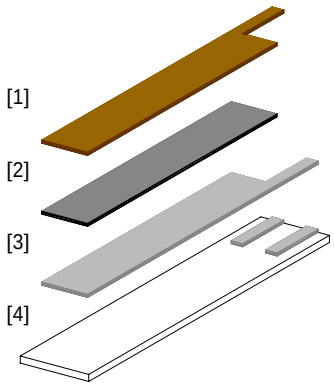
Impedance Sensor Technology

Accurate, fast and reliable ceramic moisture sensor for the measurement of absolute humidity in process air and gases

- Robust construction
- High repeatability and long-term reliability
- Fast speed of response
- Wide dew point range
- Measurement accuracy up to ±1 °C dew point

All Michell's Impedance instruments use the Advanced Ceramic Moisture Sensor. Backed by over twenty five years' experience in humidity measurement, our latest generation impedance dew-point sensor combines fast response and high repeatability with long-term stability and resistance to contamination.



Layers of the Michell Ceramic Tile

Key:
[1] Porous conductive layer
[2] Hygroscopic active layer
[3] Conductive layer
[4] Ceramic substrate

Sensor Technology

The principle of operation is quite simple. Operation of the sensor depends upon the adsorption of water vapour 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 metre) and the porous top conductor that allows transmission of water vapour into the sensor is less than 0.1 micron thick. 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.

Rugged and Reliable

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 large particulates it is housed in a protective sintered stainless steel guard.

Our Ceramic Moisture Sensor has been proven time and again in virtually every application, from pure gases to corrosive processes. The sensor can withstand the most aggressively acid media - for example virtually 100 % hydrogen sulphide - conditions in which no other humidity sensor will survive (we are told by our customers). If oil, other liquids or solid matter contaminates the sensor, it can be safely cleaned using distilled water, high purity solvent such as acetone, or a combination of the two. This cleaning process will not damage the sensor or affect its calibration accuracy, provided our recommended procedures are observed.

MICHELL Instruments

Wide Pressure Range Capabillity

The Ceramic Moisture Sensor handles not only high gas pressures, but also rapid changes in pressure, without damage. Some less robust dew-point sensors will be damaged by rapid pressurisation/de-pressurisation due to the inferior method of construction. The Ceramic Moisture Sensor is constructed in such a way that virtually instantaneous pressurisation right up to the 30 MPa (300 bar) limit will not cause failure.

Calibration Integrity

All Ceramic Moisture Sensors are calibrated over the full dew point range from -100 to +20 °C dew point using state-of-the-art computer controlled humidity generators with mass flow controller operation. Each sensor is individually calibrated at 10 °C dew point intervals with the exact calibration data stored in an on-board processor memory. This ensures both the optimum calibration accuracy and makes re-certification very easy to perform, allowing you to maintain conformance with your own quality assurance requirements.

Technical Specifications

Operating Range	-100 to +20 °C dew point
Accuracy	up to ±1 °C dew point
Repeatability	0.1 °C dew point
Response speed	T63 = 1 minute, dry to wet (-60 to -20 °C dew point); 5 minutes, wet to dry
Pressure rating	to 30 MPa (all sensors)
Sensor body	316 stainless steel
Sensor guard	80µ sintered stainless steel
Operating temp	-40 to +60 °C (depends on product electronics)

Storage temp	-100 to +70 °C
Temp measurement	10 K bead thermistor
Flow rate	Not critical, 1 to 5 $Nlmin^{-1}$ recommended
Gas velocity	Max $10msec^{-1}$ (direct insertion)
User calibration	Not required - fully factory calibrated
Traceability	NPL (UK) and NIST (USA)
Warranty	1 year

Saturation Water Vapour Pressure Tables based on the ITS-90
-100 to 0 over ice, 0 to +20 over water

	9	8	7	6	5	4	3	2	1	0	
°C	Pa	Pa	Pa	Pa	Pa	Pa	Pa	Pa	Pa	Pa	°C
-100										1.40207E-3	-100
-90	1.71760E-3	2.09933E-3	2.56011E-3	3.11512E-3	3.78221E-3	4.58233E-3	5.54002E-3	6.68401E-3	8.04780E-3	9.67045E-3	-90
-80	1.15974E-2	1.38813E-2	1.65832E-2	1.97739E-2	2.35348E-2	2.79602E-2	3.31581E-2	3.92530E-2	4.63875E-2	5.47250E-2	-80
-70	6.44523E-2	7.57828E-2	8.89597E-2	1.04260E-1	1.21997E-1	1.42530E-1	1.66262E-1	1.93651E-1	2.25216E-1	2.61541E-1	-70
-60	3.03283E-1	3.51185E-1	4.06079E-1	4.68902E-1	5.40702E-1	6.22655E-1	7.16075E-1	8.22430E-1	9.43359E-1	1.08069	-60
-50	1.23645	1.41290	1.61256	1.83821	2.09294	2.38017	2.70367	3.06762	3.47664	3.93579	-50
-40	4.45069	5.02748	5.67294	6.39449	7.20029	8.09927	9.10122	10.2168	11.4578	12.8370	-40
-30	14.3682	16.0667	17.9490	20.0332	22.3388	24.8871	27.7012	30.8062	34.2291	37.9994	-30
-20	42.1488	46.7119	51.7257	57.2304	63.2692	69.8888	76.3844	85.0751	93.7542	103.239	-20
-10	113.597	124.900	137.226	150.657	165.282	181.197	198.503	217.309	237.731	259.893	-10
0	283.928	309.977	338.191	368.730	401.765	437.477	476.061	517.720	562.674	611.154	0

	0	1	2	3	4	5	6	7	8	9	
°C	Pa	Pa	Pa	Pa	Pa	Pa	Pa	Pa	Pa	Pa	°C
0	611.213	657.080	705.972	758.060	813.520	872.540	935.313	1002.04	1072.94	1148.23	0
10	1228.13	1312.90	1402.77	1498.02	1598.91	1705.71	1818.74	1938.28	2064.66	2198.20	10
20	2339.25										20

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