas to remote probes may reduce the risk in some cases, while other sensors can be designed to be intrinsically safe, by limiting the electrical energy to a level low enough that it cannot ignite the atmosphere. Where this is a concern, an appropriate certification of intrinsic safety should be sought.

End use – Humidity itself may be of interest, or humidity may be used as an indication of the moisture content of other solid or liquid substances. If so, it may give no more than a very indirect indication of the actual content, though ERH and water activity are proper indications, in a different way, of the condition or equilibrium of materials with the environment.

Calibration – Method of calibration, and ease of doing so, should be considered. even when there does not appear to be a call for highly accurate results.

Robustness – Both hygrometer sensors and casings vary in their robustness against condensation, drying out, temperature extremes, dust, chemical or other contamination, vibration, or even simple handling.

Versatility – If more than one kind of use is expected, the adaptability of the hygrometer should be kept in mind.

Interchangeability – It may be desirable to have a set of hygrometers which can be used interchangeably, or to substitute other probes for use with the main body of the hygrometer. It may be necessary to replace components of the sensor which might fail. In any of these cases, it is important to consider how interchangeable the instruments or components really are. Interchangeability is best ensured by calibration against a consistent reference. However, replacing a key component of an instrument may invalidate its previous calibration.

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Maintenance – Some types of hygrometers need routine cleaning, regeneration, or replacement of parts.

Availability of spares – It may be worth knowing about spare parts; whether they can be fitted by the user, and whether they are freely available locally and quickly. Any consumable supplies, such as charts, should be available and clearly coded or identified, as they are not always interchangeable.

After-sales service – The availability of a warranty, or of a good maintenance or service contract may be a factor in the decision.

4. How to interpret the data sheet information?

Detailed below are technical terms used to make statements about instrument performance, as typically found in manufacturers' data sheets. They are:

- range
- resolution
- uncertainty (accuracy)
- repeatability
- reproducibility
- non-linearity
- hysteresis
- response time
- long-term stability
- temperature coefficient

This list is not exhaustive, although it indicates the most important specifications to consider when selecting an instrument. Practical considerations such as dimensions, power supplies and output signals, may have little or no significance to the measurement performance characteristics of the unit. However, these practical elements should be carefully selected if the instrument is to meet the full working requirement of the application.

Each characteristic is explained separately below. However, although separately defined, it is not always possible in practice to distinguish between some of them.

Formal definitions of these terms are given in the ISO document 'International Vocabulary of Basic and General Terms in Metrology' (Second edition, 1993).

Measuring range

The stated measuring ranges for temperature and humidity provide guidance as to the upper and lower temperature and humidity environments to which the instruments sensors can be applied. Often an additional specification: operating range (electronics) is also stated; this confirms the conditions in which the instrument's electronics (other than the sensor, or probe) can safely operate. Where a maximum or minimum humidity is stated, it is often the case that the humidity sensor will be damaged if these limits are exceeded.

Resolution

Resolution simply defines the extent to which an instrument is able to 'resolve' very small changes in the value of the measured parameter. Resolution usually is unrelated to uncertainty of measurement, except in the case of a coarse resolution, where the display will round the actual value up or down to the nearest significant figure, thereby introducing an additional error, depending on the method of rounding.

Uncertainty (accuracy)

The uncertainty of a measurement is defined as the parameter characterizing the range in which the 'true value' can be expected to lie. It defines a 'margin of doubt' about a reading or estimated value, together with a level of confidence (normally 95%) that the 'true value' will lie within this range.

NOTE: Often, the uncertainty for an instrument is specified for ideal operating conditions at a temperature of 20°C or 23°C. However, further contributions such as hysteresis, linearity, reproducibility and temperature dependence will need to be taken into account when estimating the overall uncertainty for an instrument. The method of use may make an important contribution to the overall uncertainty achieved.

Strictly speaking, 'accuracy' is a qualitative term only. For example, an instrument or measurement might be described generally as 'accurate' or 'not accurate'. If accuracy is to be quantified, it should be expressed in terms of uncertainty, for example, '... an uncertainty of ±5% RH ...' (not '... an accuracy of ±5% RH ...'). However, the word 'accuracy' continues to be used loosely in specifications to refer to the maximum difference that can be expected between the reading given by an instrument and the 'true value' being measured.

Repeatability

In general terms, the repeatability of an instrument is the closeness of agreement of multiple readings repeated

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under the same conditions of measurement. To quantify repeatability, the spread or dispersion of results may be quoted, e.g. in terms of a standard deviation of a number of readings.

Reproducibility
In general terms, reproducibility is an instrument's capacity to reproduce a previous measurement. This may be at a later date, or after undergoing significant changes in conditions, for example, after a change of operator, or of location. To quantify reproducibility, the spread or dispersion of results may be quoted, e.g. in terms of a standard deviation of a number of readings.

Non-linearity
In an ideal world, if a calibration were carried out at two end points in a measurement range (high and low) the instrument would behave similarly (linearly) at values in-between. However, it is usual to find some deviation from this ideal, due to non-linearity of the sensor. In other words most sensors exhibit a calibration curve, as opposed to a straight line.

The deviation from the ideal calibration line will have a maximum or minimum, usually expressed in the form: 'Non-linearity ±0.5% RH', at a given temperature. It should also be noted that linearity characteristics can be significantly affected by temperature. When having an instrument calibrated, linearity is a factor to bear in mind when deciding how many measurements are needed and at what intervals throughout the range of measurement.

Hysteresis
Hysteresis, in general terms, is the dependence of a reading upon whether the condition is approached from above or below the value of interest. For example, given a humidity cycle of say 10% RH to 50% RH to 90% RH and back to 50% RH, most hygrometers would not give an identical reading on both occasions at 50% RH.

Hysteresis is related to repeatability, but includes any 'directional' effect.

Hysteresis should be considered if the measurement is to be used for control purposes, for example to activate on-off control of air conditioning.

Response time
Response times are included in specifications to provide an indication of how long the instrument takes to react to changes in the applied condition. While the sensor itself may have a particular response time, any screening of the sensing element, e.g. by a protective filter, will slow down this response. Effective air movement will speed it up. (Constant and specified air flow is required for a response time test.) Response times are almost always slower for falling humidity than for rising humidity.

Quantitatively, response times are usually quoted in terms of the time taken to register 63% of a step change in the applied condition (although other conventions are sometimes used, e.g. 90%).

Response times are usually quoted for the hygrometer alone, at constant temperature. However, response times of the associated sampling systems may be much greater. Optimistic specifications of response time may raise false expectations for the user to see stable measurements after very short time periods. However, for most relative humidity measurements, the time taken for the sensor and nearby materials to equilibrate with respect to temperature is by far the most significant factor influencing the response time. For measurements of dry gases, equilibration of moisture in the sampling system is usually the key influence.

Long-term stability
The measurement characteristics of any instrument will change with respect to time, due to gradual changes in electrical or material components. Estimates of long-term stability or drift, refer to the likely change in the instrument's measurement performance with respect to time. Regular checks of calibration should be made to quantify this potential problem. Although it may sometimes be desirable to adjust the hygrometer reading in response to drift, performance could be compromised by the adjustment process, and the overall drift characteristics could be masked by frequent adjustments.

Quantitatively, drift may be expressed in terms of a time span and a figure. However, if an instrument was subject to drift of less than 4% RH per year, it would not follow from this that the drift over six months would be less than 2% RH (though it could be expected to be somewhat less than the annual figure). Drift is not always consistent, and measurements of drift always include some contribution from short-term variability.

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Temperature coefficient
Temperature variation has a most significant influence on relative humidity itself. In addition, every humidity sensor has a temperature coefficient, which can be simply explained as a change in measurement characteristic at a different temperature. A temperature coefficient might be expressed, for example, as 0.1% RH per °C, which could result in an additional 5% error when measuring at a temperature 50°C away from the calibrated temperature.

5. What is calibration?

Calibration is the process of comparing a measuring instrument against an authoritative reference for the same type of measurement, to identify any bias or systematic error in the readings. The outcome of a calibration is normally a certificate listing any corrections that need to be applied to the values indicated by the instrument, together with an estimate of the uncertainty in the calibration, and other relevant information. For example, a calibration of a given instrument at, say, 50% RH, might show it to read too high by 1% RH. If so, a required correction of –1% RH would be shown on the certificate.

Calibration is often taken to mean 'adjustment of the instrument to read correctly'. This is not true. Calibration and adjustment of an instrument are quite separate concepts, and the two should not be confused. Thus, when arranging for the calibration of any instrument, it is important to establish clearly whether or not the instrument is to be adjusted as well as calibrated. If so, it should be specified whether calibration information is required only after adjustment (as sent), or whether results are also required for the initial condition (as found).

Any calibration corrections identified on a certificate of calibration should be applied to measured values obtained using that instrument. If the calibration corrections cannot be applied, the quoted uncertainty in the results should include an allowance for this.

What is checking?
A measurement check is not the same thing as a calibration. A check is a test to confirm whether or not some condition is fulfilled (for example to confirm that the performance of an instrument has not drifted). The outcome of a check is not normally a certificate of calibration. However, checks of a measuring instrument against another (stable) instrument are often useful at intervals in between calibrations.

6. Recommended practices in humidity measurements

6.1 General practical recommendations

- Where relative humidity is of interest, a direct measurement of relative humidity is usually best. Where an absolute measure of humidity is needed, choose dew point, vapor pressure or similar measurements.
- Establish the measurement requirements at the purchasing stage in order to have the right instrument for the job.
- Allow hygrometers to equilibrate in any new environment. This is particularly necessary after changes in temperature due to transportation or storage. Depending on the instrument and on how great the change in conditions, this may require from only a few minutes to many hours.
- Follow Michell Instruments' care instructions for the instrument. Some instruments need routine cleaning or other maintenance. Before using any solvent cleaner, check with Michell Instruments that this will not harm the sensor or other materials of construction.
- Wherever possible, ensure that hygrometers are calibrated under the conditions of use, i.e. at similar values of humidity and temperature, and (if relevant) in similar conditions of pressure, airflow, etc.
- Keep a record of calibrations and any adjustments to the hygrometer. This will show the long-term stability of the instrument and allow the associated uncertainty to be assessed.
- Check instruments, if possible, at intervals between calibrations, by comparison with another (stable) instrument, to monitor for long-term drift. Routine checks are also useful before and after subjecting an instrument to transportation or other stress, which might lead to a shift in its performance. Where the check is against two (or more) instruments this is even better: not only does this add confidence, but in the event of one instrument drifting among a set of three, it can be seen which reading is most suspect.
- Cleanliness of the environment will affect different hygrometers in different ways. Dust and airborne droplets should be avoided or filtered out if possible.

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Contaminants can come from the most surprising sources, ordinary urban pollution, for example.

- The readings given by some types of hygrometers are sensitive to gas type. For any Instrument which reads in terms of mass per unit volume, e.g. in grams per cubic meter, it must be confirmed whether the calibration is valid for the gas in use.
- Avoid using instruments in direct sunlight or near any other source of heat, unless they are suitably shielded to prevent measurement errors.

6.2 Sampling in general

- Relative humidity measurements should be carried out at a representative temperature. Failure to allow temperature equilibration will lead to a false indication of the relative humidity.
- Variations in vapor pressure from place to place can occur where an environment is subject to any addition or removal of water. If so, care must be taken over where to make a measurement in order to obtain a representative result.
- Sources and sinks of water vapor should be avoided in any sampling system. Invasion of stray water can be minimized by attention to leaks, hygroscopic materials, droplets and condensation. The lower the humidity, the more critical these precautions are.
- Hygroscopic materials should be avoided. Many materials contain moisture as part of their structure, particularly organic materials (whether natural or synthetic), salts (or anything which contains them), and anything which has small pores. Temperature changes can increase the tendency of these materials to affect the humidity of the surrounding air.
- Condensation in a sampling process can invalidate humidity measurements by reducing the water content of the gas being measured. What is more, condensed liquid may alter the humidity elsewhere by dripping or running to other locations and evaporating there. In these circumstances, measurement results may be misleading if hygrometer location is not considered carefully.
- Water droplets or mist must be avoided. These can result in overestimates of the humidity of the air between the droplets. Such results may exceed 100% RH, or may be impossible to interpret meaningfully. Droplets of liquid also damage some electrical types of humidity sensor. Filtering the air sample can eliminate droplets.
- If pumps are used for sampling gas, these should be located after the hygrometer, to avoid contaminating the measurement environment. Where possible, oil free pumps should be used, or filters employed. Oscillations in pressure due to pumping can sometimes be reduced or buffered using a needle valve or a reservoir of large volume.
- Special treatments such as filtration can change the amount of moisture in a gas. Some drying agents take out other gases as well.
- When sealing any sensor or probe into a port or manifold in a duct or chamber, leaks through the probe or electrical cable should be considered. These are not always sealed against passage of ambient air.
- Where sampling involves a step change in temperature, pressure or gas flow rate, relative to the process being sampled, results may need to be converted or interpreted. For example 'pressure dew point' will differ from the value found after expanding the gas sample to atmospheric pressure. Care should be taken to distinguish between 'gauge' and absolute values of pressure.

6.3 Dew point in general

- The measuring environment and all parts of the sampling pathway must be kept above the dew point if condensation is to be avoided. Electrical trace heating or other heating methods should be used if necessary. An excess temperature of 10°C / 18°F above the dew point is usually a safe margin.
- For measurements in the region below 0°C / 32°F it must be clear whether the condensate is dew or frost. Failure to distinguish between these can result in errors of about 1°C / 1.8°F for every 10°C / 18°F below freezing.

6.4 Relative humidity in general

- Due care must be taken of temperature.

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- Care must be taken when expressing uncertainties, changes or fractional differences in relative humidity. For example, the difference between 50% RH and 52% RH is 2% RH. This can also be expressed as a difference of 4% of value. It is important to distinguish clearly between these two interpretations.

6.5 Recommendations specific to ranges of measurements

- Ambient humidity - Avoid using hygrometers near the body, which is a source of heat and moisture. Do not breathe close to the measurement.

- High humidity, above the ambient range - Ample lines should be maintained above the dew point of the gas being measured, to avoid condensation. Electrical trace heating is often the most practical method.

- Low humidity, and very dry gases - If possible, prepare for measurements by flushing sample lines and hygrometers with dry gas, or by evacuating to low pressure. Drive off stray residual water by baking assemblies if possible (but not instruments – unless designed for this!). The lower the moisture content to be measured, the more dramatically the required drying time multiplies.

- Avoid hygroscopic materials. At low humidity (anything much below a dew point of 0°C / 32°F) the amounts of water given off by organic and porous materials can dramatically affect the value of humidity. The lower the level of moisture, the more significant the effects.

- Choose impermeable materials, to avoid inward diffusion of moisture through sampling tubes and enclosures. Steel and other metals are practically impermeable. PTFE (Teflon) is only slightly permeable and will usually be satisfactory for dew points above -20°C, and sometimes below this level. Materials such as PVC and rubber are relatively permeable and so totally unsuitable at low humidity, and not truly satisfactory in any humidity range.

- Surface finish of pipework is important for very dry gases. Even the tiny quantities of water adsorbed on the surfaces of non-hygroscopic materials can have significant effect. Polished or electropolished steel is recommended for the best results.

- Clean environments are always best for humidity measurements, but this is especially critical at very low humidity. Even fingerprints harbor water. High purity cleaning agents are recommended: Analytical Reagent (AR) quality solvents for oil-based contaminants, and purified water (distilled or deionized) for salts. Cleaning should be followed by thorough drying by a clean method.

- Sample tubing should be as short in length as possible. The surface area should be minimized by using the narrowest tubing that the flow conditions will permit.

- Avoid leaks. Minimizing the number of connections (elbows, tees, valves, etc) helps with this.

- Adequate flow of the gas sample should be ensured, to minimize the influence of sources of stray water in the flow path.

- 'Dead ends' should be avoided, as they cannot easily be flushed.

- Back-diffusion of moisture should be minimized, e.g. by fast flow rates of gas, long exhaust tubes after the sensor, or by valves which isolate the low-humidity region from ambient air.

6.6 Practical recommendations for specific types of hygrometers

Relative humidity capacitive sensor

- Care should be taken to avoid mechanical shock (impact) or thermal shock (sudden temperature changes). Sensors should be protected from steam or water sprays, and from direct sunlight.

- Where a sensor is at risk of exposure to dust, droplets, or the occasional knock during handling, the appropriate guard or filters for the sensor head should be used.

- Any temptation to breathe on the sensor, or to wave it over cups of tea, etc. should be resisted. Filters and saturation guarding may protect the sensor, but these actions carry a risk of damage by condensation or other contamination.

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- Protective filters can slow the response time of sensors. This can be avoided by removing any filter, but the benefit must be weighed against the risk of damage to the sensor.

- Sensors should not normally be submerged in liquids. In the case of a resistive (electrolytic) sensor, water or other liquids would certainly damage the sensor beyond repair.

- Salt solutions are commonly used for calibration of electrical sensors, and should be provided with traceability directly or via a calibrated hygrometer. Protection of sensors from direct contact with salt or solution is most important as contamination would destroy or seriously impair the sensing element.

Impedance dew-point hygrometer

- Sensors constructed using aluminium oxide or ceramics essentially respond to vapor pressure. They are often used at high pressure, or to sample gas originating from systems at high pressure. If so, care must be taken to ensure that the sample pressure is known, and a correction applied if necessary.

- As for other electrical sensors, filtration should be used to protect from dust and droplets or mist.

- Regular calibration is particularly important for ceramic hygrometers. The calibration intervals may be dependent on usage.

- Aluminium oxide sensors normally exhibit a temperature coefficient, which may be partially compensated within the instrument, but not totally. If the hygrometer must be used at a temperature other than that at which it was calibrated, ensure that any necessary correction to the reading is made, and that any resulting uncertainty is taken into account.

- When using the sensors at low levels of moisture, the precautions listed above under 'sampling' and 'low humidity' should be observed.

Notes

Why come to Michell Instruments and PMC for advice?

- Michell Instruments and PMC are ideally placed to give you the best possible advice when deciding on the right solution for your moisture measurement application. Our sensor experts have decades of experience in the industry, and are poised to give you technically solid solutions to most any application.
- By acquiring and integrating the product lines of Rense Instruments and Coreci in recent years, Michell Instruments now offers a range of different sensing technologies, which allows us to choose the best technical solution for any application.
- Michell has been a specialist in the field of moisture measurement for 30 years, with all our efforts concentrated on developing and servicing this market.
- Michell products are traceable to the major international standards laboratories, including NIST, NMi and NPL.
- Michell is trusted by hundreds of blue chip companies throughout the world to provide complete solutions for their humidity measurement requirements.
- Originally founded in the UK, Michell operates the longest established UKAS accredited dew-point calibration laboratory in the UK.
- PMC has network of representatives and distributors throughout North America, ensuring the best possible local support and advice, provided by friendly and knowledgeable personnel.

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