

# ***Thunder Scientific Corporation***



***Model 5A-1MP***  
*Laboratory Reference Psychrometer*

Humidity Generation,  
Calibration and Measurement



# Model 5A-1MP

## Laboratory Reference Psychrometer

### FEATURES

- Traceable to NIST
- Direct NIST Certification Available
- Guaranteed  $\pm 1\%$  Accuracy;  $\pm 0.5\%$  Typical
- 1 to 100% RH Operating Range
- 0 to 100°C Temperature range
- Superior to all Hygrometers Near Saturation
- Easily Used, Maintained and Calibrated
- Programmable Sample Interval
- RS-232 and IEEE 488 Interface
- No Measurement Hysteresis
- Displays Relative Humidity and Dew Point
- Not Susceptible to Contamination

### DESCRIPTION

The **Model 5A-1MP** Laboratory Reference Psychrometer provides extremely accurate measurements of relative humidity, dew point, and air temperature. The **5A-1MP** is portable, needs no special installation, is simple to use, reliable, and requires very little service to maintain its high accuracy over a long period of time. When properly maintained and utilized, the psychrometer's accuracy can exceed that of any other type of hygrometer in most humidity measuring situations. The **5A-1MP** attains its highest accuracy and is superior to all other hygrometers near saturation.

The **5A-1MP** Laboratory Reference Psychrometer may be used for quick and easy measurements in environmentally controlled rooms, environmental test chambers, and manufacturing areas where humidity sensitive products and materials are produced, etc.. It may be used to measure the atmospheres directly or used to test the humidity monitoring instrumentation controlling these areas.

The **5A-1MP** probe can be placed directly into the environments to be measured without any special preparation. Measurements at high relative humidities (dew points) and at high temperatures can be made quickly and easily as the psychrometer does not require a special heated sampling system.

To operate the instrument, simply fill the probe's water reservoir, connect the cable, and apply power to the instrument. When the probe's aspirator is enabled, the



psychrometer will indicate an accurate relative humidity, dew point, and temperature within 60 seconds.

Printer output is user programmable from one minute to 24 hour print intervals. In the Auto Mode, the probe aspirator will automatically run prior to a sample printout. After printout, the aspirator is disabled until the next sample period is reached. Bi-directional RS-232 and IEEE 488 communication allow remote operation and data retrieval.

### PRINCIPLE OF OPERATION

The **5A-1MP** Reference Psychrometer employs two platinum thermometers. One platinum thermometer is bare and dry and measures ambient temperature. The other platinum thermometer is covered with a cotton wick wetted with pure water. It is maintained wet by drawing water, through capillary action, from the probe's reservoir. The **5A-1MP** psychrometer is normally used with forced ventilation. In normal operation a motorized fan draws the test gas into the probe at a fixed velocity over the platinum thermometers. Airflow provides the mechanism for water evaporation, cooling the wetted thermometer, resulting in a measurable difference between it and the ambient or dry

thermometer. The wetted thermometer temperature corresponds closely to the “thermodynamic wetbulb” or “adiabatic saturation temperature.” Highly accurate formulas relate the wet temperature and the dry temperature to the ambient humidity.

The **5A-1MP** operates using an on board multifunction CPU to perform calculation and measurement functions with relative humidity, dew point, and temperature indications displayed in real time. The embedded computer allows the **5A-1MP** to operate completely unattended in an automated mode, continuously sampling and printing instrument data. Peripheral equipment, such as a computer, may be connected using the bi-directional RS-232C and IEEE 488 interfaces. Virtually all functions available through the keypad are also available through the RS-232 and IEEE 488 interface.

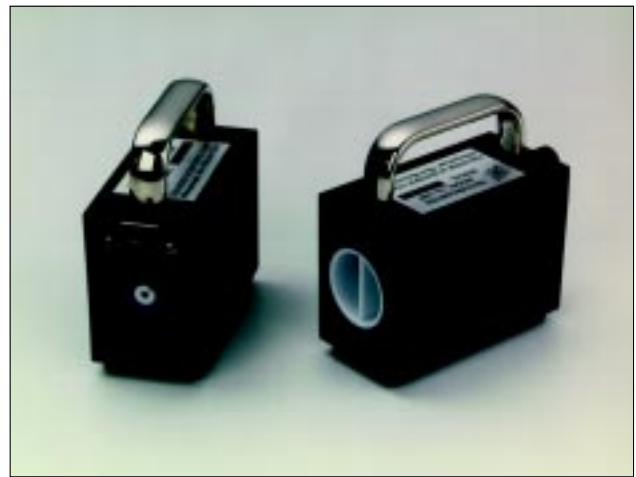
The precision of the psychrometer is determined by the sensitivity, accuracy, and agreement of the temperature measurements, and on the constant air velocity past the wetted platinum thermometer. Proper calibration of the platinum thermometers ultimately determines the accuracy of the **5A-1MP** psychrometer. Calibration of the platinum thermometers is performed by immersing the probe into a temperature bath containing a high dielectric fluid and comparing them to a NIST traceable reference thermometer. While operating the temperature bath over the temperature range of the psychrometer, the resistance of each platinum thermometer is indicated by the **5A-1MP**. From this resistance data, separate mathematical coefficients for each platinum thermometer are computed then downloaded via the RS-232 or IEEE 488 interface for storage into the **5A-1MP**'s nonvolatile memory.

Greater measurement accuracy is achieved by maintaining a wick free of organic films and by the use of high purity water to wet the wick. The surface of the wet element must be maintained clean. This is easily accomplished by directing a steady stream of clean water directly at the wick from the tube tip of a small squeeze bottle. Organic films are quickly washed away by this procedure and may be repeated any time during normal operation of the psychrometer.



### Model CK-1 Wick Changing Kit

This tool kit for probe maintenance contains all of the special tools necessary for periodic field replacement of the wick.



### Model PR101 Probe

The probe is serviceable and has a self contained aspirator fan and wick reservoir. The probe housing is made of 6061-T6 aluminum and has a black anodized finish for long lasting durability.

## APPLICATIONS

**A**ccurate measurements of humidity must be made for many purposes. Virtually any humidity point may be measured, for any length of time, within the operational limits of the psychrometer. The printed data may then be used for analysis.

**Environmental Testing:** The **5A-1MP** Psychrometer provides extremely accurate measurements of relative humidity, dew point, and air temperature when monitoring the effects of humidity on the manufacture, consistency, and storage of humidity sensitive products, e.g., polymers, composites, paper, textiles, tobacco leaves, grain silos, film, magnetic medium, pharmaceuticals, consumables electronics, optics, computer rooms, clean rooms, etc.

**Humidity Sensors:** Compare your humidity sensors to the **5A-1MP** Psychrometer and: determine humidity calibration accuracy; perform operational checks such as the sensing system's capability to correctly calculate and display other humidity parameters; determine the stability and drift characteristics of various humidity sensing systems.

**Chilled Mirror Hygrometers:** Compare your chilled mirror hygrometer to the **5A-1MP** Psychrometer and: verify mirror temperature measurement accuracy (calibration) when the hygrometer is in thermal equilibrium with its environment; perform operational checks of the heatpump and optical components before and after mirror cleaning and balancing; determine if the hygrometer is correctly calculating other humidity parameters.

# Model 5A-1MP

## Laboratory Reference Psychrometer

### SPECIFICATIONS

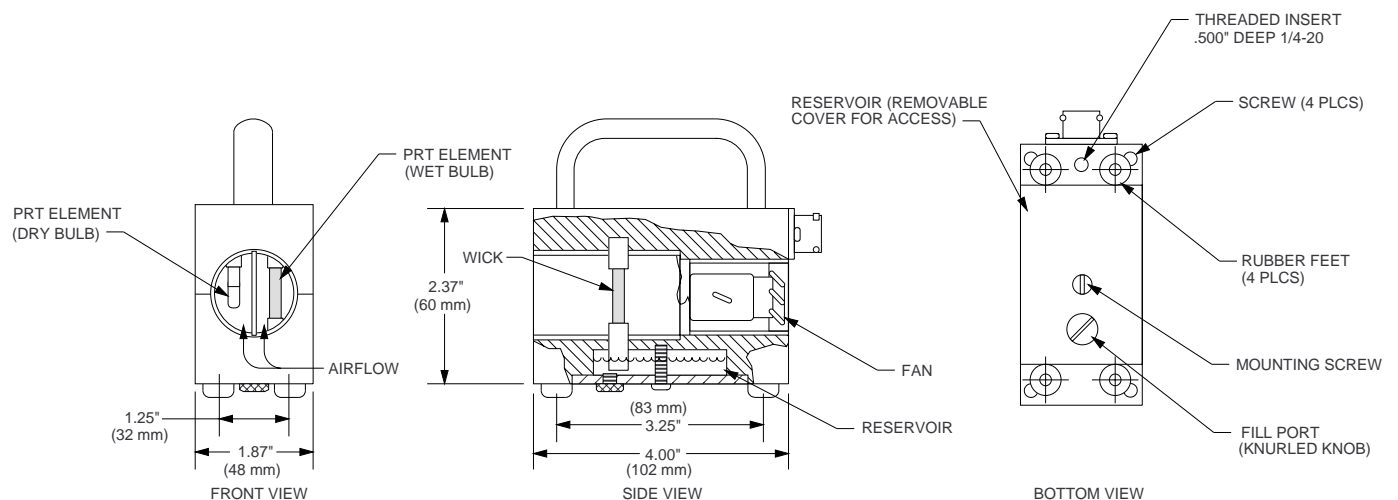
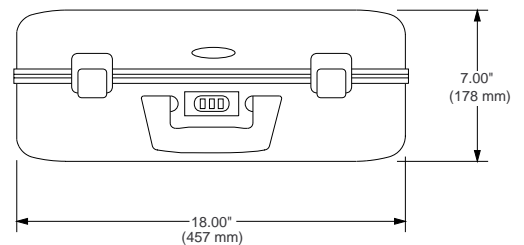
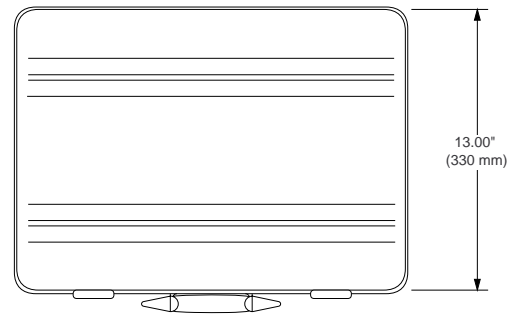
**Relative Humidity Accuracy (Guaranteed):** .....  $\pm 1.0\%$  RH  
**Relative Humidity Accuracy (Typical):** .....  $\pm 0.25\%$  RH  
**Relative Humidity Range:** ..... 1 to 100% RH  
**Relative Humidity Resolution:** ..... 0.01% RH  
**Temperature Accuracy (Guaranteed):** .....  $\pm 0.1^\circ\text{C}$   
**Temperature Accuracy (Typical):** .....  $\pm 0.04^\circ\text{C}$   
**Temperature Range:** ..... 0 to  $100^\circ\text{C}$   
**Temperature Resolution:** .....  $\pm 0.01^\circ\text{C}$   
**Dew Point Accuracy (Typical):** .....  $\pm 0.25^\circ\text{C}$   
**Dew Point Range:** .....  $-20$  to  $95^\circ\text{C}$   
**Dew Point Resolution:** .....  $0.01^\circ\text{C}$   
**Physical Dimensions Case:** 18" x 14" x 7" (457 mm x 355 mm x 178 mm)  
**Physical Dimensions Probe:(w/Handle & Connector)** 2" x 4" x 6"  
**Weight:** ..... 18 Pounds (8.16 kg)

**Printer Interface:** ..... Centronics Parallel  
**Computer Interfaces:** ..... RS-232 Serial & IEEE 488

**Power Requirements:** ..... 120 V~, 0.63 A, 50/60 Hz  
 (Optional) ..... 240 V~, 0.30 A, 50/60 Hz

**Operating Temperature:** .....  $15$  to  $30^\circ\text{C}$   
**Storage Temperature:** .....  $0$  to  $50^\circ\text{C}$   
**Humidity:** ..... 5 to 95% Non-condensing

**Recalibration Cycle (Recommended):** ..... One Year  
**Warranty:** ..... One Year



**For More Information or to Place an Order Contact:**



**Thunder Scientific**

623 Wyoming S.E. • Albuquerque, New Mexico 87123-3198  
 Ordering: 800.872.7728 • Tel: 505.265.8701 • FAX: 505.266.6203

[www.thunderscientific.com](http://www.thunderscientific.com)