MP 101A
HUMIDITY TEMPERATURE PROBE

INSTRUCTION MANUAL

CONTENTS

DESCRIPTION 3
OPERATION 3
INSTALLATION 4
MAINTENANCE 7
CALIBRATION BASICS 7
CALIBRATION PROCEDURE 8
SPECIFICATIONS 11

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.

Each ROTRONIC instrument is carefully calibrated before shipment. No further adjustments should be required before installation. 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 MP101A is a combined humidity and temperature probe designed primarily for outdoor applications. Operation from a DC voltage and low power consumption make the MP101A particularly suitable for operation at remote locations. Energizing of the probe is required for only 0.25 seconds during each measurement. The linear output signals are consistent with the requirements of most data acquisition systems.

Use of the HYGROMER C94 capacitive humidity sensor results in exceptional resistance to contaminants. Advanced filter technology provides further protection. The MP101A can be used over long periods of time without any maintenance or recalibration.

The MP101A is available in 2 basic configurations:

- MP101A-C4/5 with 2 meters hard wired cable terminated by a connector (4 or 5-pin).
- MP101A-T7 with a 7-pin connector directly on the probe.

The probe MP101A-C4 is supplied with a 4-pin CANNON connector and is fully interchangeable with the previous probes of the MP100 series. When the application requires a total length of cable in excess of 6.5 ft (2 meters), either the probe MP101A-C5 or the probe MP101A-T7 should be used. Both probes feature a compensation that eliminates potential errors resulting from cable resistance for lengths up to 330 ft (100 meters).

OPERATION

1. Power Supply

The MP101A accepts an unregulated supply voltage between 4.8 and 30 VDC. The current consumption is 10 mA.

The MP101A 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 Signals

The MP101A provides two linearized voltage output signals: one for humidity and the other for temperature.

Relative humidity Output Signal (linear)	0...1.0 VDC = 0 to 100%RH
Temperature Output Signal (linear)	Standard: -0.4..0.6 VDC = -40..+60°C Optional: 0.0..1.0 VDC = -40..+60°C Optional: 0.0..1.0 VDC = -30..+70°C

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

3. Temperature Limits

The MP101A can operate within -40°C and +60°C. Operating the MP101A outside of the temperature limits may result in inaccurate measurements and can permanently damage the unit.

4. Humidity Limits

The MP101A can operate within 0 and 100 %RH. Direct condensation on the sensors does not damage the sensors. However, the humidity sensor will not provide correct readings as long as condensation is present. The MP101A provides a humidity output that is referenced to the saturated water vapor pressure above liquid water. With this reference, the maximum humidity temperatures below freezing is as follows:

100 %RH at 0°C	95 %RH at -5°C	91 %RH at -10°C
87 %RH at -15°C	82 %RH at -20°C	78 %RH at -25°C
75 %RH at -30°C		

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 measure accurately 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 electronic circuit of the MP101A uses data from the temperature sensor to automatically compensate the effect of temperature on the accuracy of humidity measurement.

6. Sensor Protection

Always use the dust filter provided with the probe to protect the sensors.

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 MP101A does not require that the unit be electrically grounded. However, we strongly recommend grounding the (-) side of the supply voltage to the probe.

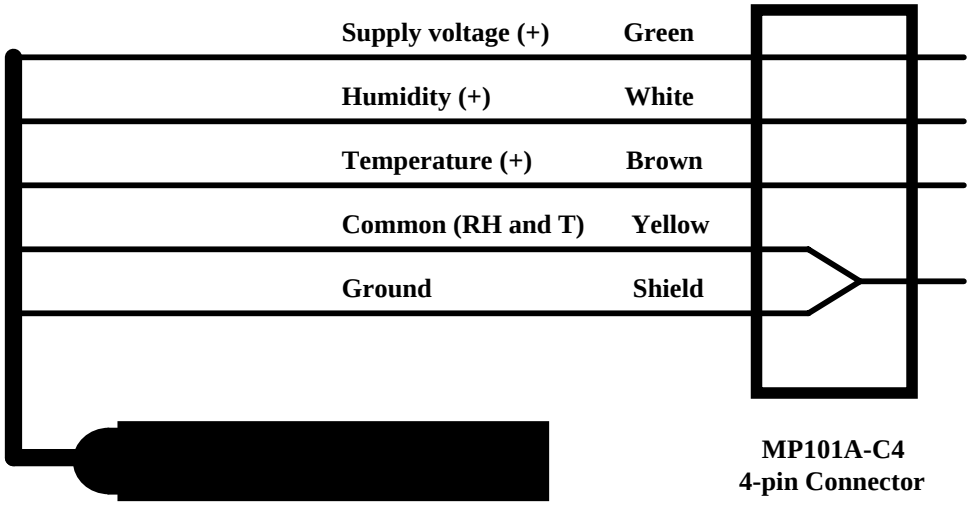
3. Wiring

Before connecting the probe, please make sure that there is no wiring error. Improper wiring may damage the probe.

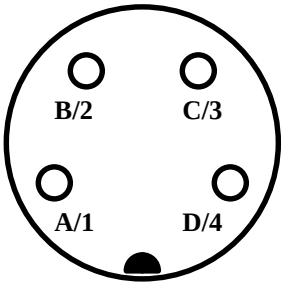
The different models of connector supplied with the MP101A are designed for outdoor use. Since the probe will have to be removed from its location to be calibrated from time to time, we do not

recommend replacing the cable supplied with the probe cable with a longer cable. Instead of this, use an extension cable with a maximum length of up to 330 feet (100 meters).

MP101A-C4: To provide interchangeability with older probes, a 4-pin connector is used on this model. Preferably, this probe should not be used with an extension cable since this additional cable length will not be compensated. The ground wire of the supply voltage and the common wire of the output signals are soldered to the same pin at the 4-pin connector.



MP101A-C4
4-pin Connector



A or 1: Green **Supply Voltage +**

B or 2: Yellow & Shield **Ground and Common**

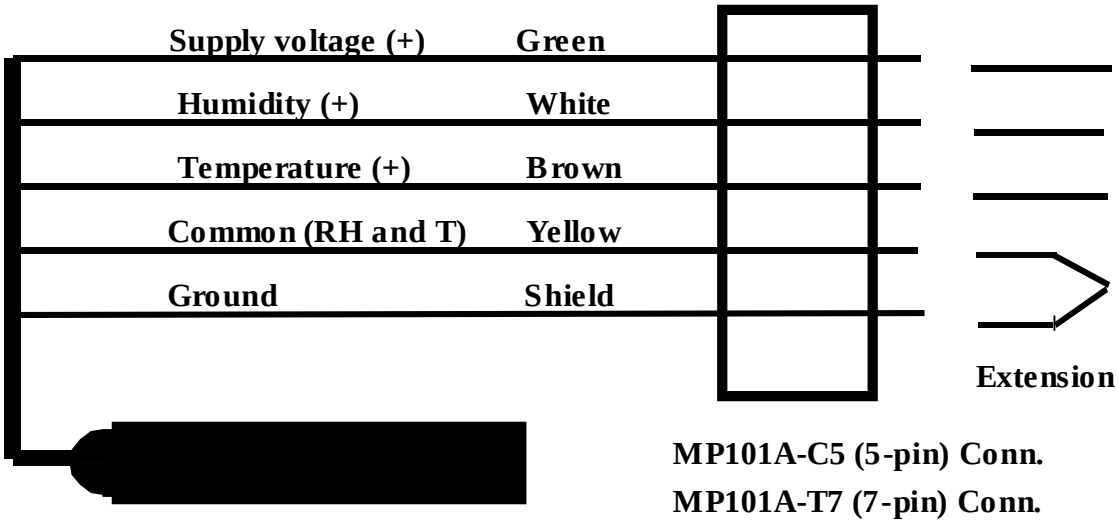
C or 3: White **%RH (+)**

D or 4: Brown **Temp. (+)**

Amphenol Connector Part Numbers:

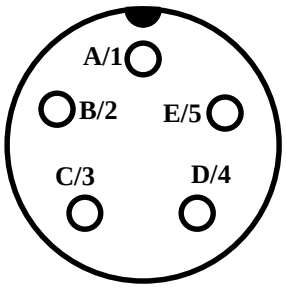
Plug:	MS3106A-14S-4P
Clamp:	MS3057-6A
Mating:	MS3101A-14S-4S

MP101A-C5 and MP101A-T7: Both models permit the use of up to 330 feet (100 meters) extension cable. A 5-pin connector (MP101A-C5) or a 7-pin connector (MP101A-T7) is used to separate the ground wire of the supply voltage from the return (or common) wire of the output signals. On a long extension cable, the 10 mA flowing to the probe would otherwise create a voltage drop and an error on the output signals. For compensation purposes, the two wires should be joined together at the end of the extension cable (see drawing below).



MP101A-C5 (5-pin) Conn.
MP101A-T7 (7-pin) Conn.

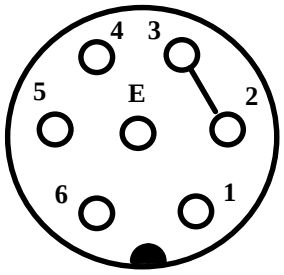
MP101A-C5



A or 1: Green Supply Voltage (+)
B or 2: Yellow Common
C or 3: White %RH (+)
D or 4: Brown Temp. (+)
E or 5: Shield Ground

Amphenol Part Number: Plug MS3106A-14S-5P
Clamp MS3057-6A
Mating MS3101A-14S-5S

MP101A-T7



1: Green Supply Voltage (+)
2 & 3: Ground
4: Brown Temp. (+)
5: Yellow Common
6: White %RH (+)

Consult factory for part number.

MAINTENANCE

1) Cleaning or Replacing the Dust Filter:

The dust filter should be cleaned 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 filter, 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 a new dust filter, check the alignment of both 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.

Both the Pt 100 RTD temperature sensor and associated electronics are very stable and should not require any calibration after the initial factory adjustment.

CALIBRATION BASICS

1. Temperature Calibration

The stability of the Pt100 RTD sensor used to measure temperature is such that temperature calibration in the field is seldom required.

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. If the probe has a slotted cap, this should be left on 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 constant or at least it should not change at a rate that is less than 10 times the shortest time constant of either the probe or reference thermometer.

If you are not able to meet the above requirements, you cannot correctly check the accuracy of temperature measurement and should not attempt to calibrate temperature.

2. 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 ±0.25°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 and Humidity Standards:

The calibration device is a small airtight container that fits on the 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). Calibration device model EM25 fits the MP101A. 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.

The Rotronic humidity 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.

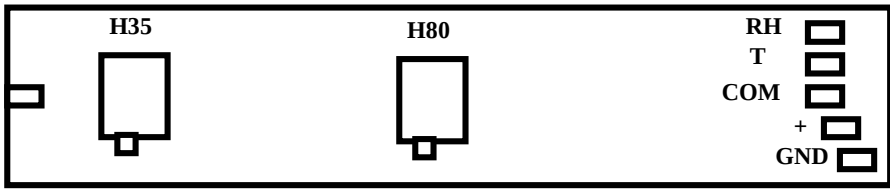
CALIBRATION PROCEDURE

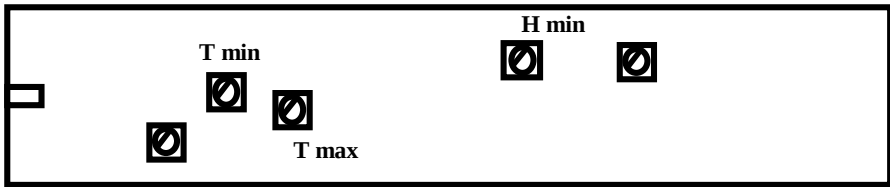
1. Calibration Potentiometers

To access the calibration potentiometers proceed as follows:

a) MP101A-C4 and MP101A-C5: 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.

b) MP101A-T7: remove the 3 screws located near the tip of the probe. Carefully pull out the tip of the probe from the probe barrel to gain access to the electronic board.





2. Calibration Procedure

Full calibration of the MP101A requires a 2-point calibration of temperature and a 3-point calibration of humidity.

Calibration should be done exactly in the sequence indicated in this manual. Because of the high stability of the Pt100 RTD sensor, temperature calibration is optional. However, if temperature calibration becomes necessary, it must be done prior to humidity calibration and must always be followed by a humidity calibration.

2.1 Temperature Calibration (optional)

Should a temperature calibration be necessary, you should proceed as follows, depending on the equipment available to you:

a) Two Temperatures Air Generator:

- Connect a voltmeter to the T (+) and COM (-) terminals.
- Position the T max potentiometer in the middle of its span.
- Set the air generator at 0°C and adjust the probe output with the T min potentiometer. If you cannot go as low as 0°C, you will have to repeat the entire procedure a few times.
- Set the air generator at a temperature such as 40 to 50°C and adjust the probe output with the T max potentiometer.

b) One Temperature Air Generator (Room Temperature)

Remove the Pt100 RTD from the probe and replace it by a decade box that simulates the resistance of the RTD at different temperatures. Adjust the electronic circuit as follows:

- Connect a voltmeter to the T (+) and COM (-) terminals.
- Position the T max potentiometer in the middle of its span.
- Set the decade box to simulate 0 °C.
- Adjust the probe output with the T min potentiometer.
- Set the decade box to simulate a temperature of either 50 or 100°C.
- Adjust the probe output with the T max potentiometer.
- Put the Pt100 RTD back on the probe and check the probe at room temperature. If necessary, adjust the probe output with the T min potentiometer.

After calibrating temperature you should always calibrate humidity since the humidity output is affected by the temperature output.

2.2. Humidity Calibration

The first calibration adjustment should be at 35 %RH or at a value close to that.

- Remove the dust filter and screw 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 %RH (+) and COM (-) terminals.
- 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, 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

Humidity Sensor	ROTRONIC HYGROMER™ C94
Temperature Sensor	Pt100 RTD
Humidity Measuring Range	0..100 %RH
Temperature Measuring Range	See Temperature Limits
Temperature Limits	-40..+60°C
Humidity Output Signal (linear)	0..1.0 VDC = 0..100%RH
Temperature Output Signal (linear)	Standard: -0.4..0.6 VDC = -40..+60°C Optional: 0.0..1.0 VDC = -40..+60°C Optional: 0.0..1.0 VDC = -30..+70°C
Minimum Load per Output	1000 Ω
Accuracy (at 20..25°C)	± 1 %RH from 0 to 100%RH *) ± 0.3°C
Repeatability	± 0.3 %RH and ±0.1°C
Humidity Sensor Stability	better than 1 %RH over a year
Response Time (without filter)	10 seconds (%RH and temperature)
Calibration Potentiometers	35, 80%RH and RH min. Tmin and Tmax
Supply Voltage	4.8 to 30.0 VDC
Max. Current Consumption	10 mA
Connector	MP101A-C4: 4-pin CANNON MP101A-C5: 5-pin CANNON MP101A-T7: 7-pin TUCHEL
Cable Length	MP101A-C4 or C5: 6.5 ft (2 m) MP101A-T7: connector is on the probe
Sensor Protection	Standard: foam filter MF25C Optional: wire mesh filter SP-W25
Weight	70..700g (0.15..1.50 lb)

*) 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