

**MP 601A
Humidity Probe**

INSTRUCTION MANUAL



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PLEASE, READ THIS FIRST

- Check the product for any physical damage that may have occurred during shipment. We carefully pack and routinely insure all shipments. If any damage has occurred, it is your responsibility to file a claim with the carrier, **prior to returning the damaged product**. Please note that our warranty does not cover damage during shipment.
- Prior to installation, get fully familiarized with important information provided in this manual such as: supply voltage, electrical connections, adjustments, operating limits. A label located on the barrel of the probe provides the main technical data.
- Do not unnecessarily remove the sensor protection (slotted cap or dust filter) from the probe. Both sensors (humidity and temperature) can be mechanically damaged by careless removal of the protection. The ROTRONIC HYGROMER™ humidity sensor looks like a small white paper tag. Do not remove from the probe!

Each ROTRONIC instrument is carefully checked before shipment. If you have any question or problem, please call our service department at 631/427-3898 and press 5 (or ask for extension 21).

DESCRIPTION

The MP601A is an OEM humidity probe designed primarily for manufacturers of meteorological systems. Operation from a DC voltage and low power consumption make the MP601A particularly suitable for integration with data acquisition systems that operate at remote locations. The probe provides a linear 0..1V output signal that corresponds to 0..100%RH. Energizing of the probe is required for only 0.25 seconds during each measurement.

Use of the HYGROMER C94 humidity sensor results in exceptional resistance to contaminants. The MP601A can be used over long periods of time without any maintenance or recalibration. The HYGROMER C94 sensor maintains its accuracy over the full range of humidity, even at conditions close to condensation. The MP601A features electronic temperature compensation of the humidity sensor. The probe is equipped with an NTC temperature sensor that is used exclusively to provide data to the temperature compensation circuit.

Separate power and signal grounds permit use of a long length of cable without loss of signal accuracy. The sensor bulkhead of the MP601A has two spare pins that can be used to attach a temperature sensor such as a thermistor or an RTD (2-, 3- or 4-wire connection).

OPERATION

1. Power Supply

The MP601A accepts an unregulated supply voltage between 4.8 and 30.0 VDC. The maximum current consumption is 2.5 mA.

The MP601A does not have to be continuously energized. Measurements require that the probe be energized for 0.25 seconds after which the power can be turned off to conserve energy.

2. Output Signal

The MP601A provides one linearized voltage output signal corresponding to relative humidity:

0...1.0 VDC = 0 to 100%RH

Do not connect a load to the output with an impedance of less than 1000 Ω .

IMPORTANT: At all temperatures, the relative humidity signal is referenced to the saturation vapor pressure over water. When relative humidity is defined in that manner, conditions of saturation (maximum signal) at temperatures below freezing are generally less than 100%RH:

| TEMPERATURE | SATURATION |
|-------------|------------|
| 0°C | 100 %RH |
| -10°C | 90.7 %RH |
| -20°C | 82.3 %RH |
| -30°C | 74.6 %RH |
| -40°C | 67.8 %RH |

3. Temperature Limits

The MP601A can operate within -40°C and +60°C. Operating the MP601A outside of the temperature limits may result in inaccurate measurements and can permanently damage the unit.

4. Humidity Limits

The MP601A can operate within 0 and 100 %RH. Direct condensation does not damage the sensor. However, the humidity sensor will not provide correct readings as long as condensation is present.

5. Temperature Compensation

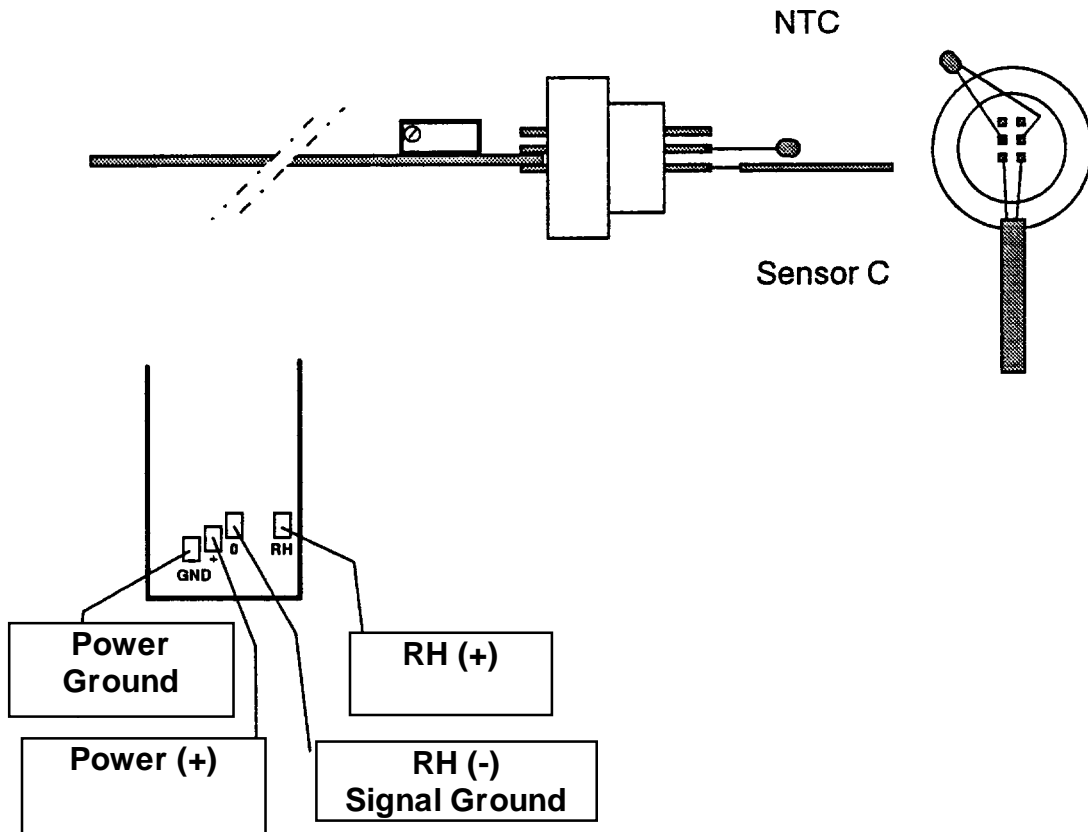
Practically every make of relative humidity sensor requires a compensation for the effect of temperature on the humidity output signal in order to provide accurate measurements over a wide range of temperature conditions. In the specific case of an instrument using a capacitive sensor, compensation is required because the dielectric characteristics of both the water molecule and the hygroscopic polymer used in the sensor vary with temperature. The MP601A is equipped with an NTC temperature sensor, located next to the humidity sensor, which is used exclusively for the purpose of compensating the humidity sensor. This sensor should not be used for measuring temperature since it would not provide sufficient accuracy. Compensation is automatically done by the electronic circuit of the MP601A, based on the data provided by the NTC sensor.

6. Sensor Protection

As a standard, the MP601A is supplied with a D25 wire mesh dust filter. **We strongly recommend to always use the filter.** The wire mesh filter is suitable for most applications. Coastal and marine applications usually require use of an MF25-MP foam filter.

WIRING

Because the MP601A can be wired in different manners, it is provided without a cable. The board of the MP601A is equipped with 4 solder pads which are used to attach the power and signal cable.



Note: Power Ground and Signal Ground are internally separated on the board by two 100 k Ω resistors in series.

A) Shared Signal and Power Ground Wire

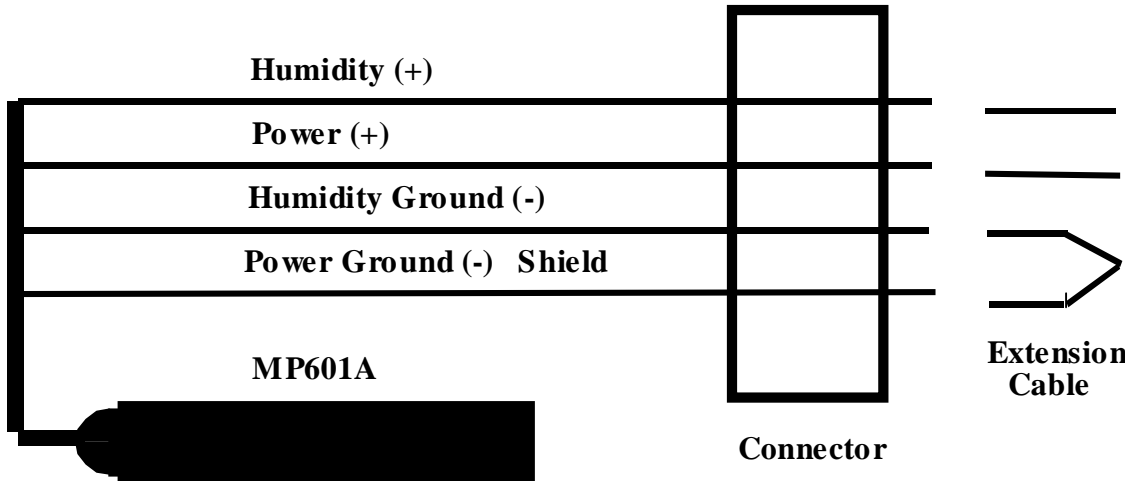
This configuration economizes one wire and may be used for cable lengths up to 6.5 ft (2 meters). On the board of the MP601A, bridge the power ground and signal ground solder pads. Attach both the cable shield and the ground wire to the Power Ground pad.

B) Separate Signal and Power Ground Wires

With this configuration, separate wires are used for signal ground and power ground. The 2.5 mA used to power the probe do not flow in the signal ground wire. This permits cable lengths of up to 330 ft (100 meters). Attach both the cable shield and the ground wire to

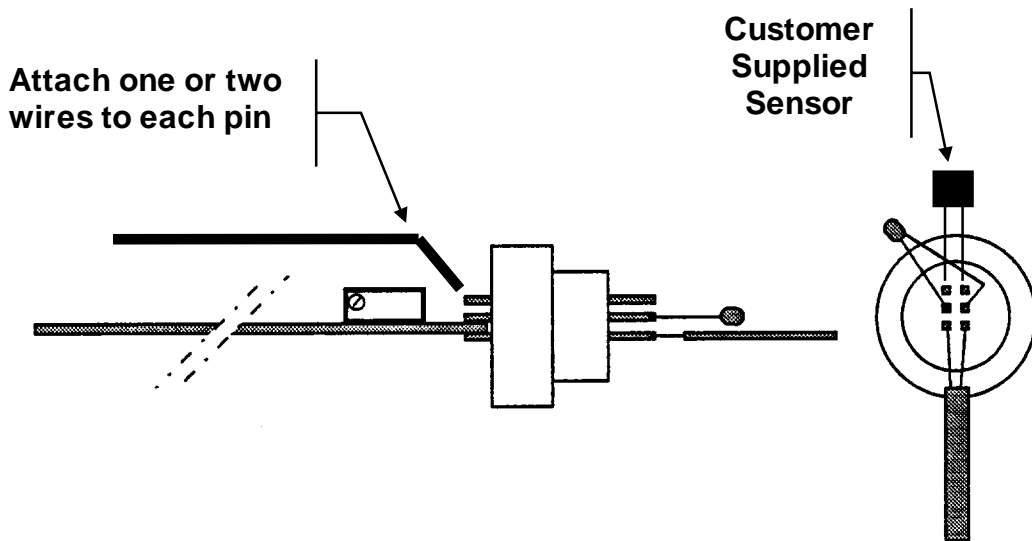
Power Ground pad. The signal ground wire and the power ground wire should be bridged at the opposite end of the cable.

Note: Since the probe will have to be removed from its location to be calibrated from time to time, we do not recommend using a single long length of cable. Instead of this, attach a short cable to the probe and provide an extension cable with a maximum length of up to 330 feet (100 meters).



C) Adding a Temperature Sensor

The sensor bulkhead of the MP601A has two free pins that may be used for adding a temperature sensor. This can be a thermistor, a RTD (2-, 3- or 4-wire connection) or another type of sensor.



INSTALLATION

1. Probe Location

Install the probe so that the local conditions at the sensors are typical of the environment to be measured:

- Use either a shield or a shelter to protect the probe and sensors from direct exposure to solar radiation and precipitation. Several shields are available from ROTRONIC (see specifications).
- In an open field, install the probe at least 3.3 feet (one meter) above ground. Increase this distance if the ground surface is concrete or black top (such as above a roof).

2. Grounding

Operation of the MP601A does not require that the unit be electrically grounded. However, we strongly recommend grounding the (-) side of the supply voltage to the probe.

MAINTENANCE

1) Cleaning or Replacing the Dust Filter:

Any filter insert should be cleaned or replaced from time to time, depending on the conditions of measurement. Cleaning should be done without removing the filter from the probe. Gently wipe the filter with a solution of water and mild detergent. If this does not remove most of the stains, the filter should be replaced. To do this, unscrew the filter from the probe. When removing the slotted cap, make sure that the sensors do not get caught. The humidity sensor is sometimes mistaken for a "white paper tag". Do not remove from the probe! Before putting on the slotted cap, check the alignment of the sensors with the probe. The wires that connect the sensors to the probe are very thin and bend easily. If this happens, correct the alignment by holding the sensor very gently with a pair of small flat nosed pliers. Do not puncture the sensor with sharp pliers or tweezers or pull too hard on the sensor.

2) Periodic Calibration Check:

Long term stability of the humidity sensor is typically better than 1 %RH per year. For maximum accuracy, calibration of the unit may be verified every 6 to 12 months.

Applications where the probe is exposed to significant pollution may require more frequent verifications. The calibration procedure is described in detail in this manual.

CALIBRATION BASICS

1. Humidity Calibration

When calibrating humidity, **temperature stability is the single most important requirement**. Do not calibrate unless the probe is at room temperature (20 to 25°C) and this temperature is stable to $\pm 0.25^\circ\text{C}$ or better during the period of time required for each calibration point. Do not calibrate close to an air vent or a heater, in direct exposure to sun rays, etc. If necessary during calibration, place the tip of the probe with the calibration device on it (see below) inside an insulating box filled with sand.

a) Calibration Device:

The calibration device is a small airtight container that fits on the instrument probe and seals around the humidity sensor. During calibration, a known reference humidity is produced inside the calibration device by means of a humidity standard (usually an aqueous salt solution).

The calibration device model EM25 fits the MP601A. To install on the probe, remove the sensor protection (dust filter) and screw in its place the calibration device. Be very careful during this operation since the sensors are not mechanically protected.

b) Humidity Standards:

RIC humidity standards permit calibration by non-skilled personnel. These standards are available in boxes of 5 glass ampoules of the same value, which can be stored indefinitely. Standards in the range of 5 to 95 %RH are non-saturated aqueous salt solutions that are precisely titrated at our factory for the right concentration. The 0 %RH humidity standard is made of small granules of a highly porous ceramic that have been dried at a high temperature. A Material Safety Data Sheet is available for each standard. Since most standards are a salt solution, parts which have come in contact with the liquid should be cleaned after each use.

2. Temperature Calibration

If a temperature sensor was added to the probe, it may be necessary to calibrate temperature from time to time. In order to be able to correctly evaluate the accuracy of the temperature measurements provided by the probe, you should be able to meet the following requirements:

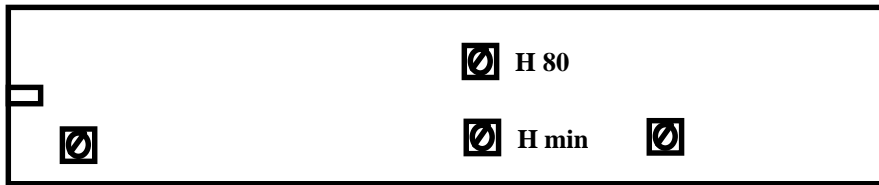
- Both the probe and a reference thermometer should be ventilated with the same stream of air. Any dust filter used to protect the sensors should be removed from the probe.

- Air velocity should be within the limits of 200 to 500 feet/minute (1 to 2.5 meters/second). Any comparison between two instruments at velocities under 200 feet/minute may not be valid. Air velocity above 500 feet/minute may damage the unprotected humidity sensor.
- The temperature of the air stream should be as constant as possible.

CALIBRATION PROCEDURE

1. Calibration Potentiometers

To access the calibration potentiometers unscrew the cable grip so as to free the cable. Next, remove the 3 screws located near the tip of the probe. Carefully pull back the probe barrel over the cable to gain access to the electronic board.



2. Calibration Procedure

Calibration should be done exactly in the sequence indicated in this manual. The first calibration adjustment should be at 35 %RH or at a value close to that.

- Install the calibration device on the probe so that the receptacle (or solution holder) is below the sensors. Remove the receptacle from the calibration device.
- Connect a voltmeter to the Signal (+) and Signal Ground (-) wires.
- Set the H80 potentiometer in mid position.
- Place one fiber disc (each box of RIC humidity standards includes 5 discs) in the receptacle of the calibration device. The purpose of this disc is to prevent accidental spilling of the solution inside the calibration device or on the humidity sensor.
- Tap the top of one ampoule of 35 %RH solution so that all liquid drops to the bottom of the ampoule. Snap off top and empty contents on fiber disc. **Since the ampoule is**

made of glass, exercise proper caution (gloves, safety glasses) when snapping off the top.

- Put the receptacle back on the calibration device and make sure that the solution does not come in contact with the sensor: **The solution inside the calibration device should never be on top of the sensors.**
- Allow at least 60 minutes to insure that the calibration device, the solution and the sensor are in a state of equilibrium. This is verified by monitoring the voltmeter.
- At equilibrium (stable output signal), adjust the reading of the voltmeter with the H35 potentiometer.
- Remove the receptacle from the calibration device. Throw away the wet disc (non reusable). **Thoroughly wash and dry the receptacle with a soft tissue, removing all traces of the humidity standard.**

Use 80 %RH as the second calibration value as this provides the best overall accuracy over the full range of measurement.

- Repeat the procedure used for the 35 %RH adjustment with an 80 %RH standard. Allow at least 60 minutes for equilibrium.
- At equilibrium, adjust the probe output with the H80 potentiometer
- Remove the receptacle from the calibration device and clean thoroughly.

The low humidity calibration is the last step of the calibration sequence.

- Repeat the procedure used before with either a 10%RH or a 0 %RH standard. Allow at least 90 minutes for equilibrium.
- At equilibrium, adjust the probe output with the H min potentiometer
- Carefully remove the calibration device from the probe (pay attention not to catch the unprotected sensors). Put the dust filter back on the probe. Thoroughly clean the receptacle.

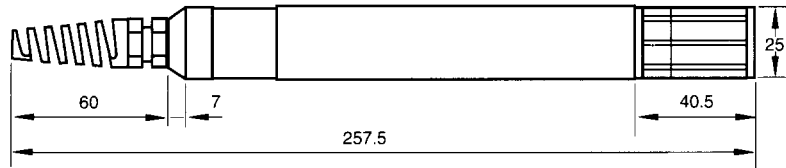
SPECIFICATIONS

| | |
|---------------------------------|---|
| Model | MP601A Meteorological Humidity Probe |
| Humidity Sensor | ROTRONIC HYGROMER™ C94 |
| Humidity Measuring Range | 0..100 %RH |
| Temperature Operating Limits | -40..+60°C |
| Humidity Output Signal (linear) | 0..1.0 VDC = 0..100%RH |
| Output Minimum Load | 1000 Ω |
| Accuracy (at 20..25°C) | ± 1 %RH from 0 to 100%RH *) |
| Repeatability | ± 0.3 %RH |
| Humidity Sensor Stability | better than 1 %RH over a year |
| Response Time (without filter) | 10 seconds |
| Calibration Potentiometers | 35, 80%RH and RH min. |
| Supply Voltage | 4.8 to 30.0 VDC |
| Max. Current Consumption | 2.5 mA when powered with 12 VDC or less |
| Sensor Protection | Standard: D25 wire mesh filter Optional: MF25-MP foam filter |
| Cable | User provided and installed |
| Weight | 70g (0.16lb) |

*) When calibrated against highest quality reference standards. Both factory calibration and field calibration with ROTRONIC standards result in ±1.5%RH accuracy or better.

Accessories (order separately)

| | |
|---------------------------|---------------------------|
| Natural Aspiration Shield | SMP-41002 |
| Motor Aspirated Shield | MAS-41003 (12 VDC, 75 mA) |
| Calibration Device | EM25 |



Dimensions in mm / Modifications Reserved