

# **MODEL 083E**

## **RELATIVE HUMIDITY /**

### **TEMPERATURE SENSOR MANUAL**



#### **Met One Instruments, Inc**

Corporate Sales & Service: 1600 NW Washington Blvd. Grants Pass, OR 97526

Tel (541) 471-7111 Fax (541) 471-7116

[www.metone.com](http://www.metone.com) - [service@metone.com](mailto:service@metone.com)



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Model 083E Relative Humidity / Temperature Sensor Manual.

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Should you require support, please consult your printed documentation or our website [www.metone.com](http://www.metone.com) to resolve your problem. If you are still experiencing difficulty, you may contact a Technical Service representative during normal business hours;

Monday – Friday 7:00 a.m. to 4:00 p.m. Pacific Time.

Voice: (541) 471-7111

Fax: (541) 471-7116

E-Mail: [service@metone.com](mailto:service@metone.com)

Mail: Technical Services Department  
Met One Instruments, Inc.  
1600 NW Washington Blvd.  
Grants Pass, OR 97526

## **Safety Notice**

The contents of this manual have been checked against the hardware and software described herein. Since deviations cannot be prevented entirely, we cannot guarantee full agreement. However, the data in this manual is reviewed regularly and any necessary corrections included in subsequent editions.

Faultless and safe operation of the product presupposes proper transportation, storage, and installation as well as careful operation and maintenance. The seller of this equipment cannot foresee all possible modes of operation in which the user may attempt to utilize this instrumentation. The user assumes all liability associated with the use of this instrumentation. The seller further disclaims any responsibility for consequential damages.

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Any product found to be defective during the warranty period will, at the expense of Met One Instruments, Inc. be replaced or repaired and return freight prepaid. In no case shall the liability of Met One Instruments, Inc. exceed the purchase price of the product.

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Other than the warranty set forth herein, there shall be no other warranties, whether expressed, implied or statutory, including warranties of fitness or merchantability.

# Table of Contents

<b>1. GENERAL INFORMATION.....</b>	<b>6</b>
1.1. Description.....	6
1.2. 083E Options.....	8
1.2.1. Temperature Option:.....	8
1.2.2. Radiation Shield Compatibility Option:.....	8
<b>2. SENSOR SITING.....</b>	<b>8</b>
<b>3. INSTALLATION.....</b>	<b>9</b>
3.1. Mounting Instructions.....	9
3.2. Wiring Instructions.....	10
<b>4. OPERATIONAL CHECK-OUT AND CALIBRATION.....</b>	<b>11</b>
4.1. Relative Humidity Sensor Check-out.....	11
4.2. Limitations of RH Measurements at Below Freezing Temperatures.....	11
4.3. Temperature Sensor.....	12
4.4. Temperature Table.....	13
4.5. Temperature Sensor Data Logger Connection.....	14
4.6. General Maintenance Schedule.....	15
4.7. 083E Relative Humidity Sensor Maintenance and Calibration.....	15
4.8. Sensor Maintenance.....	15
4.8.1. Sensor Element.....	15
4.8.2. Spare Parts.....	16
<b>5. Operational Specifications.....</b>	<b>17</b>

# 1. GENERAL INFORMATION

## 1.1. Description

The 083E sensor is an extremely accurate microprocessor controlled relative humidity and temperature sensor. The relative humidity sensor responds to the full range of 0 to 100% humidity. Response is linear with negligible hysteresis or temperature dependence. Some models contain a high accuracy linearized temperature sensor. The temperature sensor is a three-element composite thermistor type with linear response over the range of  $-50^{\circ}\text{C}$  to  $+50^{\circ}\text{C}$ . The sensor is designed to be mounted in a radiation shield when used outdoors. The exact model number you order will determine the functions of your sensor. The following section describes the model number feature assignments.



**Figure 1 Model 083E-X-35 Sensor**



**Figure 2 Model 083E-X-6 Sensor**

## **1.2. 083E Options**

The 083E options are defined by dash numbers as follows:

083E-(Temp Option)-(Shield Option)

### **1.2.1. Temperature Option:**

0 = RH (0 to 100%) only

1 = RH (0 to 100%) & Temperature (-50°C to +50°C)

### **1.2.2. Radiation Shield Compatibility Option:**

6 = Use with Model 076B or 077 radiation shield. This sensor comes with 8-inch long pigtail wires for connection to the radiation shield junction box. Refer to the radiation shield manual for sensor and cable connections.

35 = Use with Model 073B or 5980 radiation shield. This sensor has a circular connector for use with Met One Instruments cable PN 2348.

## **2. SENSOR SITING**

The EPA recommends sensor mounting in a radiation shield at a 2 meter height, ideally over green mowed grass to minimize related terrestrial radiation errors on the temperature and relative humidity readings. Typical installations may vary significantly from these recommendations due to geographic limitations or specific monitoring requirements.



### 3. INSTALLATION

If the sensor is to be mounted in a radiation shield, refer to the radiation shield manual section for mounting details. Typical installations are shown below.

Sensors not installed in a radiation shield should be mounted in a representative location having good airflow and shaded from sunlight or other heat radiation sources that would affect measurement of relative humidity or temperature.

#### 3.1. Mounting Instructions

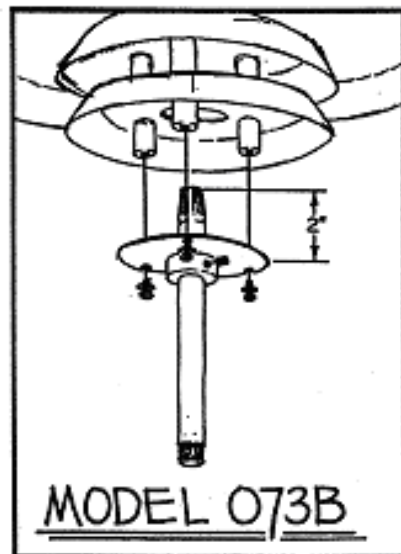
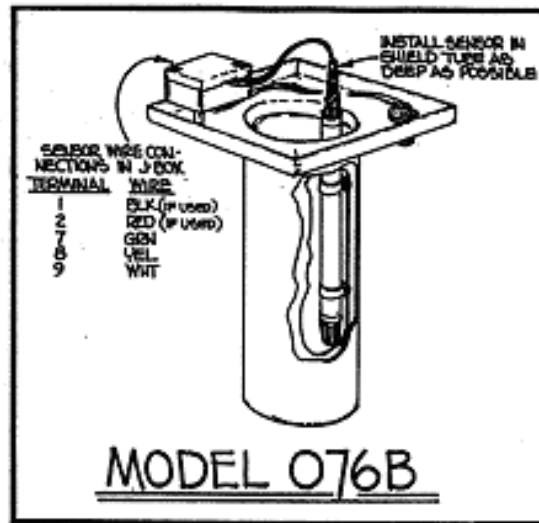
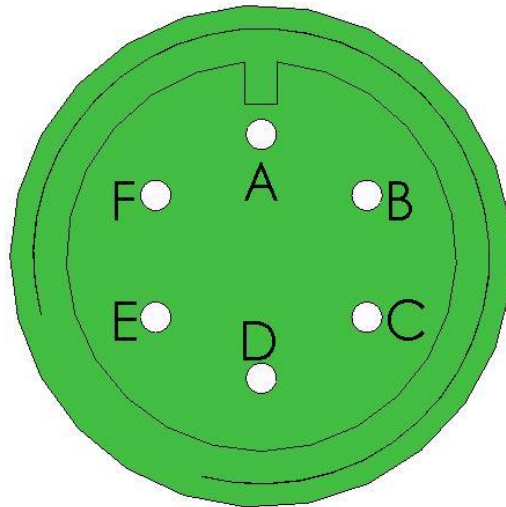


Figure 2 Radiation Shield Installation

### 3.2. Wiring Instructions

Sensor Connection	Wire Color	Description
Pin A	White	+10 to +18 VDC
Pin B	Green	Signal Ground
Pin C	Yellow or Orange	RH Analog Output
Pin D	Black	Temperature Common (Model 083E-1) No Connection (Model 083E-0)
Pin E	Red	Temperature Signal (Model 083E-1) No Connection (Model 083E-0)
Pin F	No Connection	No Connection
No Connection	White/Brown	Shield



**Figure 3 Electrical Connector**

View looking at connector pins. (Pins are also identified on connector).

## 4. OPERATIONAL CHECK-OUT AND CALIBRATION

### 4.1. Relative Humidity Sensor Check-out

To verify correct wiring and test the basic sensor operation, blow on the sensor. The moisture in your breath should cause the relative humidity reading to rise.

The relative humidity sensor has been calibrated at the factory. To check for proper operation of the sensor it is advised that the output signal be checked against a local weather service facility or a local relative humidity measuring device such as a psychrometer. Due to normal atmospheric and geographical variations, the local weather service data should be used only as a guideline. Ambient air relative humidity can be expected to vary significantly over short distances and in brief periods of time.

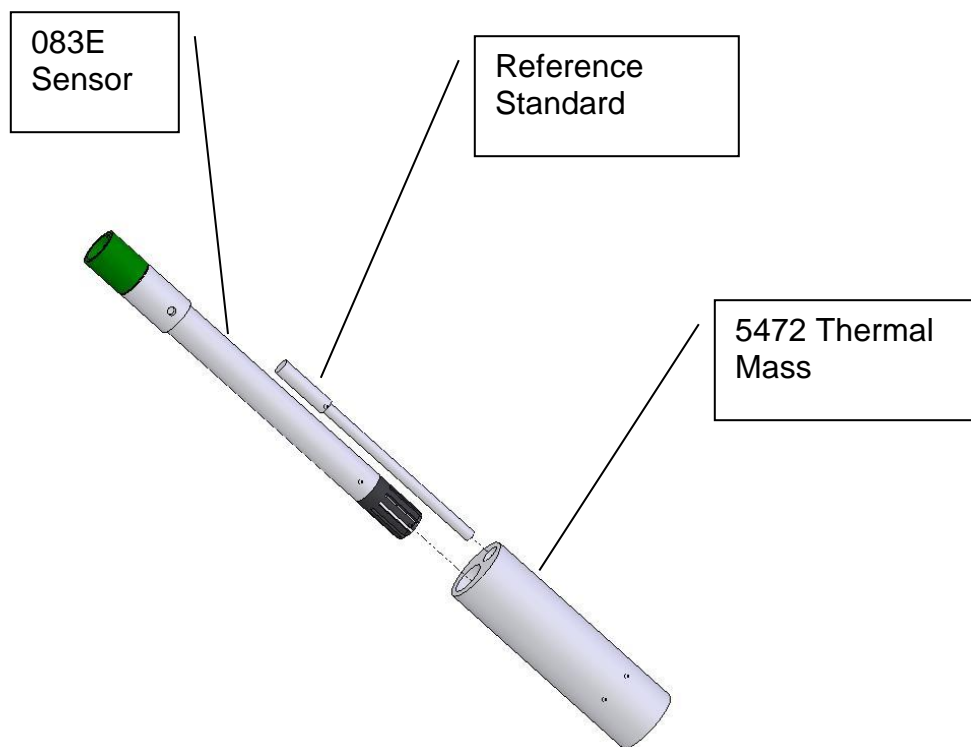
### 4.2. Limitations of RH Measurements at Below Freezing Temperatures

The sensor's relative humidity output is referenced to saturated water vapor pressure above liquid water. When the air temperature is below freezing, the sensor's maximum theoretical measurement range is limited as follows:

Air Temperature (Deg C)	Maximum RH (%)
0	100
-5	96
-10	92
-15	88
-20	84
-25	80
-30	76
-35	72
-40	68
-45	64
-50	60

### 4.3. Temperature Sensor

Compare readings with a precision NIST-traceable temperature sensor. Calibration verification should be performed using a Met One Instruments Model 5472 Thermal Mass to assure that both instruments are at the same temperature. This is an aluminum mass with drilled recesses for the 083E sensor and a standard temperature sensor (NIST thermometer or RTD). The mass can be used in air, or can be partially submerged in ice or an ice bath. The 083E sensor should not be submerged.



**Figure 4 5472 Thermal Mass**

#### 4.4. Temperature Table

##### Model 083E-1-X Temperature vs. Sensor Resistance

Temp ( °C)	RCAL (Ω Ohms)	Temp ( °C)	RCAL (Ω Ohms)	Temp ( °C)	RCAL (Ω Ohms)
-50	158181	-16	49648	18	22404
-49	150561	-15	48389	19	21908
-48	143555	-14	47173	20	21423
-47	137093	-13	45997	21	20949
-46	131114	-12	44861	22	20484
-45	125564	-11	43761	23	20029
-44	120400	-10	42696	24	19583
-43	115583	-9	41665	25	19147
-42	111079	-8	40665	26	18719
-41	106858	-7	39696	27	18300
-40	102895	-6	38755	28	17889
-39	99166	-5	37843	29	17487
-38	95651	-4	36957	30	17092
-37	92333	-3	36097	31	16705
-36	89196	-2	35260	32	16325
-35	86224	-1	34447	33	15952
-34	83406	0	33657	34	15586
-33	80729	1	32888	35	15227
-32	78183	2	32139	36	14875
-31	75760	3	31410	37	14529
-30	73449	4	30700	38	14190
-29	71245	5	30009	39	13856
-28	69138	6	29335	40	13528
-27	67124	7	28677	41	13206
-26	65195	8	28037	42	12890
-25	63348	9	27411	43	12579
-24	61576	10	26801	44	12274
-23	59875	11	26206	45	11974
-22	58242	12	25624	46	11678
-21	56671	13	25056	47	11388
-20	55160	14	24501	48	11102
-19	53705	15	23959	49	10822
-18	52303	16	23429	50	10545
-17	50952	17	22911		

RANGE -50 °C - +50°C (-58°F to +122°F)

YSI THERMISTOR BEAD **44212**

$$T_c = (((R_t^{-1}) + (23100^{-1}))^{-1}) - 13698.3) / -129.163$$

$$R_t = (((-129.163 T_c) + 13698.3)^{-1}) - 23100^{-1})^{-1}$$

Where: T<sub>c</sub> = Temperature in °C

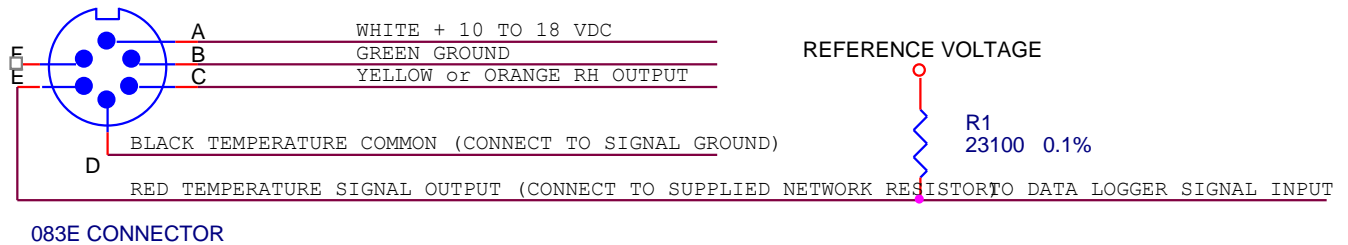
R<sub>t</sub> = Sensor Resistance in Ω Ohms

#### 4.5. Temperature Sensor Data Logger Connection

The voltage across the sensor is linear with temperature when a precision 23100Ω ±0.1% resistor (Met One Instruments part number 805030) is connected in series with excitation voltage. This resistor is provided as part of all Met One Instruments translators designed for use with this sensor, and is included with Met One Instruments data loggers configured for this sensor. For applications with other equipment, contact Met One Instruments to obtain this special resistor. Maximum recommended excitation is 3.2V. Higher excitation voltage will cause self-heating of the thermistors, and resultant temperature measurement errors.

Reference Voltage	-50.0 °C	+50.0 °C
1.000	0.872 VDC	0.313 VDC
2.000	1.744 VDC	0.625 VDC
2.500	2.180 VDC	0.7825 VDC
5.000 (DO NOT USE)		

Signal Voltage vs. Temperature for Various Excitation Voltages



#### Data Logger Connection

## MAINTENANCE AND TROUBLE SHOOTING

### 4.6. General Maintenance Schedule

6 – 12 Month Intervals:

Inspect the sensor for proper operation per Section 4.0.

12 Month Interval:

Return the sensor to Met One Instruments for calibration.

Replace the two 720050 O-Rings.

Replace the 860014 Filter Membrane.

### 4.7. 083E Relative Humidity Sensor Maintenance and Calibration

***WARNING: The sensor can be incorrectly calibrated or permanently damaged through improper acts. Do not attempt a repair or calibration if you are unsure of the procedure. Do not touch the sensor element if you do not know the correct procedure.***

***The instrument should operate for an extended period of time with a minimum of care or maintenance.***

***The sensor should be re-calibrated every 12 months.***

***If parts or maintenance assistance are required, contact Met One Instruments. Obtain shipping instructions and a return authorization (RA) before returning any unit.***

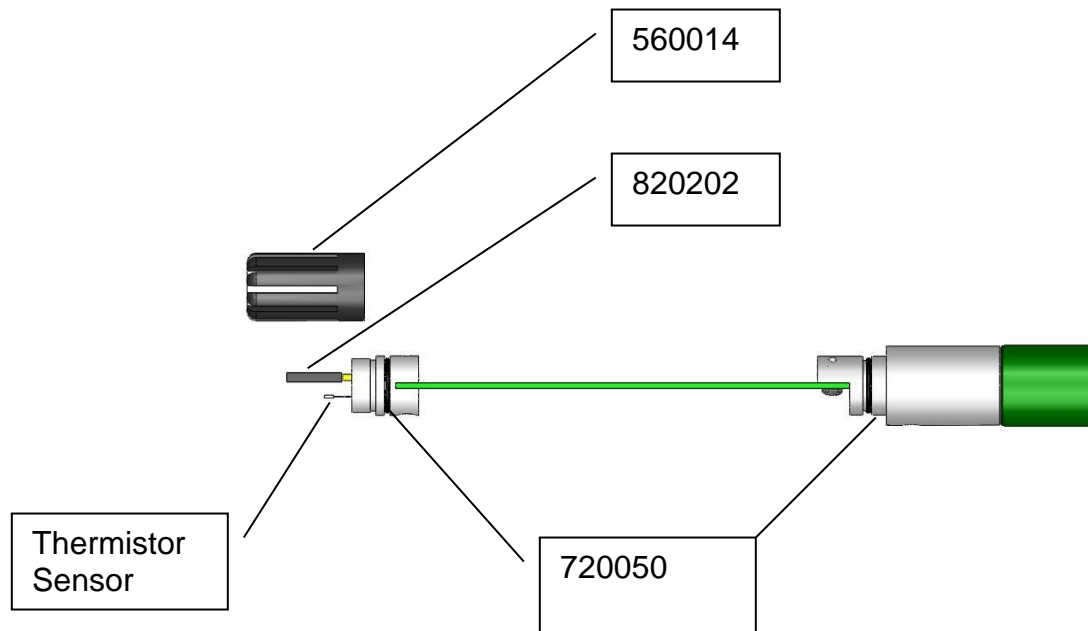
### 4.8. Sensor Maintenance

#### 4.8.1. Sensor Element

The RH sensor element is not user-replaceable (replacement requires sensor recalibration). If the element becomes damaged please send the 083E sensor to Met One Instruments for repair. Please obtain shipping instructions and a return authorization (RA) number before returning any unit.

Met One Instruments manufactures an RH Calibration Kit part number 10233 which can be purchased to perform a calibration after the sensor element is replaced. Please contact the Met One Service Department to purchase the calibration kit.

#### 4.8.2. Spare Parts



**Figure 5 Spare Parts**

820202	RH SENSOR ELEMENT (Requires factory calibration)
560014	FILTER, MEMBRANE
720050	O-RING (Two required)



## 5. Operational Specifications

### Relative Humidity

Model Number:	083E
RH Sensing Element:	Thin film polymer capacitor
Range:	0 to 100% RH
Temperature Operation Range:	-50° C to +50° C (-58° F to 122° F)
Response Time:	10 sec. with 2 m/s aspiration
Accuracy:	± 2.0% from 0 to 100% RH
Temperature Coefficient:	Compensated internally
Output:	0 to 1 VDC Standard 0 to 5.0 VDC Optional
AutoMet Auto ID:	No

### Temperature

Temperature Sensor:	Thermistor
Temperature Range:	-50° C to +50° C (-58° F to 122° F)
Accuracy	±0.10° C (0.18° F)
Output:	Resistive
AutoMet Auto ID:	No

### General

Input Power	10 to 18 VDC @ < 5 mA
Dimensions	Length: 8.5 in (21.59 cm) Diameter: 0.75 in (1.91 cm)