

E-M-XB-V1_26	Rotronic AG Bassersdorf, Switzerland
Document code	Unit
XB Humidity Temperature Transmitter User Guide	Instruction Manual
Document title	Document Type
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XB

Humidity Temperature Transmitter

User Guide



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Applicability:

This manual applies to all instruments of the XB transmitter series with firmware version 3.0 or higher. 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 XB transmitter measures temperature, relative humidity and the dew or frost point and is designed for OEM applications. The XB transmitter consists of a probe that is hard wired to a small open board with a 2 m / 6.5 ft cable. Humidity is measured with the ROTRONIC HYGROMER™ IN-1 capacitive humidity sensor. This sensor offers fast response and exceptional stability, even in high humidity environments. Sensor durability has proven to be excellent in a wide range of applications.

The XB transmitter is suitable for measuring humidity within the range of 0 to 100 %RH and temperature within the range of -100 to 200 °C (-100 to 392 °F) at the probe. At temperature values above 80°C, the maximum humidity to which the humidity sensor can be exposed is gradually limited. Both the probe and sensor survive exposure to temperature within the range of -100 to 200°C / -148 to 392°F.

The probe of the XB transmitter is equipped with a Pt100 RTD temperature sensor. Data from this sensor is used to compensate the effect of temperature on the humidity sensor so as to maintain accurate humidity measurements over a wide range of temperature values. Depending on the model (see ordering codes), data from the RTD is also used to provide a linear temperature output signal

As an option, the probe of the XB transmitter can be equipped with an additional Pt100 RTD temperature sensor. In that case, the XB transmitter is equipped with a 4-position terminal block for direct connection to the temperature sensor.

Two basic types of electronic circuit are available: XB2: 2-wire, loop powered (4...20 mA current signal) and XB3: 3-wire (voltage or current signal). The analog output signal is linear and can be transmitted over a length of cable to a remote display, recorder, controller or data processing unit. Digital signal processing within the XB transmitter ensures consistent product performance and also facilitates the task of field maintenance:

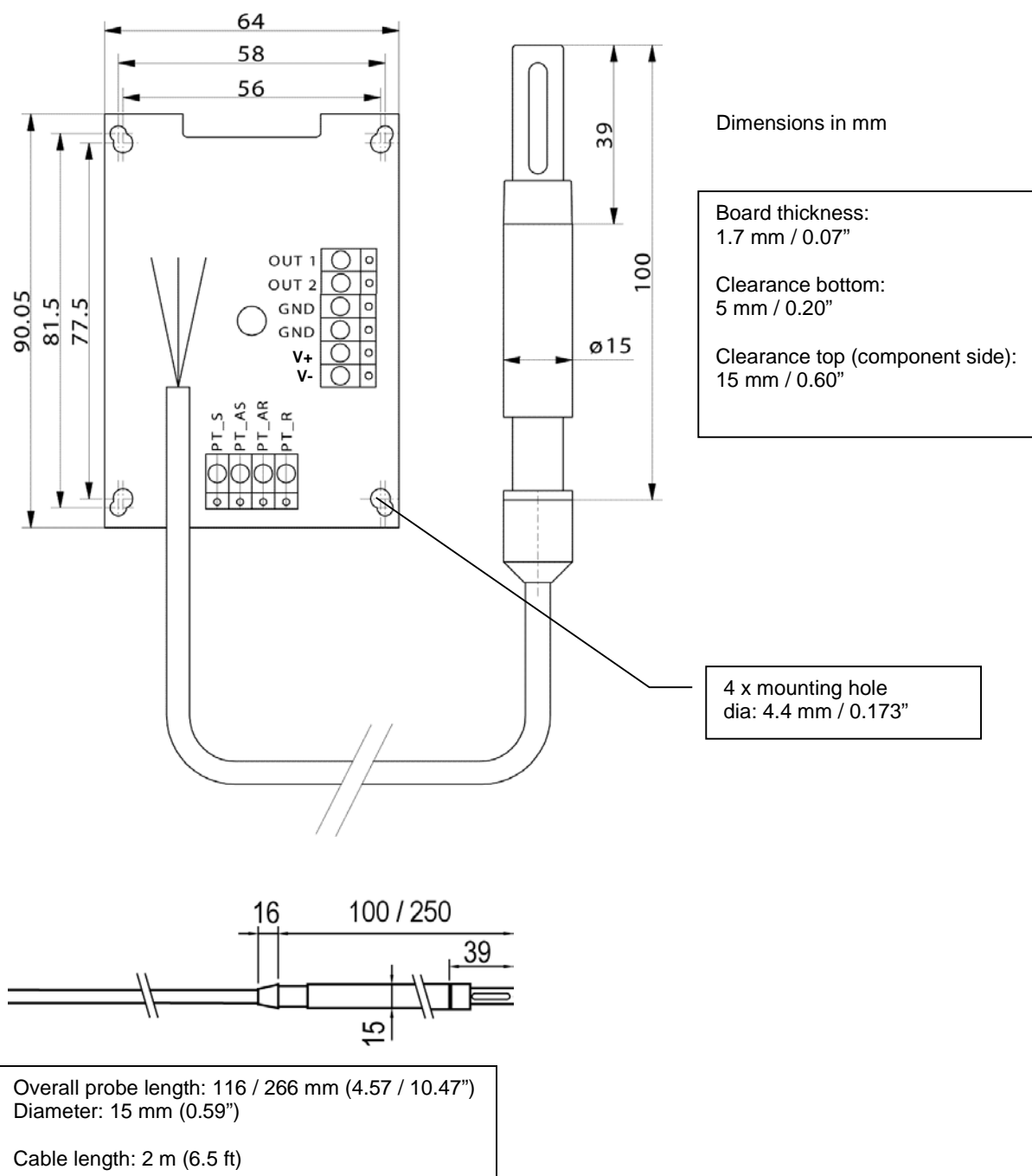
Based on the ROTRONIC AirChip 3000 digital technology, the XB transmitter series offers the following user functions which can only be accessed with the HW4 software:

- User configurable settings
- Calculation of the dew or frost point
- Humidity temperature calibration and adjustment
- Simulator mode
- Automatic humidity sensor test and drift compensation
- Sensor failure mode
- Data recording

The ability for the user to easily update the AirChip 3000 firmware means that instruments of the XB series can be kept up-to-date regarding any future functionality improvement.

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2 Dimensional drawings



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3 General description

3.1 Power supply

Depending on the circuit type, the XB transmitter requires the following power supply:

- a) **XB2** (2-wire, loop powered): 10...28 VDC - depending on the load connected to the output(s). The minimum supply voltage can be determined as follows:

$$V_{\min} = 10 \text{ V} + (0.02 \times \text{Load}^*) \quad \text{*Load resistance in ohms.}$$

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

- b) **XB3** (3-wire with analog outputs): 15 to 40 VDC (see note below) or 12 to 28 VAC. With both output circuits closed, the maximum current consumption is 50 mA.

Note: depending on the type of output signal, the XB3 will operate with the following minimum voltage

0...1 V outputs:	6 VDC or 5 VAC
0...5 V outputs:	10 VDC or 8 VAC
0...10 V outputs:	18 VDC or 13 VAC
0...20 mA or 4 ...20 mA outputs:	6 VDC or 5 VAC with 0 Ω load
	18 VDC or 13power with 500 Ω load

3.2 Measured parameters

The XB transmitter 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 XB transmitter can be configured by the user to calculate either the dew point or the frost point.

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3.4 Analog output signals

XB2 and XB3

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
- Dew or frost point

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 and exhibit a small positive offset at the bottom of the signal range as indicated below:

Signal type	Maximum offset at range bottom
0...1 V	10 mV
0...5 V	50 mV
0...10 V	100 mV
0...20 mA	0.2 mA
4...20 mA	No offset

XB3

The ROTRONIC HW4 software allows changing the type of output signal to one of the following: 0...20 mA, 4...20 mA, 0...1V, 0...5V or 0...10V. Both output signals are automatically configured with the same signal type. No calibration or adjustment is required after changing the type of output signal.

In the case of voltage output signals, load requirements apply to the external device or circuit connected to the XB3 transmitter. These requirements are defined in the "Operation" chapter

3.5 Direct RTD option (XB2 and XB3)

The standard XB transmitter is equipped with one Pt100 RTD. When ordered with the direct RTD option, the XB transmitter is supplied with a second Pt100 RTD installed on the probe. This additional RTD is directly connected to a terminal block. (4-wire connection)

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3.6 Service connector

The service connector is a UART digital interface (Universal Asynchronous Receiver Transmitter) with a mini-USB type connector. This allows connecting the XB transmitter either to a PC running the ROTRONIC HW4 software or to a probe input of another instrument that is compatible with the HygroClip 2 (HC2) probes. In both cases a service cable is required. See "Maintenance" for the location of the service connector and for the type of service cable to be used.

- Connecting the XB transmitter to a PC is used to configure the transmitter, gain access to the transmitter functions such as humidity and temperature adjustment, read data from the transmitter on the PC and update the AirChip 3000 firmware.
- Connecting the XB transmitter to the probe input of another instrument is useful only when the other instrument has its own display and keypad, and has an internal menu equivalent to the menu of the HP23 hand-held calibrator. The connection allows showing the data measured by the XB transmitter on the other instrument display and also allows using the other instrument internal menu to do for example a humidity and temperature adjustment of the XB transmitter.

3.7 Sensor protection (dust filter)

A dust filter is required to protect the sensors against dust particles and high air velocity. The probe of the XB transmitter is equipped with a with a metal filter base mod. NSP-ME. The filter cartridge must be ordered separately (see Accessories 11.5). Filter cartridge mod. SP-M15 is suitable for most applications.

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User configurable settings and functions

The XB transmitter ships configured as specified on the customer order. The analog outputs can be used just as with any conventional humidity and temperature transmitter and most users will never need to use the XB transmitter configurable settings and functions.

Making use of the XB transmitter 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 XB transmitter functions and also indicated the factory default settings.

3.8 Function overview

MEASUREMENT ACCURACY AND RELIABILITY	
AirChip 3000 Functions	Description
► Humidity / temperature adjustment	<ul style="list-style-type: none"> 1-point or multi-point humidity calibration or adjustment 1-point or 2-point temperature calibration or adjustment Generate a time stamp for calibrations and adjustments Retain and view last adjustment date and adjustment values Generate calibration and adjustment protocols
► Automatic humidity sensor test and optional drift compensation	<p>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</p> <p>The humidity sensor status can be verified either with the HW4 software and is shown as Good, SQ-tuned (corrected for drift) or Bad (defective)</p>
► Data recording	<p>The data recording function differs from a true data logging function in the sense that the AirChip 3000 does not time stamp the data. This data recording function can be used to investigate events such as a sensor malfunction as well as to retrieve data that would otherwise be lost</p> <ul style="list-style-type: none"> Start or stop data recording - up to 2000 value pairs (%RH and temperature). Starting a recording session erases all previously recorded data The recording mode and log interval can be specified 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 The recorded data can be downloaded to a PC with the HW4 software, time stamped and viewed

MEASUREMENT LOOP VALIDATION	
AirChip 3000 Functions	Description
► Simulator mode	Used to make the XB transmitter generate fixed values for the humidity, temperature and calculated parameter. Can be configured, enabled or disabled

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DEVICE SAFEGUARDS

AirChip 3000 Functions	Description
► Device write protection	Used to protect the XB transmitter with a password to prevent unauthorized digital access by a digital user. Can be configured, enabled or disabled

PROCESS PROTECTION / PROTECTION OF OTHER DEVICES

AirChip 3000 Functions	Description
► Limit humidity output to 100 %RH	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	Built-in function. Cannot be disabled A bad humidity or temperature sensor triggers a digital alarm which can be also be seen on the optional display
► Fail safe mode	Used to specify a "safe" fixed value for humidity and for temperature in the event of a sensor failure. Can be configured, enabled or disabled

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3.9 Factory default settings

Configuration of the XB transmitter by the user and access to its functions requires a PC with the ROTRONIC HW4 software (version 2.1.1 or higher) installed. Service cable AC3006 or AC3009 is used to connect the XB service connector to a USB port of the PC (see Maintenance > Service Cable).

Configurable Settings	Applicability	Factory default
Unit system (Metric or English)	XB2, XB3	As per ordering code
Analog signal type (4...20 mA or other)	XB3	As per ordering code
Psychrometric calculation	XB2, XB3	As per ordering code
Output 1 parameter, scale and unit	XB2, XB3	As per ordering code (%RH or DP)
Output 2 parameter, scale and unit	XB2, XB3	Temperature, unit as per ordering code

Functions	Applicability	Factory default
Humidity / temperature adjustment	XB2, XB3	
Device write protection	XB2, XB3	Disabled
Limit humidity output to 100 %RH	XB2, XB3	Enabled
Out-of-limit value digital / display alarm	XB2, XB3	Disabled
Data recording	XB2, XB3	Enabled (loop mode – 10 min. interval)
Automatic humidity sensor test	XB2, XB3	Disabled
Humidity sensor drift compensation	XB2, XB3	Disabled
Fail safe mode	XB2, XB3	Disabled
Simulator mode	XB2, XB3	Disabled

- For a detailed description of all AirChip 3000 / XB transmitter main functions see document **E-T-AC3000-DF-V1**
- Instructions regarding the configuration of the XB transmitter and access to its functions are provided in the following manuals:

E-M-HW4v3-Main
E-M-HW4v3-F2-009
E-M-HW4v3-DR-001
E-M-HW4v3-A2-001

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

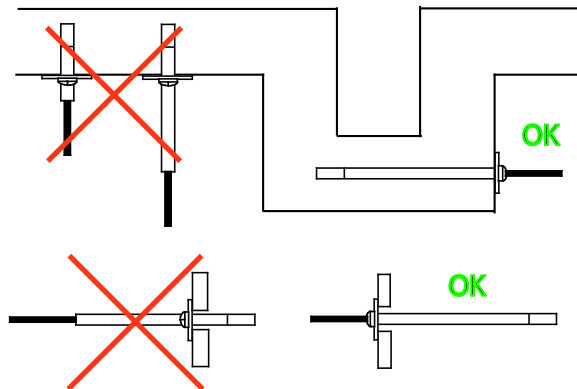
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4 Mechanical installation

4.1 General guidelines

Relative humidity is extremely dependent on temperature. Proper measurement of relative humidity requires that the probe and its sensors be at exactly the temperature of the environment to be measured. Because of this, the location where you choose to install the probe can have a significant effect on the performance of the instrument. The following guidelines should guarantee good instrument performance:

- Select a representative location:** install the probe where humidity, temperature and pressure conditions are representative of the environment to be measured.
- Provide good air movement at the probe:** air velocity of at least 200 ft/ minute (1 meter/second) facilitates adaptation of the probe to changing temperature.
- Avoid the following:** (1) Close proximity of the probe to a heating element, a cooling coil, a cold or hot wall, direct exposure to sun rays, etc. (2) Close proximity of the probe to a steam injector, humidifier, direct exposure to precipitation, etc. (3) Unstable pressure conditions resulting from excessive air turbulence.
- Immerse as much of the probe as possible in the environment to be measured.**
- Prevent the accumulation of condensation water at the level of the sensor leads.** Install the probe so that the probe tip is looking downward. If this is not possible, install the probe horizontally.



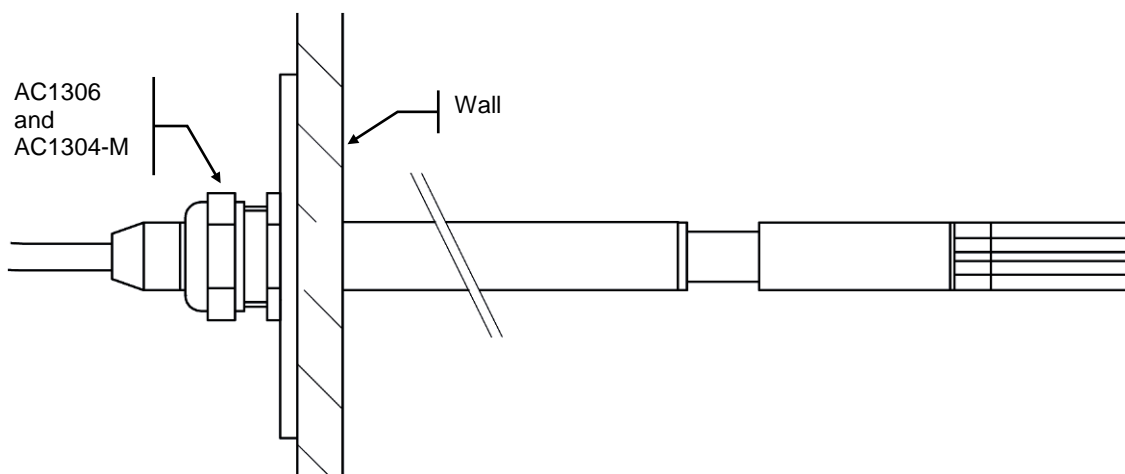
Insufficient probe immersion typically creates errors in the measurement of both humidity and temperature and may even cause a malfunction.

- Standard 100 mm (3.9") probe:** this probe is generally not suitable for through wall installation and is designed for full immersion in the environment to be measured. At least 15 to 20" of the probe cable should be inserted together with the probe.
- Optional 250 mm (9.8") probe:** this probe is designed for through wall installation. To facilitate probe installation and removal, we recommend using a probe holder mod. QMA-15. This holder is a mounting flange that is equipped with a compression fitting.

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Installation of the 250 mm or longer probe

Make sure that about 230 mm (9") of the probe are immersed in the environment to be measured.



Installation Note: You may want to provide an orifice at a distance of about 3" from the probe of the transmitter for future use by a reference probe and HygroPalm indicator.

Mounting hardware:



Part **AC 1306** is a flange and part **AC1304-M** is a compression fitting designed to hold the probe of the XB transmitter when mounted through a wall (see Accessories).

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5 Electrical installation

5.1 General 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:

<ul style="list-style-type: none"> • Bus signals such as RS485 • Data signals for PCs, printers etc. • shielded analog inputs • unshielded direct current ($\leq 60V$) • shielded process signals ($\leq 25V$) • unshielded alternate current ($\leq 25V$) • coaxial cables for CRT monitors 	in common bundles or channels / conduits
<ul style="list-style-type: none"> • 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
<ul style="list-style-type: none"> • 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

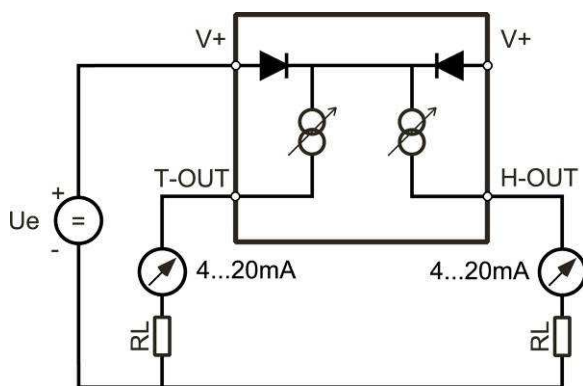
Cabling in areas with a risk of lightning requires a lightning protection. For cabling underground in between buildings, we recommend the use of special fiber optic cables. If this is not possible, use copper cables that are suitable for underground installation.

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5.2 Wiring and terminal block diagrams

5.2.1 XB2: 2-wire, loop powered transmitter

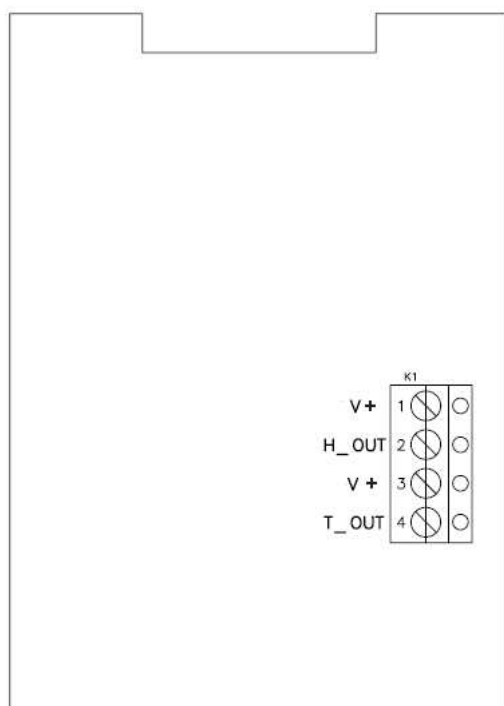
Electrical diagram



The maximum permissible cable length connecting the XB2 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.

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Terminal block diagram



Terminals	Description
K1-1: H+V	Power supply: 10...28 VDC (+)
K1-2: H-OUT	Relative humidity or dew point (+) OUT-1
K1-3: T+V	Power supply: 10...28 VDC (+)
K1-4: T-OUT	Temperature output (+) OUT-2

Note:

Connect the + of the power supply to only one of the V+ terminals. The two terminals marked H+V and T+V are internally connected.

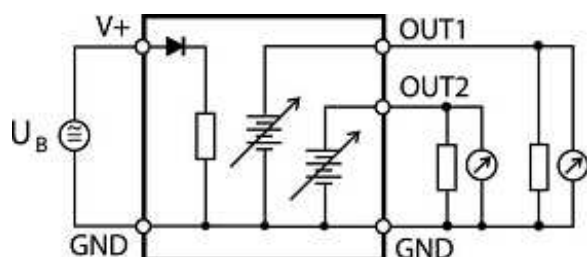
Measuring humidity or temperature only

Unless configured to measure either humidity only or temperature only, proper operation of the XB2 requires both current loops to be closed. The XB2 can be directly ordered from the factory to measure either humidity or temperature only. When necessary, any unused output of the XB2 can be disabled with the ROTRONIC HW4 software. When the XB2 is configured with one of the two outputs disabled, close only the loop that is being used.

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5.2.2 XB3: 3-wire transmitter

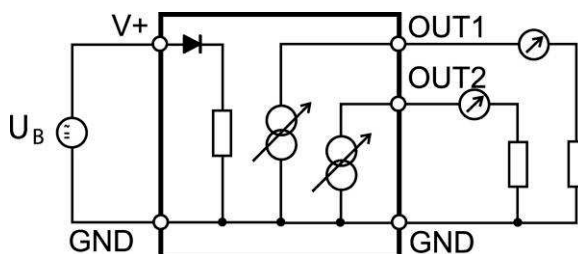
Electrical diagram for voltage outputs



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.

Minimum load requirements apply to the external device or circuit connected to the XB3 transmitter. These requirements are defined in the "Operation" chapter

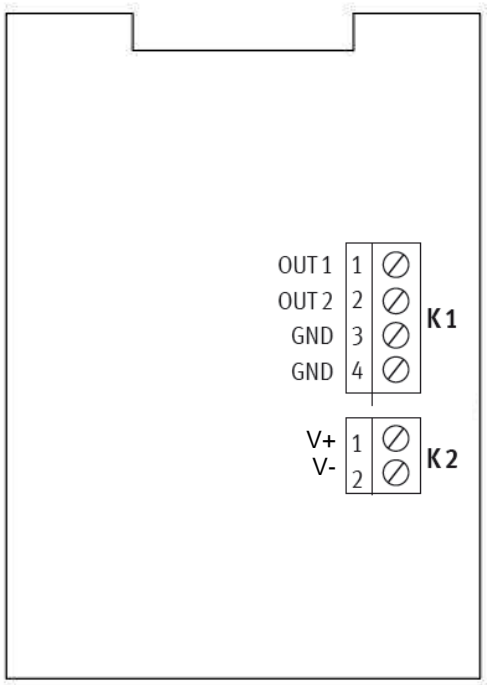
Electrical diagram for current outputs



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.

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Terminal block diagram



Terminals	Description
K1-1: OUT1	Relative humidity or dew point (+)
K1-2: OUT2	Temperature output (+)
K1-3: GND	Ground (tied with other GND)
K1-4: GND	Ground (tied with other GND)
K2-1: V+	Power supply: 15...40 VDC (+) or 12...28 VAC (Phase)
K2-2: V-	Power supply (-) or neutral (tied with other GND)

Measuring humidity or temperature only

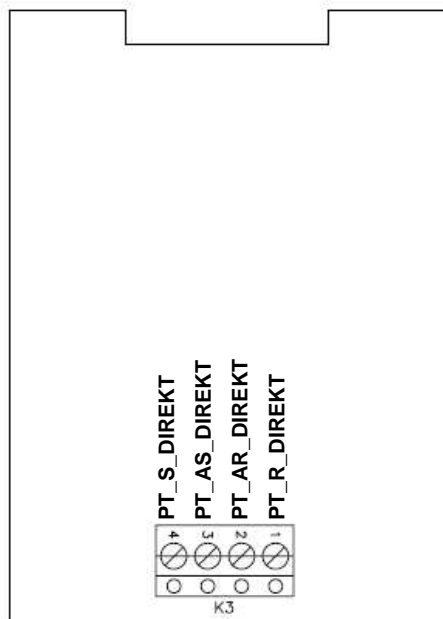
Operation of the XB3 does not require both current loops to be closed. When using the XB3 to measure either humidity only or temperature only, close only the loop that is being used.

Using the ROTRONIC HW4 software, any unused output of the XB3 can be disabled.

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5.2.3 Optional terminal block - Pt100 direct (XB2 and XB3)

Terminal block K3 is present only when the XB transmitter is equipped with an additional Pt100 RTD installed on the probe



Terminals	Description
K3-1	Pt100 direct - R
K3-2	Pt100 direct - AR
K3-3	Pt100 direct – AS
K3-4	Pt100 direct – S

5.2.4 Grounding

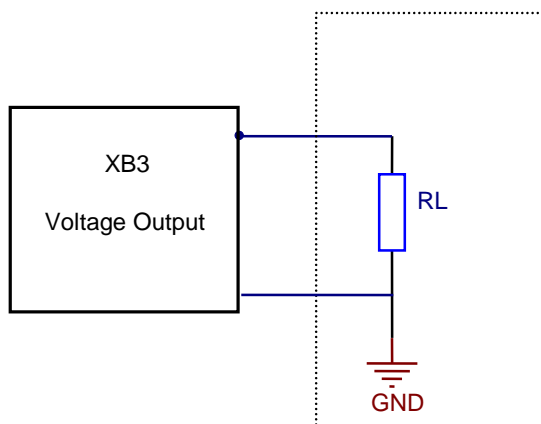
We generally recommend grounding the (-) side of the power supply, especially if the electronics will be subjected to a low humidity environment (35 %RH or less).

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6 Operation

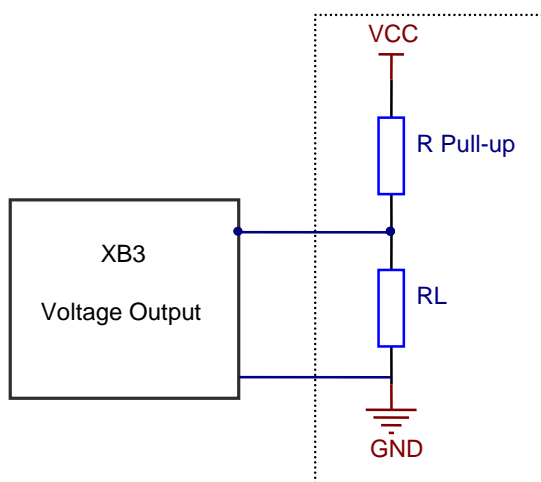
6.1 Minimum load requirements for the XB3 with voltage outputs

The following requirements apply to any external device or circuit connected to the XB3 transmitter with voltage outputs:



XB3 output signal	Input resistance RL
0...1V	$\geq 1\text{k}\Omega$
0...5V	$\geq 5\text{k}\Omega$
0...10V	$\geq 10\text{k}\Omega$

In the situation where the external device uses an internal pull-up resistor the value of this resistor should meet the requirements shown below. It is also necessary to add a pull-down resistor RL connected to ground in order to be able to read 100% of the range of the XB3 voltage output.



XB3 signal	VCC	R pull-up	RL
0...1V	3.3V	$\geq 250\text{ k}\Omega$	1 k Ω

XB3 signal	VCC	R pull-up	RL
0...1V	5.0V	$\geq 400\text{ k}\Omega$	1 k Ω
0...5V	5.0V	$\geq 400\text{ k}\Omega$	5 k Ω

XB3 signal	VCC	R pull-up	RL
0...1V	10.0V	$\geq 1\text{ M}\Omega$	1 k Ω
0...5V	10.0V	$\geq 1\text{ M}\Omega$	5 k Ω
0...10V	10.0V	$\geq 1\text{ M}\Omega$	10 k Ω

6.2 XB2 and XB3 transmitters (analog outputs)

If so desired, use the HW4 software to configure the XB transmitter. Complete the mechanical and electrical installation and simply power up the transmitter.

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7 Maintenance

7.1 Service cable

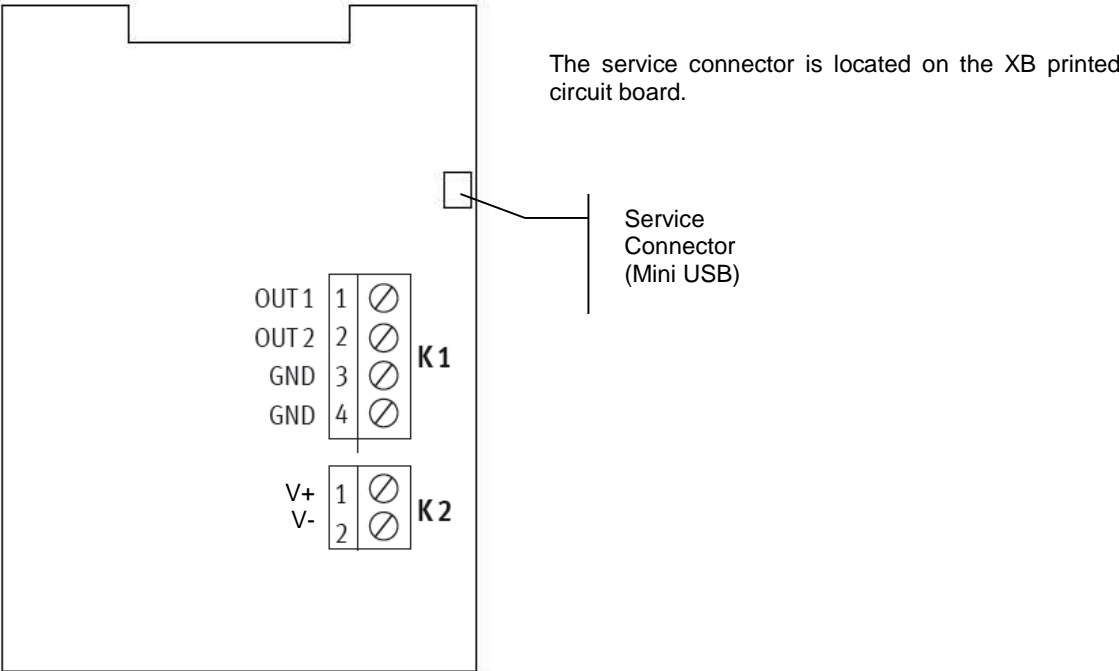
IMPORTANT:

- Use service cable AC3009 with the 2-wire, loop powered XB transmitter. This cable powers up the transmitter via the service connector. Do not use any other method for powering the transmitter when using this cable AC3009 as this will create a ground loop and damage the transmitter. For the same reasons do not use cable AC3006 with a 2-wire, loop powered transmitter.
- Use service cable AC3006 with the 3-wire XB transmitter. This cable does not provide power to the transmitter and the transmitter should be powered separately when using this cable.
- Both cables AC3006 and AC3009 convert UART (service connector) to USB and are used to connect the transmitter to a USB port of a PC running the ROTRONIC HW4 software. Prior to using any of these cables, the ROTRONIC USB driver must be installed on the PC. Both the driver and the installation instructions (document **E-M-HW4v3-Main**) are located on the HW4 CD.
- As an alternative, cable AC2001 is used to connect the XB transmitter to a probe input of the HP23 hand-held calibrator. For service purposes, the HP23 offers essentially the same functionality as the HW4 software.

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7.2 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.



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7.3 Periodic calibration check

Both the Pt 100 RTD temperature sensor 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 XB transmitter should be verified every 6 to 12 months. Applications where the XB transmitter is exposed to significant pollution may require more frequent verifications.

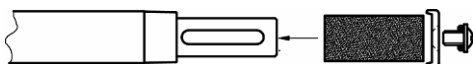
Procedure for adjusting the XB transmitter with the ROTRONIC HW4 software:

- Use the appropriate model of service cable (see Maintenance > Service Cable) to connect the service connector of the XB transmitter 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**.
- Start HW4 on the PC and search for the XB transmitter (HW4 Main Menu Bar > Devices and Groups > Search for USB Masters).
- After finding the XB transmitter with HW4, expand the device tree to see the XB transmitter functions. Select Probe Adjustment. Instructions for using the ROTRONIC calibration devices and humidity standards are provided in document **E-M-CalBasics**
- For further instructions see HW4 manual **E-M-HW4v3-A2-001**

7.4 Cleaning or replacing the dust filter

Depending on the conditions of measurement, the filter should be checked from time to time. Corroded, discolored or clogged filters should be replaced.

The probe of the XB transmitter has a removable filter cartridge. Simply replace the cartridge (leave the metal base on the probe).



7.5 Validation of the output signals transmission

If so desired, transmission of the XB transmitter 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 XB transmitter generates fixed digital and analog signals as specified by the user. For instructions see document **E-M-HW4v3-F2-009**

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8 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 the appropriate model of service cable (see Maintenance > Service Cable) to connect the service connector of the XB transmitter 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**.
- Copy the firmware update file from the ROTRONIC website to the PC.
- Start HW4 software on the PC and search for the XB transmitter (HW4 Main Menu Bar > Devices and Groups > Search for USB Masters).
- After finding the XB transmitter, expand the device tree to see the XB transmitter functions. Select Device Manager. In the Device Manager menu bar select Tools > Firmware Update. For instructions see document **E-M-HW4v3-F2-009**

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9 Technical data

9.1 Specifications

General	XB2	XB3
Device type	Humidity temperature transmitter	
Circuit type	2-wire, loop powered	3-wire

Power supply and connections	XB2	XB3
Supply voltage (VDD)	10...28 VDC V min = 10 V + (0.02 x Load*) *Load resistance in ohms.	18...40 VDC or 13...28 VAC
Nominal current consumption	2 x 20 mA	<50 mA
Electrical connections	Terminal block	
Polarity protection	Protective diode on V+	

Humidity measurement	XB2	XB3
Sensor	ROTRONIC Hygromer® IN-1	
Measuring range	0...100 %RH	
Measurement accuracy at 23 °C	±1.0 %RH	
Repeatability	0.3 %RH	
Long term stability	<1 %RH / year	
Sensor time constant	Typical 10 sec, 63% of a 35 to 80 %RH step change (1m/sec air flow at sensor)	

Temperature measurement	XB2	XB3
Sensor	Pt100 RTD, IEC 751 1/3 class B	
Measuring range	-100...200 °C (see also environmental limits)	
Measurement accuracy at 23 °C	±0.2 °C	
Repeatability	0.05 °C	
Long term stability	<0.1°C / year	
Sensor time constant	Typical 4 sec, 63% of a step change (1m/sec air flow at sensor)	

Calculated parameters	XB2	XB3
Psychrometric calculations	Dew or frost point (user configurable option)	

Start-up time and data refresh rate	XB2	XB3
Start-up time	3.4 s (typical)	1.9 s (typical)
Data refresh rate	3.4 s (typical)	1.7 s (typical)

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Configurable analog outputs	XB2	XB3
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)
Accuracy of analog output	±30 µA	±20 µA ±2 mV (0-1V) ±5 mV (0-10V)
User configurable scaling limits	-999.99 ... 9999.99 engineering units	
Maximum offset at bottom of signal range	no offset	0...1V signal range : 10 mV 0...5 V signal range : 50 mV 0...10 V signal range : 100 mV 0...20 mA signal range : 0.2 mA 4...20 mA signal range : no offset
Short circuit tolerant	Yes	
Maximum external load	500 Ω	500 Ω (current output)
Minimum external load	0 Ω	1 kΩ (0...1 V output) 5 kΩ (0...5 V output) 10 kΩ (0...10 V output) 0 Ω (current output)

Digital interface (service connector)	XB2	XB3
Interface type	UART (Universal Asynchronous Receiver Transmitter)	
Maximum service cable length	5 m (16.4 ft)	

General specifications	XB2	XB3
Probe material	Polycarbonate	
Probe dust filter material	Depends on filter type	
Physical dimensions	See Models	
Weight	225 g (8.0 oz)	

Conformity with standards	XB2	XB3
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)	
FDA / GAMP directives	compatible	

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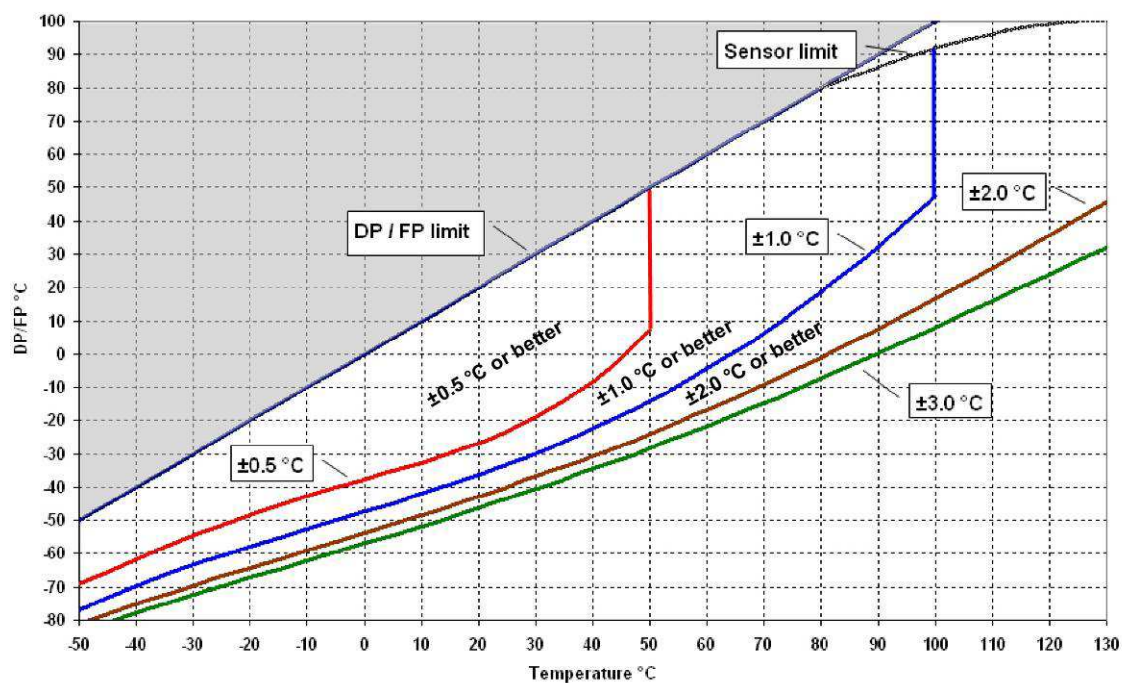
Environmental limits	XB2	XB3
Storage and transit	-50...+70 °C 0...100 %RH, non condensing	
Operating limits at electronics	-40...85 °C, 0...100 %RH, non condensing	
Temperature limits at probe	-100...200 °C	
Maximum humidity at sensor	100 %RH up to 80 °C (176 °F) 70 %RH at 100 °C (212 °F) 30 %RH at 125 °C (260 °F) 15 %RH at 150 °C (302 °F) 8 %RH at 175 °C (347 °F) 4 %RH at 200 °C (392 °F) For more information's see humidity/temperature window of sensor.	
Maximum air velocity at probe	40 m/s (7,870 ft /min) – depends on dust filter type	
Critical environments	Humidity sensor: as per DV04-14.0803.02 - Critical chemicals	

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9.2 Dew point accuracy

The XB transmitter can be configured to calculate either the dew point or frost point based on the measurement of relative humidity and temperature. The accuracy of this conversion varies, depending on the humidity and temperature conditions as shown in the graph below:

DP/FP Accuracy



Example:

At a temperature of 20 °C, a dew point value of -37 °C is measured with an accuracy of $\pm 1.0^{\circ}\text{C}$ or better.

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10 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**

11 Supporting documents

Document File Name	Contents
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-F2-009	HW4 software version 3: Device Manager - XB transmitter
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
E-M-CalBasics	Temperature and humidity adjustment basics Instructions for using the ROTRONIC humidity standards
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.

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12 Document releases

Doc. Release	Date	Notes
_20	Apr. 11, 2009	Original release
_21	Jun. 20, 2010	Updated document to HW4 software v.3
_22	Oct. 28, 2011	Updated this document regarding the model of service cable to be used with 2-wire and 3-wire models.
_23	March 26, 2015	Changes for XB with firmware v3.0 Accuracy of analog outputs added Power supply specifications updated Offset specifications updated
_24	April 01, 2015	Picture on front side adapted for devices with firmware v3.x Drawing on page 4 adapted for devices with firmware v3.x
_25	April 07, 2015	All descriptions of terminals adapted
_26	October	Maximum Humidity Sensor adaptation



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