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1. General

The XE Temperature sensor measures both the temperature and humidity of the environment in which it is placed, enabling monitoring of system health and compliance conditions. This document provides explanation of the available functionalities and instructions on how to install and integrate the sensor into your digital signage installation.

The information in this document is created for users who are familiar with the Nexmosphere API and are able to control a basic setup with a Nexmosphere API controller. If this is not the case yet, please read the general documentation on the Nexmosphere serial API first.

2. Product overview

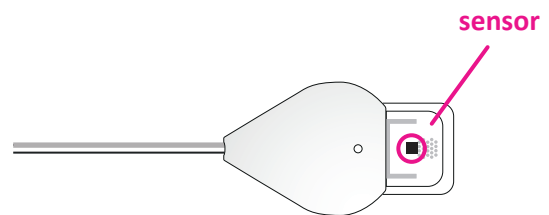
The XE Temperature sensor is available in 1 model:

	XE-T50
Temperature measurement	✓
Humidity measurement	✓



The XE Temperature sensor detects temperature and humidity levels and can be adhered to any object or surface.

The device contains a small black element that both measures both the temperature and humidity. This sensor is soldered on an exposed piece of the device's PCB.



PRODUCT MANUAL | XE TEMPERATURE SENSOR

3. Functionalities and API commands

The XE Temperature sensor provides the following functionalities:

1. **Temperature measurement** - measures the ambient temperature in ranges or degrees Celcius
2. **Humidity measurement** - measures the ambient humidity in ranges or percentages

The following sections will cover each of these functionalities in detail. Please note that for each API example in this document, X-talk interface address 001 is used (X001). When the sensor is connected to another X-talk channel, replace the "001" with the applicable X-talk address.

3.1 Temperature measurement

When the sensor is connected, it will immediately start measuring the current temperature, and send out the respective range varying from 1 to 3. This is the default setting. These ranges will then be send out using API messages which will have the following format:

X001B[Tr=*] *Temperature range *(1-3) is measured*

The default temperature values per range are as follows.

Range	Temperature
1	-25 - 0 °C
2	1 - 40 °C
3	41 - 75 °C

Example API messages

Temperature measured of 23 degrees Celcius
X001B[Tr=2]

Temperature measured of 46 degrees Celcius
X001B[Tr=3]

In addition to default range triggers, the XE Temperature sensor can also be set to provide the temperature value (in °C) as output. In order to do so, the output mode must be adjusted by sending the following setting command:

X001S[4:3] Set temperature output mode to degrees Celcius

The API commands for temperature value output will have the following format:

X001B[Tv=+XX,X] *XX,X = value -25,0 - 75,0°C*

When implementing the sensor in your setup, the default temperature ranges can be adjusted according to your preference. This can be done using setting 10-15. More information can be found on page 5 of this document.

3.2 Humidity measurement

Identical to the measurement of temperature, this sensor also detects three different humidity ranges at default. Humidity is only accurately measured when the temperature is $\geq 1^{\circ}\text{C}$. Due to condensation, it can take a few minutes before decline in high humidity is detected. The humidity ranges will be send out using API messages in the following format:

X001B[Hr=*] *Humidity range * (1-3) is measured*

The default humidity values per range are as follows.

Range	Humidity
1	1 - 34 %
2	35 - 65 %
3	66 - 100 %

Example API messages

Humidity measured of 25%

X001B[Hr=1]

Humidity measured of 71%

X001B[Hr=3]

In addition to default range triggers, the XE Temperature sensor can also be set to provide the humidity value (in %) as output. In order to do so, the output mode must be adjusted by sending the following setting command:

X001S[5:3] Set humidity output mode to percentages

The API commands for temperature and humidity value output will have the following format:

X001B[Hv=XX] *XX = value 0 - 100%*

When implementing the sensor in your setup, the default temperature ranges can be adjusted according to your preference. This can be done using setting 20-25. More information can be found on page 5 of this document.

Data requests

The temperature and humidity values can also be requested at any time by sending one of the following API commands:

X001B [TEMP?] Request current temperature value

X001B [HUMI?] Request current humidity value

X001B [ALL?] Request both the current temperature and humidity values

The reply will be identical to the triggered temperature and humidity value API messages such as listed above.

4. Installation requirements and guidelines

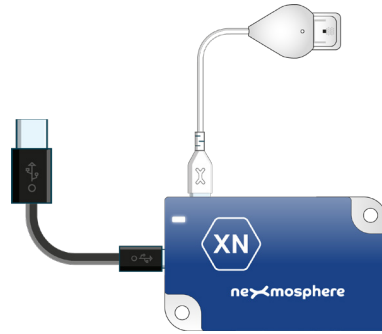
When integrating an XE Temperature sensor into your digital signage installation, several installation requirements and guidelines need to be taken into account in order for the sensor to perform optimal and operate stable.

4.1 Connection Diagrams

The XE Temperature sensor can be connected to any X-talk interface and is therefore compatible with all Xperience controllers. Make sure the XE Temperature sensor is connected to the X-talk interface before powering the Xperience controller. Otherwise, the sensor will not be recognized by the Xperience controller and no output will be provided.



Example connection to XC Controller



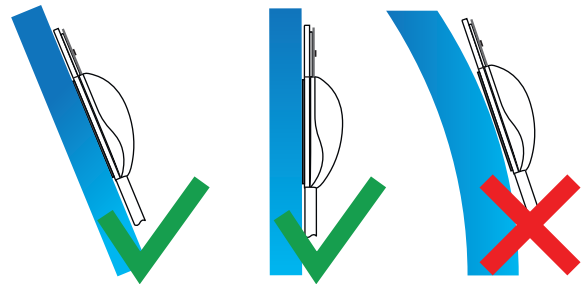
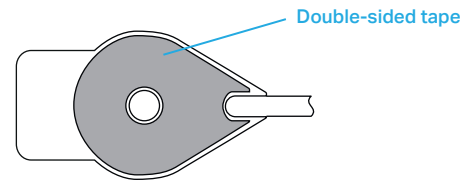
Example connection to XN Controller

4.2 Hardware integration guidelines

Installation with double sided tape

The XE Temperature sensor is typically installed using the double-sided tape. Using this method, the sensor securely mounts on any flat surface, horizontal vertical or angled. Furthermore, this tape is easily removable and non-marking.

Additionally, the XE Temperature sensor should be installed in a dry and dust-free environment.



5. Settings

The XE Temperature sensor has multiple settings which determine the behaviour and output of the interface. The settings can be adjusted by sending X-talk setting commands via the API. After a power cycle, the settings always return back to default.

Setting 1: Status LED behaviour

- | | |
|---------------------------------------|-------------------------|
| 1. LED always on | <code>X001S[1:1]</code> |
| 2. LED always off | <code>X001S[1:2]</code> |
| 3. LED on, blink at trigger (default) | <code>X001S[1:3]</code> |
| 4. LED off, blink at trigger | <code>X001S[1:4]</code> |

Setting 4: Trigger mode (Temperature)

- | | |
|--|-------------------------|
| 1. No triggers, use data requests | <code>X001S[4:1]</code> |
| 2. Trigger on range change (default) | <code>X001S[4:2]</code> |
| 3. Trigger on value change (0.1°C) | <code>X001S[4:3]</code> |
| 4. Trigger on both range and value | <code>X001S[4:4]</code> |
| 5. Trigger on temp. value change (1°C) | <code>X001S[4:5]</code> |

When set to 4:1, the sensor will only trigger when any of the API commands for data requests are send (see page 3). When set to 4:2, the sensor will trigger when the temperature reaches another temperature range. When set to 4:3, the sensor will switch to triggering on the temperature in degrees Celcius each time the temperature changes by 0.1°C. When set to 4:4, the sensor will trigger on changes in degrees Celcius and give an additional trigger when a new temperature range is reached. When set to 4:5, the sensor will trigger on the temperature in degrees Celcius each time the temperature changes by 1°C. For more info, please see section 3, page 2.

Setting 5: Trigger mode (Humidity)

- | | |
|--------------------------------------|-------------------------|
| 1. No triggers, use data requests | <code>X001S[5:1]</code> |
| 2. Trigger on range change (default) | <code>X001S[5:2]</code> |
| 3. Trigger on value change (2%) | <code>X001S[5:3]</code> |
| 4. Trigger on both range and value | <code>X001S[5:4]</code> |

When set to 5:1, the sensor will only trigger when any of the API commands for data requests are send (see page 3). When set to 5:2, the sensor will trigger when the humidity reaches another humidity range. When set to 5:3, the sensor will switch to triggering on the humidity in percentages each time the humidity changes by 2%. When set to 5:4, the sensor will trigger on changes in humidity percentage and give an additional trigger when a new humidity range is reached. For more info, please see section 3, page 3.

Setting 10-15: Changing temperature range values

- | | |
|-------------------------------|--------------------------|
| 10. Lower value temp. range 1 | <code>X001S[10:X]</code> |
| 11. Upper value temp. range 1 | <code>X001S[11:X]</code> |
| 12. Lower value temp. range 2 | <code>X001S[12:X]</code> |
| 13. Upper value temp. range 2 | <code>X001S[13:X]</code> |
| 14. Lower value temp. range 3 | <code>X001S[14:X]</code> |
| 15. Upper value temp. range 3 | <code>X001S[15:X]</code> |

The XE Temperature sensor offers the option to define custom trigger ranges. The lower or upper value of the ranges can be given through the use of a simple formula: $X - 100 = °C$. The outermost x-values that can be used as lower or upper values are 75 (-25°C) and 175 (75°C). However, the maximum recommended operating temperature of the product is 50°C.

Setting 20-25: Changing humidity range values

- | | |
|-------------------------------|--------------------------|
| 20. Lower value humi. range 1 | <code>X001S[20:X]</code> |
| 21. Upper value humi. range 1 | <code>X001S[21:X]</code> |
| 22. Lower value humi. range 2 | <code>X001S[22:X]</code> |
| 23. Upper value humi. range 2 | <code>X001S[23:X]</code> |
| 24. Lower value humi. range 3 | <code>X001S[24:X]</code> |
| 25. Upper value humi. range 3 | <code>X001S[25:X]</code> |

The XE Temperature sensor offers the option to define custom trigger ranges. Instead of the X-values above, the new preferred humidity percentages can be set. The outermost x-values that can be used as lower or upper values are 1 and 99.

6. Quick test

In order to test if the XE Temperature sensor is installed correctly, please follow the test procedure below:

Step 1 - Setup

Connect the XE Temperature sensor to an Xperience controller and power the Xperience controller.

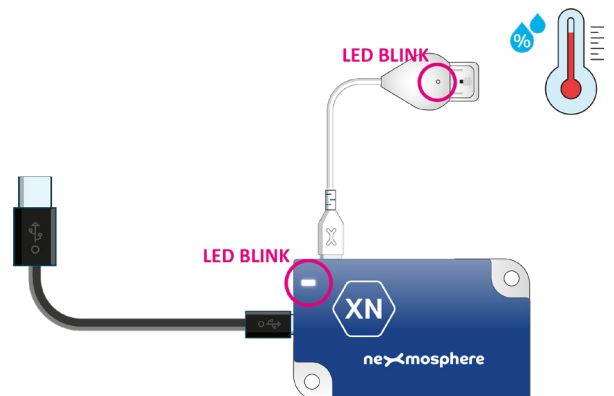
The green status LED of the XE should blink twice. The status LED of the controller will start to blink and once power-up is completed will be lit continuously. When power-up is completed, the XE status LED will also blink once.



Step 2 - Test

Place the XE Temperature sensor in an environment that is situated in another range, considering the three default ranges of either the temperature or the humidity.

Both the green status LED of the sensor and the status LED of the controller should blink.



In case any of the steps above does not provide the expected result, please check the installation guidelines in this document.

For a full test we recommend to connect the setup to a mediaplayer or PC and test all API commands listed in this document (see section 3, page 2-3). For more information on how to setup a test for your controller, please see the Quick Start Guide of the Xperience controller you are using. These are available on nexmosphere.com/support-documentation

Please contact support@nexmosphere.com for any support questions you may have.