

**MP 100H / MP400H
HUMIDITY TEMPERATURE 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 (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 MPH series are combined humidity and temperature probes designed primarily for outdoor applications. These probes operate from a DC voltage. The MPH series uses the HygroClip S3 digital plug-in probe which features the well proven ROTRONIC Hygromer™ C94 capacitive humidity sensor and a precision Pt100 RTD. Calibration data, sensor characteristics, serial number, etc., are retained in a non-volatile memory within the probe. The HygroClip S3 is fully interchangeable and can be replaced in seconds without loss of accuracy.

The MPH series is available with two types of analog output signals:

MP100H: linear voltage output signals (0...1 V) for %RH and temperature

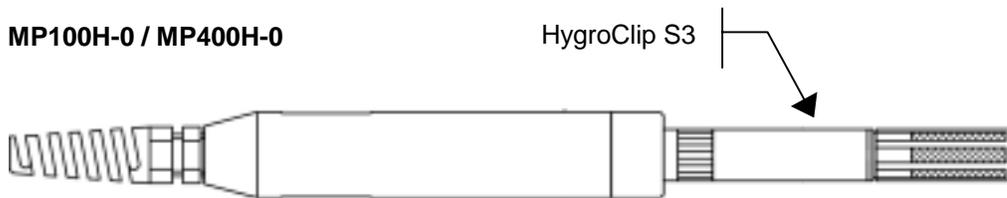
MP400H: linear current output signals (4...20 mA) for %RH and temperature

In addition, the MPH series has a digital input/output (DIO) that is directly connected to the HygroClip S3 probe.

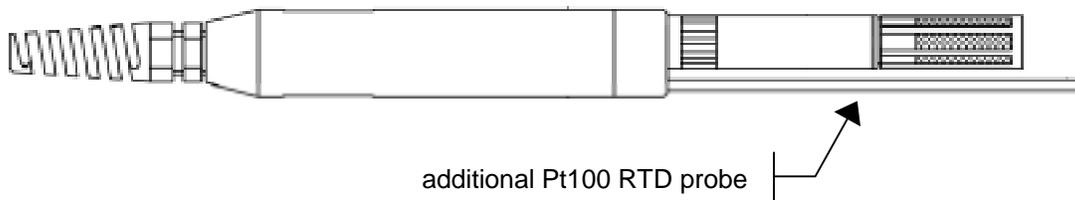
The MPH series offers several choices regarding the temperature output:

- 1) MP100H-0 / MP400H-0: humidity and temperature signals from the HygroClip S3 plug-in digital probe.
- 2) MP100H-1 / MP400H-1: humidity signal from the HygroClip S3 probe and temperature from an additional fast response RTD probe (T2).
- 3) MP100H-4 / MP400H-4: humidity signal from the HygroClip S3 probe and additional RTD probe (T2) with direct 4-wire connection (can also be used as 3- or 2-wire connection). The temperature signal from the HygroClip S3 is also available.

MP100H-0 / MP400H-0



MP100H-1 / MP100H-4 / MP400H-1 / MP400H-4



OPERATION

Power supply and current consumption

- a) MP100H - voltage outputs: 3.6...35 VDC, 10 mA (including HygroClip S3 probe).
Measurements require that the probe be energized for 4 seconds after which the power can be turned off to conserve energy.
- b) MP400H - current outputs: 5 VDC + 0.02 x Load (in ohm), maximum 35 VDC, maximum 45 mA (including HygroClip S3). The MP400H is designed for continuous operation.

Output Signals

- a) MP100H: depending on the model, the MP100H provides the following output signals:

Parameter	Model	Range
Humidity - HygroClip S3	All models	0...1V = 0...100 %RH
Temperature T1 - HygroClip S3 or Temperature T1 - HygroClip S3 and direct connection to additional RTD probe	MP100H-01 MP100H-41	-0.4...0.6V = -40...60°C
	MP100H-02 MP100H-42	0...1V = -30...70°C
	MP100H-03 MP100H-43	0...1V = -40...60°C
Temperature T2 - additional RTD probe	MP100H-11	-0.4...0.6V = -40...60°C
	MP100H-12	0...1V = -30...70°C
	MP100H-13	0...1V = -40...60°C
	MP100H-41 MP100H-42 MP100H-43	direct 4-wire connection can also be used as 2- or 3-wire

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

- b) MP400H: depending on the model, the MP400H provides the following output signals:

Parameter	Model	Range
Humidity - HygroClip S3	All models	4...20 mA = 0...100 %RH
Temperature T1 - HygroClip S3 or Temperature T1 - HygroClip S3 and direct connection to additional RTD probe	MP400H-07 MP400H-17 MP400H-47	4...20 mA = 0...100°C
	MP400H-08 MP400H-18 MP400H-48	4...20 mA = -40...60°C
	MP400H-09 MP400H-19 MP400H-49	4...20 mA = -30...70°C
	Temperature T2 - additional RTD probe	MP400H-17
MP400H-18		4...20 mA = -40...60°C
MP400H-19		4...20 mA = -30...70°C
MP400H-47 MP400H-48 MP400H-49		direct 4-wire connection can also be used as 2- or 3-wire

Do not connect a load to any current output with an impedance of more than 500 Ω.

Temperature Limits

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

Humidity Limits

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

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 HygroClip S3 probe uses data from its own temperature sensor to automatically compensate the effect of temperature on the accuracy of humidity measurement.

Sensor Protection

As a standard, the HygroClip S3 is supplied with a wire mesh dust filter. Marine environments may require the use of a foam filter (part # R83/MF15 – 100% foam or R83/BF15 – foam cartridge and stainless steel base). Always use a dust filter to protect the sensors.

INSTALLATION

Location

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

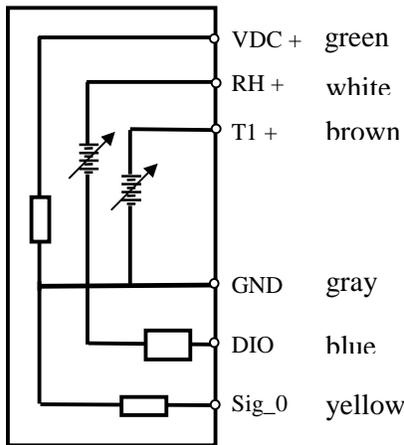
- Use either a shield or a shelter to protect the probe and sensors from direct exposure to solar radiation and precipitation. Several shields are available from ROTRONIC (see specifications).
- In an open field, install the probe at least 6.6 feet (two meters) above ground. Increase this distance if the ground surface is concrete or black top (such as above a roof).

Grounding

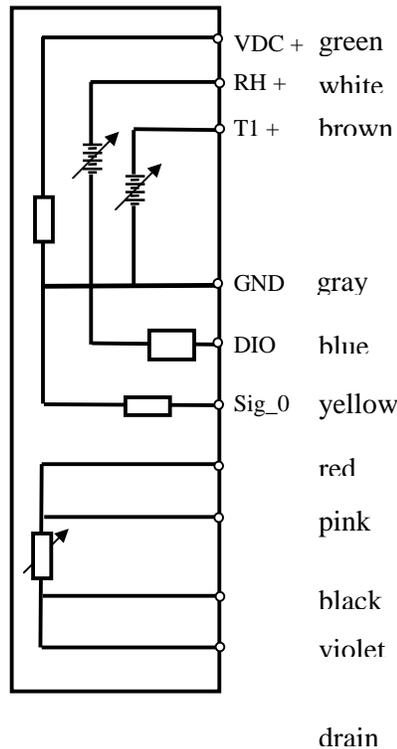
Operation of the MPH does not require that the unit be electrically grounded. However, we strongly recommend grounding the (-) side of the supply voltage to the probe. Note that the cable drain (shield) is not connected to the MP100H / MP400H PCB but that it is connected to ground on the connector end of the cable.

Wiring diagrams

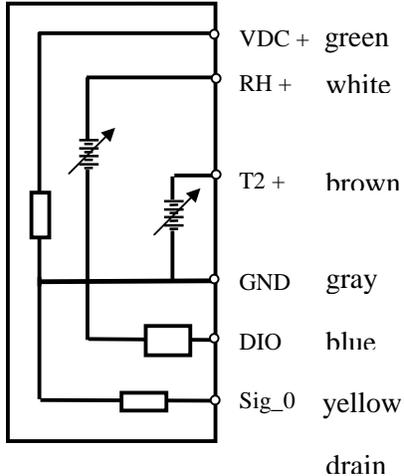
MP100H-0 (no additional RTD Probe)



MP100H-4 (with additional RTD probe)



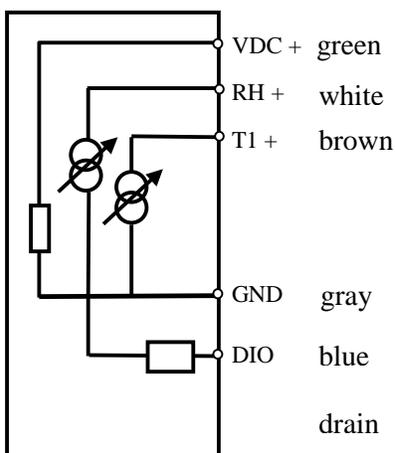
MP100H-1 (with additional RTD Probe)



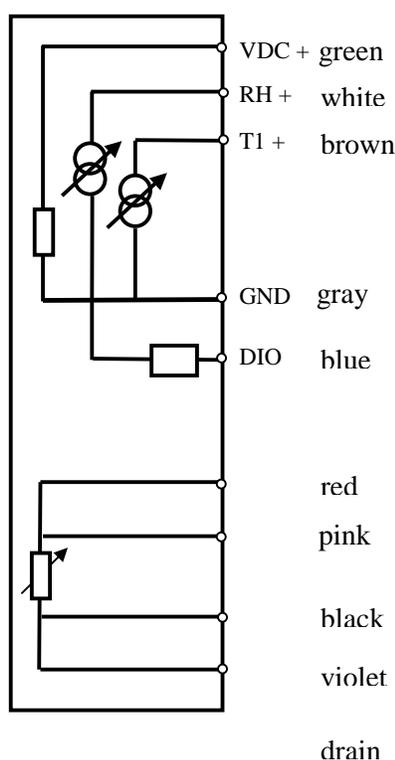
DIO: digital input / output from HygroClip S3

Sig_0: cable length compensation

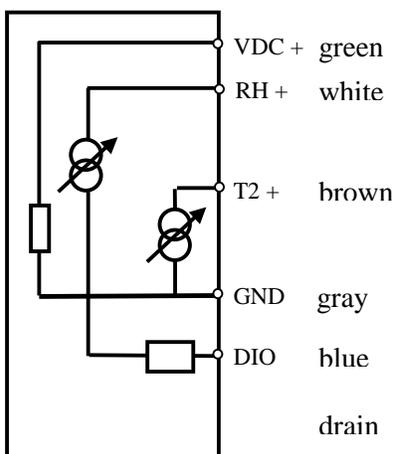
MP400H-0 (no additional RTD Probe)



MP400H-4 (with additional RTD Probe)



MP400H-1 (with additional RTD Probe)



DIO: digital input / output from HygroClip S3

Note regarding the DIO: the DIO provides direct access to the HygroClip S3. The digital format used by the DIO is not directly compatible with the COM port of a PC (RS232). Communication with a PC requires an additional circuit to convert the DIO format into the RS232 format. Customers who wish to use the DIO, should contact ROTRONIC for a description of the digital protocol of the HygroClip probe.

Wiring

The MPH is supplied with 3m (9 ft) of PUR cable with tinned ends. Before connecting the probe, please make sure that there is no wiring error. Improper wiring may damage the probe.

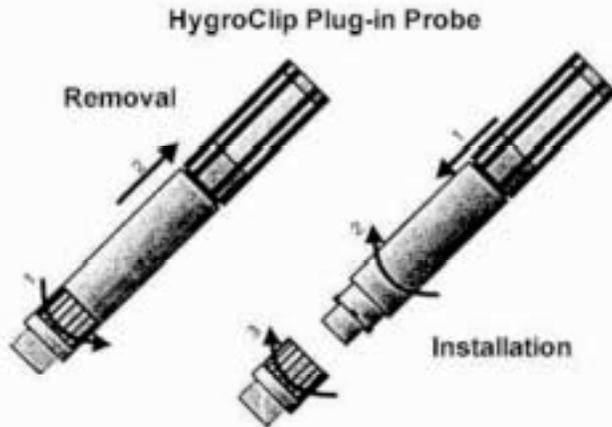
To facilitate maintenance of the probe, keep the probe cable short. Do not replace the cable supplied with the probe with a much longer cable. If a long length of cable is required, use an extension cable with a maximum length of up to 330 feet (100 meters).

The electronic circuit of the MP100H features a compensation of the cable length up to 330 ft (100 meters) so as to avoid a degradation of the voltage signals. To enable this compensation, the wire labeled Sig_0 should be connected together with the GND wire at the end of the connecting cable (or at the end of any extension cable).

Note: no cable length compensation is required with the MP400H (current output signals).

MAINTENANCE

Installation and Removal of the HygroClip S3



Both the HygroClip S3 and the probe base on the MPH are marked with a dot.

The probe can be inserted straight into the connector when the two dots are aligned. When the dots are not aligned, the probe should be rotated clockwise during insertion.

After inserting the probe, turn the locking ring clockwise to secure the probe.

Cleaning or Replacing the Dust Filter of the HygroClip

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.

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.

Periodic Calibration Check

Long term stability of the ROTRONIC Hygromer™ C94 humidity sensor is typically better than 1 %RH per year. For maximum accuracy, calibration of the HygroClip S3 should be verified every 6 to 12 months. Applications where the probe is exposed to significant pollution may require more frequent verifications.

Both the Pt 100 RTD temperature sensor and associated electronics (HygroClip S3 and separated RTD probe) are very stable and should not require any calibration after the initial factory adjustment.

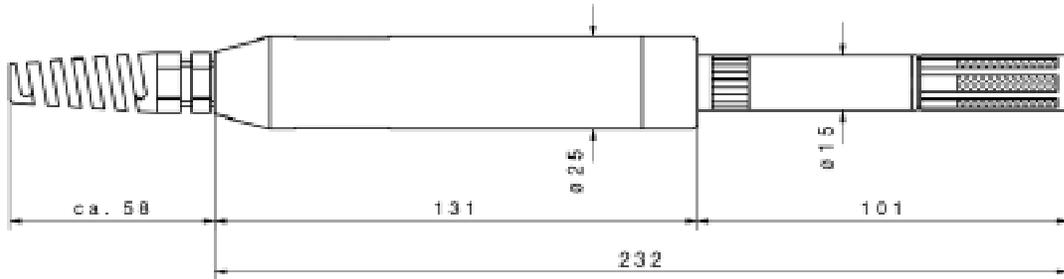
Calibration instructions are provided in appendix 1 and appendix 2 of this manual.

SPECIFICATIONS

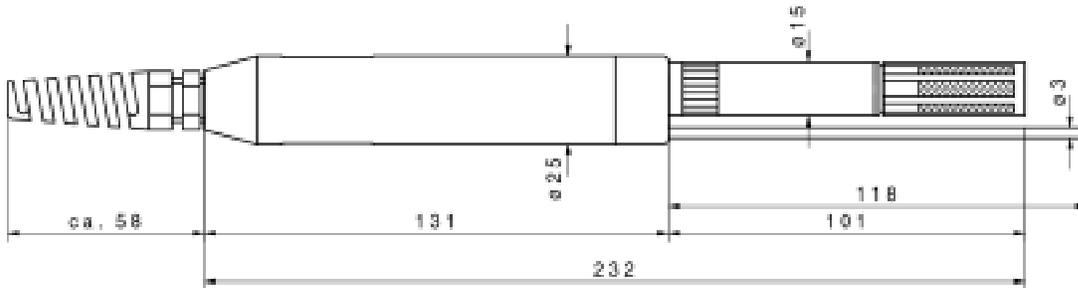
HygroClip S3	Humidity Sensor	ROTRONIC HYGROMER™ C94
Additional Temperature Probe (T2)	Temperature Sensor (T1)	Pt100 RTD 1/3 DIN
Operating / Measuring Range		Pt100 RTD 1/3 DIN (standard)
Humidity Output Signal	MP100H	Pt100 RTD 1/5 or 1/10 DIN (option)
Temperature Output Signal	MP400H	0..100 %RH and -40...60°C
	MP100H (T1 or T2)	0.. 1.0 VDC = 0..100%RH
		4...20 mA = 0...100%RH
	MP100H (T2)	0...1.0 VDC = -40...60°C (standard)
	MP400H (T1 or T2)	-0.4...0.6 VDC = -40...60°C (option)
		0...1.0 VDC = -30...70°C (option)
		direct connection (2-, 3- or 4-wire - option)
	MP400H (T2)	4...20 mA = -40...60°C (standard)
		4...20 mA = 0...100°C (option)
		4...20 mA = -30...70°C (option)
		direct connection (2-, 3- or 4-wire - option)
Accuracy (at 20..25°C)		± 1.5 %RH from 0 to 100%RH
Repeatability		± 0.2°C
Humidity Sensor Stability		± 0.3 %RH and < ±0.1°C
Response Time (without filter)		better than 1 %RH over a year
Minimum Load per Output	MP100H	10 seconds (%RH and temperature)
Maximum Load per Output	MP400H	1000 Ω
Calibration Potentiometers	Additional RTD (T2)	500 Ω
		TT 0 and TT MAX
Supply Voltage	MP100H	(only with voltage or current output)
	MP400H	3.6 to 35 VDC
Max. Current Consumption	MP100H	5 VDC + (0.02 x Load in Ohm), max. 35 VDC
	MP400H	10 mA
Minimum Excitation Time	MP100H	45 mA
Cable		4 sec.
		PUR cable white
		(7- or 10-core, depends on model, options)
Cable Length		3m (9 ft), tinned ends
Cable Length Compensation	MP100H	effective up to 100 m (330 ft)
	MP400H	N/A (current outputs)
Sensor Protection	HygroClip S3	wire mesh filter (standard)
		foam filter BF15 or MF15 (option)
Weight		210g (7.5 oz)
Dimensions		see outline drawings
Accessories (order separately)		
Natural Aspiration Shield	RS41004-7A (16 plates)	
Motor Aspirated Shield	VHTS2-W-00 (white) – 10...16 VDC or 24 VAC	
	VHTS2-EM-00 (Ematal) – 10...16 VDC or 24 VAC	
Calibration Device	ER15 (for HygroClip S3)	
Calibration Cable	MOK-02-WIN (for HygroClip S3 – includes HW3 software)	

OUTLINE DRAWINGS

MP100H-0 / MP400H-0



MP100H-1 / MP100H-4 / MP400H-1 / MP400H-4



Dimensions in mm

Appendix 1: Calibration Basics

Temperature Calibration

Note: 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:

- a) 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 carefully removed from the probe. If the probe has a protective slotted cap, this may be left on the probe.
- b) Air velocity at the sensor should be within the limits of 200 to 500 feet/minute (1 to 2.5 meters/second). Any comparison between two instruments at a velocity under 200 feet/minute may not be valid. Air velocity above 500 feet/minute may damage the unprotected humidity sensor.
- c) The temperature of the air stream should be practically constant.

If you cannot meet the above requirements, you should not attempt to calibrate temperature.

Humidity Calibration

ROTRONIC provides easy-to-use, certified humidity standards for those customer who do not have access to a humidity generator. To use these standards with the HygroClip S3, you will need the calibration device ER15.

Calibration Device

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).

Certified Humidity Standards

The ROTRONIC certified 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.

Each box of standards comes with a certificate that provides statistical information on the manufacturing batch of the standard. Information on the effect of temperature on each standard is provided on the cover of each box of standard. When calibrating either with the HygroPalm or with the HW3 software, the effect of temperature on the standards is compensated by the software and no further correction is required. The value of the standards is not affected by altitude.

Instructions for using the Standards

- Install the calibration device on the probe so that the receptacle (or solution holder) is under the probe. Check for a tight fit and remove the receptacle from the calibration device.
- Place one fiber disc (each box of 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 the ampoule 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 display.
- After adjusting the probe, remove the receptacle from the calibration device. Throw away the wet disc (non reusable). Thoroughly wash and dry the receptacle.

General Recommendations

During calibration, temperature stability is the single most important requirement. If possible, calibrate the probe at room temperature (18 to 25°C). Room temperature should be 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 using a humidity generator to calibrate the probe, make sure that the probe is as fully immersed in the generator as possible to minimize temperature effects.

APPENDIX 2: Calibration Instructions

HygroClip S3 probe

Verifying the accuracy of the HygroClip S3, requires bringing the probe within a controlled environment such as found in a laboratory. Accuracy of the humidity signal can be verified at any time with the calibration device ER15 and ROTRONIC certified humidity standards (see Appendix 1: calibration basics). Accuracy of the temperature signal can be verified against a reference thermometer (see Appendix 1: calibration basics).

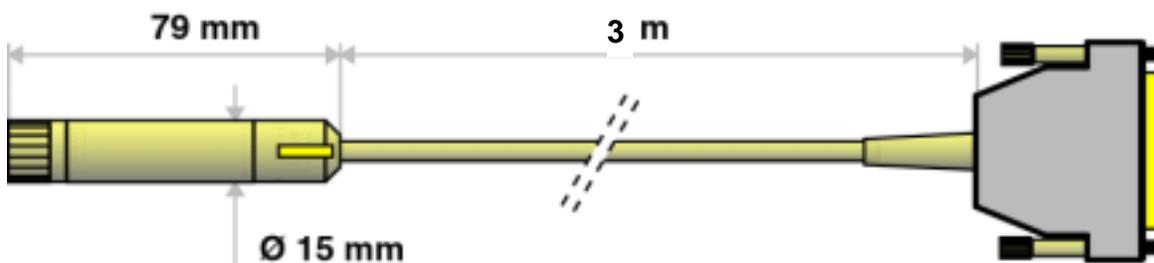
The HygroClip S3 digital probe is adjusted (calibrated) entirely by means of software (no calibration potentiometers). Should the HygroClip S3 require an adjustment, two basic choices are available:

- 1) Make use of the HygroClip exchange program. Under this program, the HygroClip S3 is sent back to ROTRONIC for immediate replacement with a rehabilitated probe (part # HygroClip R3). The HygroClip R3 is fully calibrated and is always equipped with a brand new humidity sensor and dust filter.
- 2) Remove the HygroClip S3 from the MPH probe and connect the HygroClip S3 to the COM port of a PC with the calibration cable MOKX-03-WIN. This cable is shipped together with the HW3 software. All necessary instructions are provided with the HW3 software in the form of an on-line manual that is structured like a web site.

Requirements for using the HW3 software:

PC	Pentium 133MHz or better
Windows®	95/98 or NT®
Memory	32MB
Disk Space	20MB free
Drives	CD ROM drive required
Monitor	VGA or Super VGA
Resolution	800 x 600 or higher (set to small fonts) High Color 16Bit (256 Color minimum)
COM Port	RS232 (COM 1-4)
Software	HW3 (includes - MSIE 4.0 Browser - Adobe® Acrobat Reader) MS Internet Explorer: for best viewing, set fonts to smallest

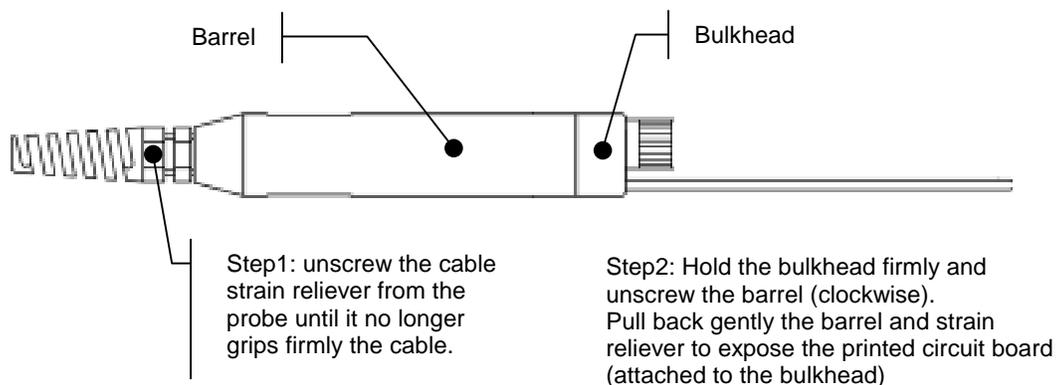
MOKX-03-WIN



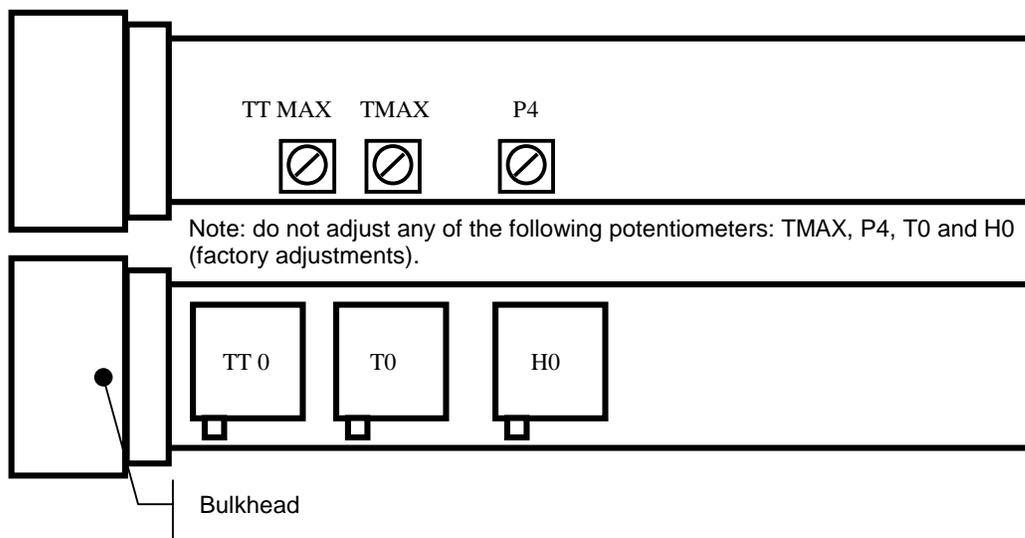
Additional RTD probe

When the MPH probe has an additional RTD with a voltage or current output, calibration of the output signal can be done as follows:

- 1) Remove the HygroClip S3 probe
- 2) Open the MPH probe to gain access to the printed circuit board



- 3) Immerse the additional RTD in a temperature stable environment
- 4) Adjust the temperature output T2 (see wiring diagrams) first at the low temperature with potentiometer TT 0 and then at the high temperature with potentiometer TT MAX.



MPH - analog outputs

The analog circuits used in the MPH should not exhibit any noticeable long term drift. Should these output drift, the MPH probe should be returned to ROTRONIC.

Please contact ROTRONIC for instructions if you wish to adjust these outputs for any reason.