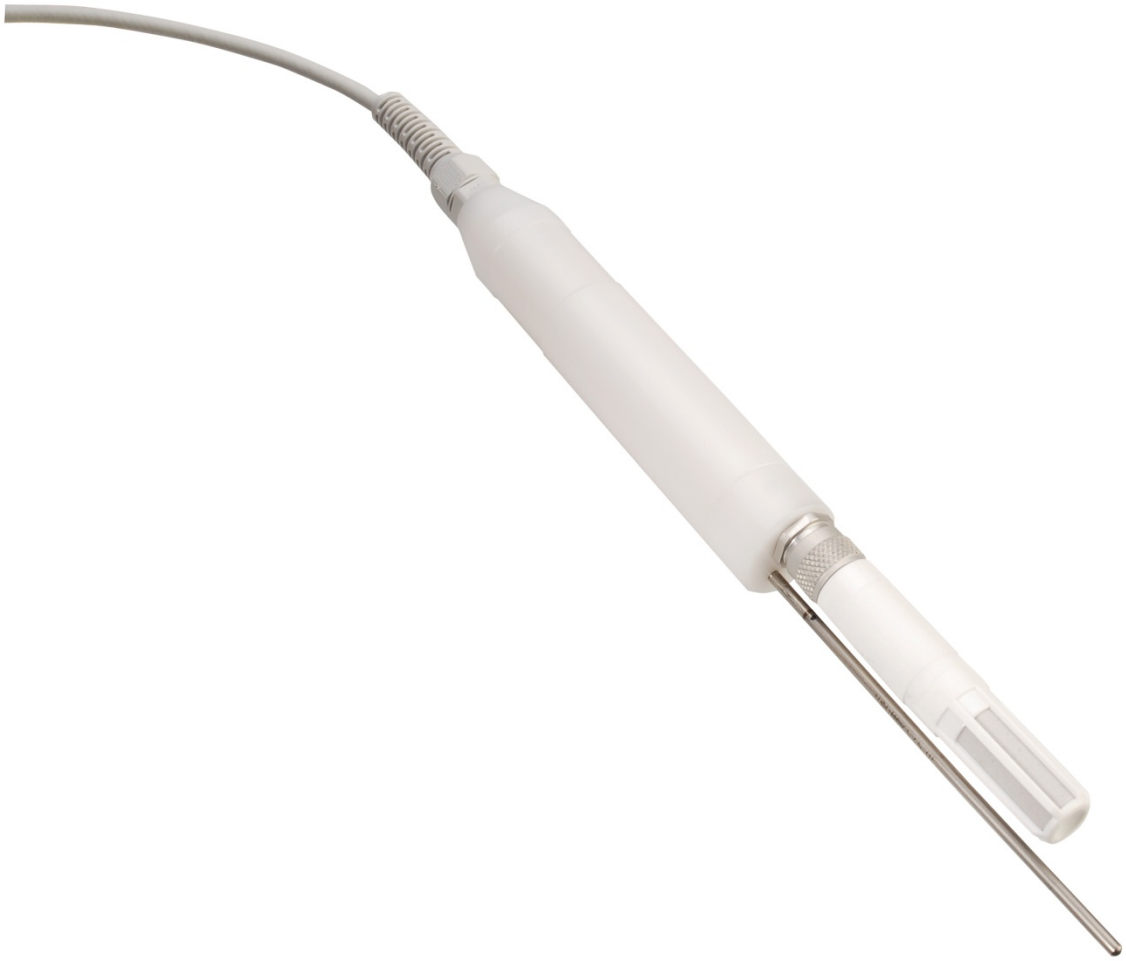
HygroMet MP
Humidity Temperature Meteorological Probe

User Guide



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Applicability:

This manual applies to the HygroMet MP probe series with firmware version 1.x, where 1.x can be 1.0, 1.1, etc. Changes to the last digit of the version number reflect minor firmware changes that do not affect the manner in which the instrument should be operated.

1 Overview

The HygroMet MP probe uses the digital signals from a HygroClip HC2-S3 digital plug-in probe to measure humidity and temperature at conditions within the range of 0 to 100 %RH and -40 to 80°C. In addition the HygroMet MP can be configured to calculate a psychrometric value such as dew point, frost point, enthalpy, etc. The HygroMet MP operates from a DC voltage source and is designed for use in weather stations where power is available on a continuous basis.

The HygroClip HC2-S3 digital plug-in probe features the well proven ROTRONIC Hygromer ™ IN1 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 HC2-S3 is fully interchangeable and can be replaced in seconds without loss of accuracy. As an option, the HygroMet MP probe can be ordered with an additional fast response temperature probe (Pt100 RTD) that is directly accessible by means of 4-wires.

The HygroMet MP is available in two basic versions: 2-wire loop powered circuit type or 3-wire circuit type. Both versions provide two analog output signals corresponding to any two of the following: relative humidity, temperature or calculated value such as dew point, enthalpy, mixing ratio, etc. The 3-wire version features a RS-485 interface for the digital transmission of all 3 signals: relative humidity, temperature and calculated parameter.

Based on the ROTRONIC AirChip 3000 digital technology the combination of HygroMet MP and HC2-S3 2 probe offers the following user functions:

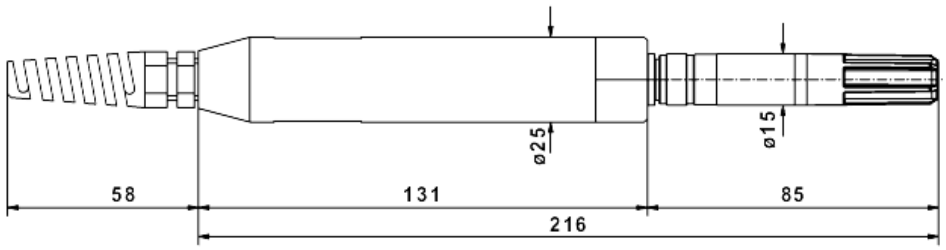
- User configurable settings
- Calculation of psychrometric parameters such as the dew or frost point
- Humidity temperature calibration and adjustment [1)]
- Simulator mode
- Automatic humidity sensor test and drift compensation [1)]
- Sensor failure mode [1)]
- Data recording [1)]

1) Except 2-wire loop powered version of the HygroMet MP

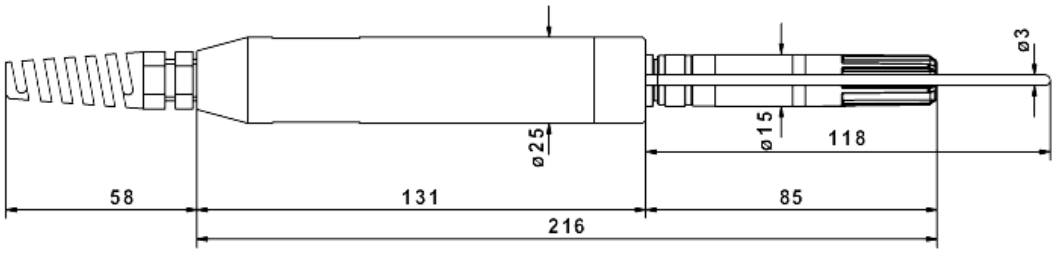
The ability for the user to easily update both the HygroMet MP and HygroClip 2 probe firmware means that both devices can be kept up-to-date regarding any future functionality improvement.

2 Mechanical configurations and dimensions

HygroMet MP with HC2-S3 probe



HygroMet MP with HC2-S3 probe and additional Pt100 RTD probe



3 General description

3.1 Power supply

Depending on the circuit type, the HygroMet MP requires the following power supply:

a) **2-wire, loop powered version**: 10…28 VDC - depending on the load connected to the output(s). The minimum supply voltage can be determined as follows:

V min = 10 V + (0.02 x Load*) *Load resistance in ohms.

For the maximum load of 500 Ω, the minimum supply voltage is 10 + (0.02 x 500) = 20 VDC. With both output circuits closed, the maximum current consumption is 40 mA.

b) **3-wire version**: 15 to 24 VDC. With both output circuits closed, the maximum current consumption is 50 mA.

Depending on the type of analog output signal, the minimum supply voltage can be reduced as follows:

0…1 V outputs: 5 VDC minimum
0…5 V outputs: 10 VDC minimum

3.2 Measured parameters

The HygroClip HC2-S3 probe used with the HygroMet MP measures relative humidity with a ROTRONIC Hygromer® IN1 capacitive sensor and temperature with a Pt100 RTD.

3.3 Calculated parameters

Using the ROTRONIC HW4 software, the HygroMet MP can be configured by the user to calculate one of the following parameters:

- Dew point (Dp) above and below freezing
- Frost point (Fp) below freezing and dew point above freezing
- Wet bulb temperature (Tw)
- Enthalpy (H)
- Vapor concentration (Dv)
- Specific humidity (Q)
- Mixing ratio by weight (R)
- Vapor concentration at saturation (Dvs)
- Vapor partial pressure (E)
- Vapor saturation pressure (Ew)

Note: some of the above parameters depend on the value of the barometric pressure. Using the ROTRONIC HW4 software, a fixed barometric pressure value can be specified. For instructions see the following HW4 manual: **E-M-HW4v3-F2-014**

3.4 Output signals

HygroMet MP: HF2-wire and 3-wire versions

With the ROTRONIC HW4 software any of the two analog output signals can be made to correspond to one of the following:

- Relative humidity
- Temperature
- Calculated parameter

Any output can also be disabled.

The scale of each analog output can be set within the numerical limits of -999.99 and 9999.99. The D/A converters used to generate the analog output signals feature a 16-bit resolution.

HygroMet MP 3-wire version: this version offers a RS-485 digital interface in addition to the two analog output signals. Making use of this interface allows the simultaneous transmission of relative humidity, temperature and calculated parameter.

3.5 Analog output signal type

The HygroMet MP 2-wire version provides two 4…20 mA current output signals.

The HygroMet MP 3-wire version can be ordered with the following output signal types:

a) Current outputs: 0…20 mA or 4…20 mA
b) Voltage outputs: 0…1 V, 0…5 V or 0…10 V

Note: the analog signal type is configured at the factory and cannot be changed by the user.

3.6 Service connector

The HygroMet MP has an internal service connector (mini-USB type). This connector provides access to the HygroMet MP UART digital interface (Universal Asynchronous Receiver Transmitter) and is used to connect the HygroMet MP with a service cable to a PC running the ROTRONIC HW4 software. See “Maintenance” for the location of the service connector and for the type of service cable to be used. The service connector is used to configure the HygroMet MP and to and update its firmware as necessary.

3.7 Probe

The HygroMet MP is normally used with the HC2-S3 probe and is compatible with all available models of HygroClip 2 probes. For detailed information on the HygroClip 2 probes see document **E-M-HC2 Probes-V1**.

4 User configurable settings and functions

The HygroMet MP ships configured as specified on the customer order. The HygroMet MP can be installed and used just as any conventional humidity and temperature probe and most users will never need to use the HygroMet MP configurable settings and functions. Use of the RS-485 digital interface may require configuration by the user of the RS-485 network address.

Making use of the HygroMet MP and HC2-S3 probe configurable settings and functions is entirely up to the user and the appropriate settings depend on the user application. We have provided below a short description of the HygroMet MP and HC2-S3 and probe functions and also indicated the factory default settings.

4.1 Requirements for configuring the HygroMet MP

Configuration of the HygroMet MP by the user and access to its functions requires the following:

- PC with the ROTRONIC HW4 software (version 2.3.0 or higher) installed.
- Service cable AC3006 to connect the HygroMet internal service connector to a USB port of the PC.
- DC voltage source to power the HygroMet MP

Note: The RS-485 interface of the HygroMet MP 3-wire version can be used as an alternative to the service connector to configure the HygroMet MP after connecting the HygroMet MP to a RS-485 network monitored by a PC with the HW4 software.

4.2 Function overview

MEASUREMENT ACCURACY AND RELIABILITY (PROBE FUNCTIONS)	
AirChip 3000 Functions	**Description**
► Humidity / temperature adjustment	o 1-point or multi-point humidity calibration or adjustment o 1-point or 2-point temperature calibration or adjustment o Generate a time stamp for calibrations and adjustments o Retain and view last adjustment date and adjustment values o Generate calibration and adjustment protocols
► Automatic humidity sensor test and optional drift compensation	Tests the humidity sensor for drift caused by contaminants and can be used to automatically apply a correction. The test is automatically carried out at regular intervals of time. Can be configured, enabled, or disabled. The humidity sensor status can be verified either with the HW4 software or with the instrument display (if available) and is shown as Good, SQ-tuned (corrected for drift) or Bad (defective) **Not available when the probe is connected to a HygroMet 2-wire version**
► Data recording	The data recording function differs from a true data logging function in the sense that the AirChip 3000 does not time stamp the data. The data recording function can be use to investigate events such as a sensor malfunction as well as to retrieve data that would otherwise be lost o Start or stop data recording - up to 2000 value pairs (%RH and temperature). Starting a recording session erases all previously recorded data o The recording mode and log interval can be specified o When the device is powered off, the recording session is paused but not ended As long as the recording session has not been ended, the device automatically resumes recording data when powered up again o The recorded data can be downloaded to a PC with the HW4 software, time stamped and viewed **Not available when the probe is connected to a HygroMet 2-wire version**

MEASUREMENT LOOP VALIDATION	
Functions	**Description**
► Simulator mode	Used to make the HygroMet generate fixed values for the humidity, temperature and calculated parameter. Can be configured, enabled or disabled

DEVICE SAFEGUARDS	
Functions	**Description**
► Device write protection	Used to protect the HygroMet with a password to prevent unauthorized digital access by a digital user. Can be configured, enabled or disabled

PROCESS PROTECTION AND PROTECTION OF OTHER DEVICES	
AirChip 3000 Functions	**Description**
► Limit humidity output to 100 %RH	This probe function is used to prevent the humidity signal from exceeding 100 %RH when condensation forms on the sensor. Can be enabled or disabled
► Out-of-limit value alarm	Used to specify the normal range for humidity, temperature and the calculated parameter depending on the user application. Can be configured, enabled or disabled Out-of-limit values trigger a digital alarm which can be also be seen on the optional display
► Bad sensor alarm	This is a built-in probe function. Cannot be disabled A bad humidity or temperature sensor triggers a digital alarm, provided that the HygroMet is set to monitor probe alarms
► Fail safe mode	Used to specify a "safe" fixed value for humidity and for temperature (HygroMet or probe) in the event of: o Loss of communication with the probe (HygroMet function) o Sensor failure (probe function) Can be configured, enabled or disabled

4.3 Factory default settings

Configurable Settings	Applicability	Factory default
Unit system (Metric or English)	2-wire, 3-wire	As per ordering code
Analog signal type (4…20 mA or other)	3-wire	As per ordering code
Psychrometric calculation	2-wire, 3-wire	As per ordering code
Fixed pressure value	2-wire, 3-wire	1013.25 hPa or 29.92 In Hg
Output 1 parameter, scale and unit	2-wire, 3-wire	As per ordering code (%RH or other)
Output 2 parameter, scale and unit	2-wire, 3-wire	Temperature, unit as per ordering code
Communication protocol	3-wire	RO-ASCII
RS-485 address	3-wire	0
Device name	2-wire, 3-wire	Instrument model

Functions	Applicability	Factory default
Humidity / temperature adjustment	3-wire	
Device write protection	2-wire, 3-wire	Disabled (HygroMet and probe)
Limit humidity output to 100 %RH	2-wire, 3-wire	Enabled (probe)
Out-of-limit value digital / display alarm	2-wire, 3-wire	Disabled (HygroMet and probe)
Data recording (probe)	3-wire	Enabled (loop mode – 10 min. interval)
Automatic humidity sensor test	3-wire	Disabled (probe)
Humidity sensor drift compensation	3-wire	Disabled (probe)
Fail safe mode	2-wire, 3-wire	Disabled (probe)
Monitor probe alarms	2-wire, 3-wire	Enabled
Loss of communication with probe	2-wire, 3-wire	Disabled (HygroMet)
Simulator mode	2-wire, 3-wire	Disabled (HygroMet and probe)

- For a detailed description of all AirChip 3000 main functions see document **E-T-AC3000-DF-V1**

- Instructions regarding the configuration of the HygroMet MP and probe as well as access to the functions are provided in the following manuals:

  E-M-HW4v3-Main
  E-M-HW4v3-F2-014
  E-M-HW4v3-F2-001
  E-M-HW4v3-DR-001
  E-M-HW4v3-A2-001
  E-M-AC3000-CP

- The factory default setting for dew / frost point calculation is frost point below freezing

4.4 Interaction between the HygroMet MP and probe functions

It is important to note that when used together, the HygroMet MP transmitter and HC2 probe (HygroClip 2) constitute a 2-component system. Each system component has its own microprocessor, firmware and functions. Some of these functions are unique to each system component. Other functions are found in both components.

2-wire, loop powered HygroMet version: due to the necessity of limiting the current consumption of the combination of HygroMet and HC2 probe to less than 4 mA, several probe functions such as RH sensor test, data recording and probe adjustment are not available.

The functions and settings of the HygroMet MP (HM) and HygroClip 2 probe (HC2) operate together as indicated below:

Function / Setting	HM	HC2	Notes
Device protection	**X**	**X**	Individual to the HygroMet and HC2 probe
RS-485 address	**X**	**X**	Individual to the HygroMet and HC2 probe
Device Name	**X**	**X**	User defined description The device name of the HC2 probe is not displayed by HW4 and is replaced with the HygroMet Input Name
Calculation	**X**	**X**	Psychrometric calculation HygroMet setting overrides HC2 probe setting

Function / Setting	HM	HC2	Notes
Data refresh rate	**X**		This setting has no effect on the HygroMet and probe. Depending on the model, the data refresh rate is as follows: HygroMet 2-wire: typically 5 s HygroMet 3-wire: typically 1 s
Simulator function	**X**	**X**	Generates fixed humidity and / or temperature value When enabled, the HygroMet settings override the HC2 probe settings
Unit system	**X**	**X**	The HygroMet setting overrides HC2 probe setting regarding the HygroMet signals. The HC2 probe settings still apply when the probe is used alone **Make sure to use the same humidity symbol and the same temperature unit for both the HygroMet and probe.**
Out-of-limits value alarm	**X**	**X**	The HygroMet settings are independent from the HC2 probe settings. The HC2 probe settings have an effect only when the HygroMet is enabled to monitor alarms generated by the probe When out-of-limit values have been defined for the same parameter for both the HygroMet and probe, any alarm is triggered based on the narrowest set of limits (assuming that the HygroMet has been set to monitor probe alarms).
Analog outputs	**X**	**X**	Parameter and scale The HC2 probe settings have no effect on the HygroMet

5 Mechanical installation

5.1 General guidelines

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

a) 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).

b) 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).

6 Electrical installation

6.1 General wiring guidelines

Power supply wiring

Heavy machinery and instrumentation should not share the same power supply wiring. If this cannot be avoided, noise filters and surge protectors should be used. Most UPS devices have those features already integrated.

General guidelines for signal cables

The following guidelines are derived from European Standard EN 50170 for the transmission of signals by copper wires. When planning an installation, the rules provided by EN 50170 should be followed under consideration of local circumstances to determine the position of machines and equipment.

All ROTRONIC products are tested for Electromagnetic Compatibility according to EMC Directive 2004/106/EG and following European standards:

- EN 61000-6-1: 2001, EN 61000-6-2: 2005
- EN 61000-6-3: 2005, EN 61000-6-4: 2001 + A11

Whenever the level of electromagnetic interference is expected to be high, both the instruments and signal cables should be placed as far away as possible from the source of interference.

In general, signal cables should be installed in bundles or channels / conduits, separate from other cables as indicated in the table below:

• Bus signals such as RS485 • Data signals for PCs, printers etc. • shielded analog inputs • unshielded direct current (<= 60V) • shielded process signals (<= 25 V) • unshielded alternate current (<= 25V) • coaxial cables for CRT monitors	**in common bundles or channels / conduits**
• direct current from 60 V to 400 V (unshielded) • alternate current from 25V to 400 V (unshielded)	**in separated bundles or channels / conduits, without minimum distance**
• direct and alternate current > 400 V (unshielded) • Telephone lines • lines leading into EX-rated areas	**in separated bundles or channels / conduits, without minimum distance**

Lightning protection

Cabling in areas with a risk of lightning requires a lightning protection. For cabling underground in between buildings, we recommend the use of special fiber optic cables. If this is not possible, use copper cables that are suitable for underground installation.

6.2 Guidelines for RS-485 wiring (HygroMet MP 3-wire)

See document **E-DV04-RS485.01:** RS485 Network Installation and Start-up Guidelines

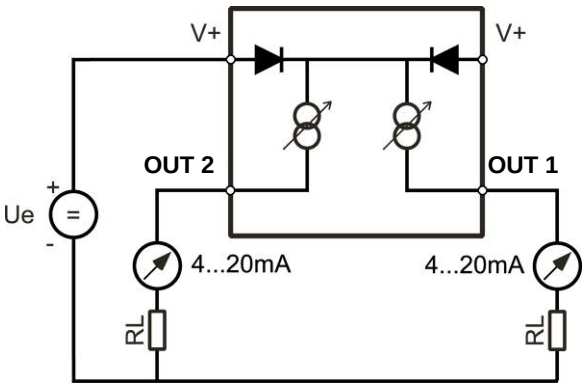
6.3 Wiring color code

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

To facilitate maintenance of the HygroMet MP, 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). When transmitting analog voltage signals over a long distance, you should use separate wires for power ground and for each signal ground.

6.3.1 *HygroMet: 2-wire version, loop powered*

Electrical diagram



The maximum permissible cable length connecting the HygroMet MP to other devices is determined by the total resistance resulting from the addition of the cable resistance and that of the devices connected in series with the unit. This resistance should not exceed 500 ohms.

Wiring color code

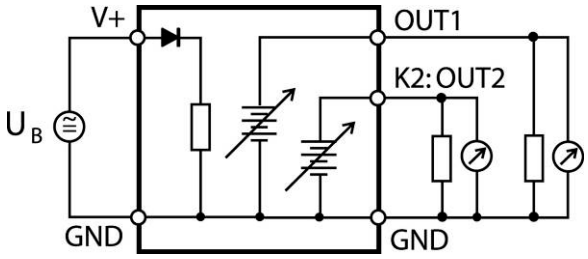
Wire color	Description
Green	Power supply (+) 10…28 VDC
White	Output 1 (+) – default: relative humidity or calculated parameter
Brown	Output 2 (+) – default: temperature
Black	Optional: additional Pt100 RTD probe
Purple	Optional: additional Pt100 RTD probe
Orange	Optional: additional Pt100 RTD probe
Yellow	Optional: additional Pt100 RTD probe
Cable shield	Drain – should be connected to power supply (-) or to an earth ground

Measuring humidity or temperature only

Unless configured to measure either humidity only or temperature only, proper operation of the HygroMet MP requires both current loops to be closed. The HygroMet MP can be ordered from the factory to measure either humidity or temperature only. When necessary, any unused output of the HygroMet MP can be disabled with the ROTRONIC HW4 software. When the HygroMet MP is configured with one of the two outputs disabled, close only the loop that is being used.

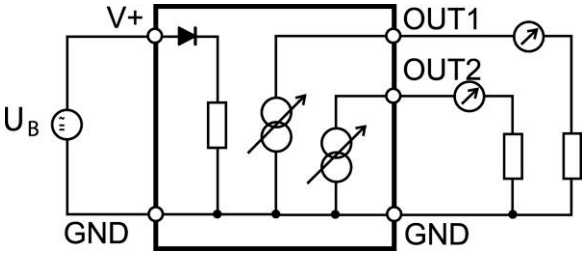
6.3.2 *HygroMet : 3-wire version*

Electrical diagram for voltage outputs



The maximum permissible cable length can be determined under consideration of the voltage drop caused by the current flowing to the devices connected to the unit. The voltage drop in the cable depends both on cable resistance and on the equivalent resistance of the devices connected in parallel to the unit. The total resistance connected to each unit output should be at least 1000 ohms. Cable resistance should not be more than 1/1000 of the load resistance.

Electrical diagram for current outputs



The maximum permissible cable length, connecting the unit to other devices, is determined by the total resistance resulting from the addition of the cable resistance and that of the devices connected in series with the unit. This resistance should not exceed 500 ohms.

Wiring color code

Wire color	Description
Gray	Power ground
Green	Power supply (+) 5…24 VDC (depends on output signal type)
White – labeled 1	Output 1 (+) – default: relative humidity or calculated parameter
White – labeled 2	Output 1 (-) – A-GND 1
Brown	Output 2 (+) – default: temperature
Pink	Output 2 (-) – A-GND 2
Red	RS485 (RXD)
Blue	RS485 (TXD)
Black	Optional: additional Pt100 RTD probe – PT S
Purple	Optional: additional Pt100 RTD probe – PT AS
Orange	Optional: additional Pt100 RTD probe – PT R
Yellow	Optional: additional Pt100 RTD probe – PT AR
Cable shield	Drain – should be connected to power supply (-) or to an earth ground

Measuring humidity or temperature only

Operation of the HygroMet MP does not require both current loops to be closed. When using the HygroMet MP to measure either humidity only or temperature only, close only the loop that is being used.

Using the ROTRONIC HW4 software, any unused output of the HygroMet MP can be disabled.

6.3.3 *Grounding (all models)*

Operation of the HygroMet MP does not require that the unit be electrically grounded. However, we strongly recommend connecting to an earth ground the (-) side of the supply voltage to the probe.

7 Operation

7.1 Analog outputs

Use the HW4 software to configure the HygroMet MP as desired, complete the mechanical and electrical installation, make the electrical connections probe and simply power up the HygroMet MP.

7.2 RS-485 serial interface

Instructions for using the HygroMet MP with a RS-485 network are provided in the following manuals: **E-M-HW4v3-Main** (§ 7.5), **E-M-HW4v3-F2-014** and **E-DV04-RS485.01**.

Notes:

- Instruments connected to the same RS-485 network must use the same baud rate and each instrument must be given a unique RS-485 address (the address requirement applies to the HygroMet MP but not to its probe)
- **RS-485 Compatibility**: The communications protocol used by the HygroMet MP is the RO-ASCII protocol. This protocol is not compatible with the protocol used by the previous generation of ROTRONIC products. Do not connect legacy products and the HygroMet MP to the same RS-485 multi-drop network.

The specifications of the RS-485 interface are as follows:

Baud rate : 19200
Parity : none
Data bits : 8
Stop bits : 1

8 Maintenance

8.1 Service cable

Cable AC3006 is used to connect the HygroMet MP to a USB port of a PC running the ROTRONIC HW4 software. The AC3006 cable does not power the HygroMet MP and the HygroMet MP should be powered separately.

Prior to using this cable you must install the ROTRONIC USB driver on the PC (available from the HW4 CD or from www.rotronic-humidity.com). For instructions see the HW4 manual **E-M-HW4v3-Main** (§ 7.3)

8.2 Location of the service connector (mini USB type)

WARNING: the service connector is a UART interface with a mini-USB connector type. Do not connect the service connector directly to the USB port of a PC or hub.

The service connector is located on the PCB of the HygroMet MP. To gain access to the service connector proceed as follows:

a) Unscrew the curly cable grip from the barrel of the HygroMet MP
b) Slide back the sealing grommet over 15 cm (6") of cable
c) Unscrew the barrel from the bulkhead of the HygroMet MP
d) Pull the barrel back to uncover the PCB

8.3 Periodic calibration check of the HC2-S3 probe

Both the Pt 100 RTD temperature sensor used in the HC2-S3 probe and associated electronics are very stable and should not require any calibration after the initial factory adjustment.

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

Note: **the HC2-S3 2 probe cannot be adjusted when connected to the HygroMet 2-wire version**

Using the HW4 software to adjust the probe connected to the HygroMet MP (3-wire version only):

- Use cable AC3006 to connect the service connector of the HygroMet MP to a USB port of a PC with the HW4 software installed. Note that the ROTRONIC USB driver must be installed on the PC as explained in the HW4 manual **E-M-HW4v3-Main**.
- Power the HygroMet MP from a DC voltage source
- Start HW4 on the PC and search for the HygroMet MP (HW4 Main Menu Bar > Devices and Groups > Search for USB Masters).
- After finding the HygroMet MP with HW4, expand the device tree to see the HygroMet MP functions. Select Probe and Probe Adjustment.
- For further instructions see HW4 manual **E-M-HW4v3-A2-001**

8.4 Cleaning or replacing the probe dust filter

See document **E-M-HC2 Probes-V1**

8.5 Validation of the output signals transmission

If so desired, transmission of the HygroMet MP output signals can be validated by using the simulator function. The HW4 software is required to enable and configure this function. When this function is enabled the HygroMet MP generates fixed digital and analog signals as specified by the user. For instructions see document **E-M-HW4v3-F2-014**

9 Firmware updates

Firmware updates will be available on the ROTRONIC website for downloading. Firmware files are given a name that shows both to which device the file applies and the version number of the firmware. All firmware files have the extension HEX. Procedure for updating the firmware:

- Use cable AC3006 to connect the service connector of the HygroMet MP to a USB port of a PC with the ROTRONIC HW4 software installed. Note that the ROTRONIC USB driver must be installed on the PC as explained in the HW4 manual **E-M-HW4v3-Main**
- Power the HygroMet MP from a DC voltage source. **Be sure to power the HygroMet MP during the entire firmware update process.**
- Copy the firmware update file from the ROTRONIC website to the PC.
- Start HW4 software on the PC and search for the HygroMet MP (HW4 Main Menu Bar > Devices and Groups > Search for USB Masters).
- After finding the HygroMet MP, expand the device tree to see the HygroMet MP functions. Select Device Manager. In the Device Manager menu bar select Tools > Firmware Update. For instructions see document **E-M-HW4v3-F2-014**

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10 Technical data

10.1 Specifications

General	HM 2-wire	HM 3-wire
Device type	Humidity temperature probe with analog output signals	Humidity temperature probe with analog output signals and RS485 interface
Circuit type	2-wire, loop powered	3-wire

Power supply and connections	HM 2-wire	HM 3-wire
Supply voltage	10…28VDC V min = 10 V + (0.02 x Load*) *Load resistance in ohms.	15…24 VDC 0…1 V outputs: 5…24 VDC 0…5 V outputs: 10…24 VDC
Nominal current consumption	2 x 20 mA	< 50 mA
Electrical connections	3 m cable with tinned ends	
Polarity protection	Protective diode on V+	

Humidity and temperature measurement	
See document **E-M-HC2 Probes** > Specifications	

Calculated parameters	HM 2-wire	HM 3-wire
Psychrometric calculations	Dew point (Dp) above and below freezing Frost point (Fp) below freezing and dew point above freezing Wet bulb temperature (Tw) Enthalpy (H) Vapor concentration (Dv) Specific humidity (Q) Mixing ratio by weight (R) Vapor concentration at saturation (Dvs) Vapor partial pressure (E) Vapor saturation pressure (Ew)	

Start-up time and data refresh rate	HM 2-wire	HM 3-wire
Start-up time	14 s (typical)	3 s (typical)
Data refresh rate	5 s (typical)	1 s (typical)

Configurable analog outputs		**HM 2-wire**	**HM 3-wire**
Output 1		Can be made to correspond to any parameter	
	Factory default parameter	Relative humidity or dew / frost point	
	Factory default scale	As per ordering code	
Output 2		Can be made to correspond to any parameter	
	Factory default parameter	Temperature	
	Factory default scale	As per ordering code	
Output 1 and Output 2			
	Signal type	4…20 mA	0…20 mA 4… 20 mA 0… 1 V 0… 5 V 0… 10 V (user configurable)
	User configurable scaling limits	-999.99 … +9999.99 engineering units	
	Short circuit tolerant	Yes	
	Maximum external load	500 Ω	500 Ω (current output)
	Minimum external load	0 Ω	1000 Ω (voltage output) 0 Ω (current output)

Digital interface	**HM 2-wire**	**HM 3-wire**
Interface type	N/A	RS-485

Service connector	**HM 2-wire**	**HM 3-wire**
Interface type	UART (Universal Asynchronous Receiver Transmitter)	
Maximum service cable length	5 m (16.4 ft)	

General specifications	**HM 2-wire**	**HM 3-wire**
HC2-S3 Probe material	Polycarbonate	
Probe dust filter material	Polyethylene	
Housing material	POM	
Housing protection grade	IP 65	
Physical dimensions	See Models	
Weight (with HC2-S3 probe)	258 g (9.1 oz)	

Conformity with standards	**HM 2-wire**	**HM 3-wire**
CE / EMC immunity	EMC Directive 2004/108/EG: EN 61000-6-1: 2001, EN 61000-6-2: 2005 EN 61000-6-3: 2005, EN 61000-6-4: 2001 + A11	
Solder type	Lead free (RoHS directive)	
Fire protection class	Corresponds to UL94-HB	
FDA / GAMP directives	compatible	

Environmental limits	HM 2-wire	HM 3-wire
Storage and transit	-50…+70 °C / -20...+70 °C (models with display), 0…100 %RH, non condensing	
Operating limits at electronics	-40 … +80 °C , 0…100 %RH, non condensing	
Temperature limits at probe	Depends on probe model	
Maximum humidity at sensor	100 %RH	
Maximum air velocity at probe	20 m/s (3,935 ft /min)	
Critical environments	Humidity sensor: as per DV04-14.0803.02 - Critical chemicals	

10.2 Dew point accuracy

See document **E-M-HC2 Probes** > **Dew point accuracy**

11 Accessories

For accessories and parts such as the HW4 configuration software, service cables, calibration accessories and spare dust filters, please see document **E-M-HC2-accessories**

12 Supporting documents

Document File Name	Contents
E-M-HC2 Probes-V1	HygroClip 2 (HC2) Humidity Temperature Probes, User Guide
E-M-HC2-accessories	Accessories and parts for probes, indicators and transmitters
E-T-AC3000-DF-V1	AirChip 3000 Description and Main Functions
E-M-HW4v3-DIR	List of the HW4 manuals
E-M-HW4v3-Main	HW4 software version 3: General instructions and functions common to all devices
E-M-HW4v3-F2-014	HW4 software version 3: Device Manager – HygroMet MP probe
E-M-HW4v3-F2-001	HW4 software version 3: Device Manager – HC2 probe series
E-M-HW4v3-A2-001	HW4 software version 3: Probe Adjustment function AirChip 3000 devices
E-M-HW4v3-DR-001	HW4 software version 3: Data Recording Function AirChip 3000 Devices
E-M-AC3000-CP	AirChip 3000 Communication Protocol Options
E-DV04-RS485.01	RS485 Network Installation and Start-up Guidelines
E-M-CalBasics	Temperature and humidity calibration basics Instructions for using the ROTRONIC humidity standards

Document File Name	Contents
E-T-HumiDefs	Humidity Definitions

Note: All document file names have an extension corresponding to the document release number. This extension is not shown in the above table.

13 Document releases

Doc. Release	Date	Notes
_10	Dec. 4, 2009	Original release
_11	Jun. 20, 2010	Updated document to HW4 software v.3
_12	Oct. 27, 2011	Changed the wiring code of the HygroMet 3-wire version

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