X-DTHS-P

Industrial Temperature & Humidity Sensor

USERS MANUAL Revision 1.0

Temperature/Humidity Probe with 1-Wire Interface

Features

▶ Sensor measures both temperature and humidity

▶ Includes wall mounting clip and thru-wall mount bracket

▶ 10-foot thermoplastic rubber cable

▶ Sintered bronze pre-filter protects the sensor from dust and insects

▶ Sensor element has a PTFE cover to protect the sensor under harsh environmental conditions

▶ Fully calibrated, linearized, and temperature compensated

▶ Digital "1-Wire" interface

▶ Easy to use

▶ Sensor cable can be extended

Section 1: Introduction

The XW-DTHS-P is a temperature/humidity sensor for use in a broad range of industrial applications. It works directly with many ControlByWeb™ products (see www.controlbyweb.com for a list of compatible products.) No power supply or additional software is required. Simply connect and configure using the built in configuration and setup web pages of the host device.

Use the probe to monitor both temperature and humidity in indoor/outdoor conditions, coolers, warehouses, factories and many more applications.

The XW-DTHS-P is easy to use and comes with both wall and thru-wall mount brackets. A built in sintered bronze filter protects the sensor from dust and insects.

1.1 Features

➢ Sensor measures both temperature and humidity

➢ Includes wall mounting clip and thru-wall mount bracket

➢ 10-foot thermoplastic rubber cable

➢ Sintered bronze pre-filter protects the sensor from dust and insects

➢ Sensor element has a PTFE cover to protect the sensor under harsh environmental conditions

➢ Fully calibrated, linearized, and temperature compensated

➢ Digital "1-Wire®" interface

➢ Easy to use

➢ Sensor cable can be extended

1.2   Installation Instructions

Mount the X-DTHS-P sensor using either the wall mount clip or the thru-wall bracket. The thru-wall bracket is normally used to install the sensor in a HVAC duct and has a foam gasket to seal the access hole. The sensor can be installed outdoors but must be protected from the elements. Install the sensor in a protected location away from rain or direct sunlight.

The sensor has 3-wires which are connected to a compatible ControlByWeb device. The cable can be extended with additional wire if needed.

3-Wire Cable	
Wire	**Description**
Red	+5V power
White	Data
Black	Ground

ControlByWeb devices can support multiple "1-Wire" sensors. The sensors share the same three connections for communications and power (+5V, Ground, Data). Every sensor on the bus is assigned a unique serial number when it is manufactured. That number is used to address the sensor during communication.

Multiple sensors can be connected in two ways: directly connected (star topology) or "daisy chained" (linear topology). Many factors can determine the maximum length of the cable, including the sensor network topology, the type of cable used, the number of sensors and ambient electromagnetic noise. Combined cable lengths to all sensors of 600 ft using Cat 5e cable have been successful. However, due to the uniqueness of installation environments, results may vary. Please test in the desired environment before making a permanent installation. Cable capacitance generally limits the length. A linear (daisy chain) topology will minimize signal reflections, providing a more reliable connection and will allow longer cable length than a star topology.

The 1-Wire bus is "single-ended" and has no intrinsic noise protection. It is susceptible to interference if the cable is routed near power lines, fluorescent fixtures, motors or other noise sources. Keep the cable wiring short and avoid routing it near other electrical equipment.

1.3   Setup Instructions

Once the sensor is connected to a compatible device, the device must associate a sensor name with the sensor address. You must define a sensor name and associate an address for each 1-Wire sensor.

For example, up to 16 1-Wire sensors can be connected to a ControlByWeb X-410 module. From the X-410 setup page, select the *I/O Setup>1-Wire Sensors* tab. A list of associated 1-Wire sensors is shown.

To add a new 1-Wire sensor click *Add 1-Wire Sensor*.

Enter a descriptive name for the sensor in the *Sensor Name* box such as "Outdoor Temperature". Click ▼ to see a list of the connected 1-Wire sensors. The addresses of the non associated sensors on the bus are shown in the drop-down list together with the sensor type of each sensor. Click the ⟳ button to make a fresh scan of the bus for sensors. For each sensor being added, select the appropriate address from the sensor address drop-down list. As 1-Wire sensors are associated, the addresses are automatically removed from the pull down ▼ list of available addresses. The X-DTHS-P is a composite temperature/humidity device and has a single 1-Wire address. The drop down list will show both a temperature and a humidity ID with the same sensor address. Select appropriate ID (temperature or humidity) and the sensor address that matches the sensor address printed on the housing of the X-DTHS-P.

Alternatively, connect the sensors to the bus one at a time. The procedure is to start with one sensor and associate it with the appropriate sensor name by selecting the sensor address within the drop-down list. Submit the page, connect a second sensor, and press the Refresh List button. Associate the second sensor to the appropriate sensor name. Continue this procedure until all sensors are set up.

For more information about how to configure these options, consult the user manual for the specific host device. Normally the G*eneral Setting*s page has a setting to select the display for Fahrenheit or Centigrade units.

Appendix A: Specifications

Sensor Element

    Sensor: Sensiron™ SHT31-DIS-F

Power Requirements

Input Voltage:	+5.0 VDC ±0.25V
Input Current:	1mA max (idle)
	5mA, 50mS typ during measurement and communication

Communication

Protocol:	Maxim (Dallas) "1-Wire®"
Sensor Address:	Factory-lasered 64-bit registration number
Conversion Time:	30mS max
Min polling period:	2 seconds (to minimize self heating of sensor)

Humidity Sensor

Range:	0 to 99%RH
	(not suitable for environments with reoccurring or prolonged condensation)
Accuracy tolerance:	±2%RH
Repeatability:	0.15%RH
Resolution:	0.01%RH
Hysteresis:	±0.8%RH (@25ºC)
Long term drift:	<.25%RH/yr

Temperature Sensor

Sensor Range:	-40ºC to 80ºC (-40ºF to 180ºF)
Accuracy tolerance:	±0.4ºC (typ 0ºC to 80ºC)
Repeatability:	0.25ºC
Resolution:	0.015ºC
Settling time:	300 sec

Environmental

Operating Temperature:	-40ºC to 80ºC (-40ºF to 180ºF)
Storage Temperature:	-40ºC to 85ºC (-40ºF to 185ºF)

Mechanical

Size:	0.625in (15.9mm) dia X 3.92in (99.6mm) long
Weight:	0.7oz (18 grams)
Enclosure Material:	ABS
Cable:	3-conductor, 24AWG, TPE Jacket, 0.160" dia, 105ºC, black, 10-ft (3.04m) long

Appendix B: 1-Wire Format

The X-DTHS-P is designed for direct connection to ControlByWeb host devices. However, as a "1-Wire" sensor it can also be used with other host devices with appropriate custom programming. The information below is provided to facilitate using the X-DTHS-P with other devices.

The first byte indicates the sensor type, for the X-DTHS-P the device code is 0x03. The X-DTHS-P sensor transmits temperature and humidity in four, binary data bytes. Following the temperature and humidity data is a CRC of bytes 0-4. This CRC uses the standard 1-Wire CRC polynomial:

$$CRC = X^8 + X^5 + X^4 + X^0$$

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5
Device Code 0x03	Sensiron-SHT31 Temperature LSB	Sensiron-SHT31 Temperature MSB	Sensiron-SHT31 Humidity LSB	Sensiron-SHT31 Humidity MSB	Checksum

Formulas for converting Temperature/Humidity Probe readings into engineering units:

$$RH = 100 \cdot \left(\frac{S_{RH}}{2^{16} - 1} \right) \quad T[C] = -45 + 175 \cdot \left(\frac{S_T}{2^{16} - 1} \right) \quad T[F] = -49 + 315 \cdot \left(\frac{S_T}{2^{16} - 1} \right)$$

The X-DTHS-P employs a Maxim DS2408 interface chip. With this chip the 1-Wire measurements are "pipe-lined" such that the data returned from a data collection sequence is from the previous measurement sequence. If the sensor is polled every few seconds this delay will not be a problem. If longer polling options are desired, make a measurement, wait at least 30ms for a new conversion, then read the data again for a fresh measurement.

Xytronix Research & Design, Inc.

Appendix C: Trademark and Copyright Information

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Appendix D: Warranty

This Xytronix Research & Design, Inc. product is warrantied against defects in material and workmanship for a period of five years from the date of shipment. During the warranty period, Xytronix Research & Design, Inc. will, at its option, either repair or replace products that prove to be defective. This warranty is extended to the original purchaser of the equipment only.

For warranty service or repair, customer must contact Xytronix Research & Design, Inc. technical support (support@ControlByWeb.com) and obtain a Return Authorization number (RA#). Before issuing an RA#, a support technician will work with customer to try to resolve the issue without returning the product. If technician determines that product must be returned for service an RA# will be issued. Next, the product must be properly packaged and returned to Xytronix Research & Design, Inc. with the RA# clearly marked on the package. The purchaser shall prepay all charges for shipping to Xytronix Research & Design, Inc. For warranty repairs of products less than one year old, Xytronix Research & Design, Inc. will pay the shipping charges to return the product to the purchaser as long as the product is shipped within the continental United States. If the product is shipped outside of the continental United States or the product was shipped more than one year earlier, the purchaser shall pay all shipping charges both ways.

Limitation

The foregoing warranty shall not apply to defects or damage resulting from improper use or misuse, unauthorized repair, tampering, modification, improper connection, or operation outside the electrical/environmental specifications for the product. Further, the warranty does not cover damage from Acts of God, such as lightning, fire, flood, hurricanes and tornadoes. This warranty does not cover damage to property, equipment, direct, indirect, consequential, or incidental damage (including damage for loss of business profit, business interruption, loss of data, and the like) arising out of the use or misuse of this product.

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Appendix E: FCC Statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

Warning

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not in-stalled and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into a relay on a circuit different from where the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Notice

Changes or modification not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.