Safety Precautions

Ursalink will not shoulder responsibility for any loss or damage resulting from not following the instructions of this operating guide.

- The device must not be disassembled or remodeled in any way.
- Do not place the device outdoors where the temperature is below/above operating range. Do not place the device close to objects with naked flames, heat source (oven or sunlight), cold source, liquid and extreme temperature changes.
- The device is not intended to be used as a reference sensor, and Ursalink will not shoulder responsibility for any damage which may result from inaccurate readings.
- The battery should be removed from the device if it is not to be used for an extended period. Otherwise, the battery might leak and damage the device. Never leave a discharged battery in the battery compartment.
- The device must never be subjected to shocks or impacts.
- Do not clean the device with detergents or solvents such as benzene or alcohol. To clean the device, wipe with a soft moistened cloth. Use another soft, dry cloth to wipe dry.

Declaration of Conformity

Ursalink AM100 series is in conformity with the essential requirements and other relevant provisions of the CE, FCC, and RoHS.

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Fax: 86-592-5023065

Revision History

<table>
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<tr>
<th>Date</th>
<th>Doc Version</th>
<th>Description</th>
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<tr>
<td>April 7, 2020</td>
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<td>Initial version</td>
</tr>
<tr>
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<td>V 1.1</td>
<td>APP pictures replacement</td>
</tr>
<tr>
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<td>V 1.2</td>
<td>Add screen display mode and configuration examples</td>
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1. Overview

1.1 Description

AM100 series is a compact indoor ambience monitoring sensor including motion, humidity, temperature, light, TVOC, CO₂, barometric pressure for wireless LoRa network. AM100 series is a battery powered device and is designed to be wall-mounted. It is equipped with NFC (Near Field Communication) and can easily be configured via a smartphone or a PC software. Sensor data are transmitted in real-time using standard LoRaWAN protocol. LoRaWAN enables encrypted radio transmissions over long distance while consuming very little power. The user can obtain sensor data and view the trend of data change through Ursalink Cloud or through the user’s own Network Server.

1.2 Features

- Robust LoRa connectivity for indoor or HVAC environments
- Integrated multiple sensors like temperature, humidity, light, air quality, etc.
- Easy configuration via NFC
- Visual display via E-Ink screen
- Standard LoRaWAN support
- Ursalink Cloud compliant
- Low power consumption (about 1 year battery life)
- Standard AA alkaline battery

1.3 Specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>AM102</th>
<th>AM100</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LoRaWAN</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frequency</td>
<td>EU433/CN470/IN865/RU864/EU868/US915/AU915/KR920/AS923</td>
<td></td>
</tr>
<tr>
<td>Tx Power</td>
<td>20dBm</td>
<td></td>
</tr>
<tr>
<td>Sensitivity</td>
<td>-147dBm @300bps</td>
<td></td>
</tr>
<tr>
<td>Mode</td>
<td>OTAA/ABP Class A</td>
<td></td>
</tr>
<tr>
<td><strong>Sensors</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Temperature</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Range</td>
<td>-20°C to + 70°C</td>
<td></td>
</tr>
<tr>
<td>Accuracy</td>
<td>0°C to + 70°C (+/- 0.3°C), -20°C to 0°C (+/- 0.6°C)</td>
<td></td>
</tr>
<tr>
<td><strong>Humidity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Range</td>
<td>0% to 100% RH</td>
<td></td>
</tr>
<tr>
<td>Accuracy</td>
<td>10% to 90% RH (+/- 3%), below 10% and above 90% RH (+/- 5%)</td>
<td></td>
</tr>
<tr>
<td><strong>PIR</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## AM100 Series User Guide

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detection Area</td>
<td>94 ° Horizontal, 82 ° Vertical</td>
</tr>
<tr>
<td>Detection Distance</td>
<td>5 m</td>
</tr>
<tr>
<td>Output Range</td>
<td>0-65535</td>
</tr>
</tbody>
</table>

### Light
- **Range**: 60000 lux (Visible + IR, IR)
- **Accuracy**: ±30%

### CO2
- **Range**: 400 - 5000 ppm
- **Accuracy**: ±30 ppm or ±3 % of reading

### TVOC
- **Range**: 0 - 60000 ppb
- **Accuracy**: N/A
- **Long-term Stability**: 1.3 % accuracy drift per year

### Barometric Pressure
- **Range**: 300 - 1100 hPa (-40°C - 85°C)
- **Accuracy**: ±1 hPa

### Display & Configuration
- **Display**: 2.13-inch Black&White E-Ink Screen
- **Configuration**: 1. Mobile APP via NFC
  2. PC software via NFC or USB type-C port

### Physical Characteristics
- **Power Supply**: 1. 2 × AA Alkaline battery
  2. 5VDC USB type-C power supply
- **Battery Life¹**: 0.9-0.7 year 1.5-1.2 year
  0.8-0.6 year (Smart Mode Disabled) 1.3-1 year(Smart Mode Disabled)
- **Operating Temperature**: 0°C to +45°C
- **Relative Humidity**: 0% to 100% (non-condensing)
- **Dimension**: 105 × 70.4 × 21.2 mm (4.1 × 2.8 × 0.8 in)
- **Mounting**: Wall

---

¹ Tested under laboratory conditions and for guideline purposes only.
² Smart Mode: When Activity Level (PIR) =0 and lasts for 20 minutes, screen will go to sleep mode to save power.
2. Hardware Introduction

2.1 Packing List

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>AM100/AM102</td>
<td>1 x</td>
</tr>
<tr>
<td>AA Batteries (LR6)</td>
<td>2 x</td>
</tr>
<tr>
<td>Mounting Sticker</td>
<td>1 x</td>
</tr>
<tr>
<td>Mounting Screws</td>
<td>2 x</td>
</tr>
<tr>
<td>Warranty Card</td>
<td>1 x</td>
</tr>
<tr>
<td>Quick Guide</td>
<td>1 x</td>
</tr>
<tr>
<td>NFC Reader (Optional)</td>
<td>1 x</td>
</tr>
</tbody>
</table>

If any of the above items is missing or damaged, please contact your Ursalink sales representative.

2.2 Product Overview

**Front Panel:**
1. E-ink screen
2. NFC Area
3. LoRa Antenna (Internal)
4. PIR Sensor
5. Light Sensor

**Back Panel:**
6. Power button
7. Battery Cover
8. Mounting Holes
9. Type-C Port
2.3 E-link Screen

2.3.1 Screen Icons

AM100 series provide 3 types of display modes:

<table>
<thead>
<tr>
<th>AM100</th>
<th>Mode 1</th>
<th>Mode 2</th>
<th>Mode 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Thermometer" /></td>
<td><img src="image2" alt="Thermometer" /></td>
<td><img src="image3" alt="Thermometer" /></td>
<td></td>
</tr>
<tr>
<td><img src="image4" alt="Humidity" /></td>
<td><img src="image5" alt="Humidity" /></td>
<td><img src="image6" alt="Humidity" /></td>
<td></td>
</tr>
<tr>
<td><img src="image7" alt="Battery" /></td>
<td><img src="image8" alt="Battery" /></td>
<td><img src="image9" alt="Battery" /></td>
<td></td>
</tr>
<tr>
<td><img src="image10" alt="Time" /></td>
<td><img src="image11" alt="Time" /></td>
<td><img src="image12" alt="Time" /></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>AM102</th>
<th>Mode 1</th>
<th>Mode 2</th>
<th>Mode 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image13" alt="Thermometer" /></td>
<td><img src="image14" alt="Thermometer" /></td>
<td><img src="image15" alt="Thermometer" /></td>
<td></td>
</tr>
<tr>
<td><img src="image16" alt="Humidity" /></td>
<td><img src="image17" alt="Humidity" /></td>
<td><img src="image18" alt="Humidity" /></td>
<td></td>
</tr>
<tr>
<td><img src="image19" alt="Battery" /></td>
<td><img src="image20" alt="Battery" /></td>
<td><img src="image21" alt="Battery" /></td>
<td></td>
</tr>
<tr>
<td><img src="image22" alt="Time" /></td>
<td><img src="image23" alt="Time" /></td>
<td><img src="image24" alt="Time" /></td>
<td></td>
</tr>
</tbody>
</table>

To learn what an icon means, find it below.

<table>
<thead>
<tr>
<th>Icon</th>
<th>Description</th>
<th>Screen Update</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image25" alt="Battery" /></td>
<td>Battery level</td>
<td>Once per day</td>
</tr>
<tr>
<td>22:22</td>
<td>Sync time with software or mobile APP</td>
<td>1 min</td>
</tr>
<tr>
<td><img src="image26" alt="Network" /></td>
<td>The device joins the network.</td>
<td>According to join status</td>
</tr>
<tr>
<td><img src="image27" alt="Network" /></td>
<td>The device fails to join the network.</td>
<td></td>
</tr>
<tr>
<td>Parameter</td>
<td>Level 0</td>
<td>Level 1</td>
</tr>
<tr>
<td>-----------------------------------------------</td>
<td>---------</td>
<td>---------</td>
</tr>
<tr>
<td>Temperature</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Humidity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Luminance</td>
<td>0-5 lux</td>
<td>6-50 lux</td>
</tr>
<tr>
<td>Total volatile organic compounds</td>
<td>0-100 ppb</td>
<td>101-200 ppb</td>
</tr>
</tbody>
</table>

**Alarm:** ≥ 401ppb.

**Note:** AM100 series will do a full-screen refresh every 30 minutes in order to remove ghosting.

### 2.3.2 Screen Mode Switch

Here are 3 methods to switch between the three modes:

- **Power button:** Quick press on the power button to switch the mode.
- **Mobile APP:** Go to APP menu “Device > Settings > Basic Settings” to select screen display mode.
- **Software:** Go to Toolbox menu “Device Settings > Basic” to select screen display mode.
2.4 Dimensions (mm)

3. Power Supply

Remove the battery cover and install two new AA/LR6 batteries. Batteries can be replaced on the fly.

Note:
- AM100 series can also be powered by type-C USB port (5V, 100mA). When batteries and external power are both connected, external power will power the device first.
- USB port can't be used to charge battery.
4. Turn On/Off via Power Button

AM100 series can be turned on/off or reset by power button on the rear panel.

<table>
<thead>
<tr>
<th>Function</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turn On</td>
<td>Press and hold the power button for more than 3 seconds until the screen changes state.</td>
</tr>
<tr>
<td>Turn Off</td>
<td>Press and hold the power button for more than 3 seconds until the screen changes state.</td>
</tr>
</tbody>
</table>
| Reset          | Press and hold the power button for more than 10 seconds.  
**Note:** AM100 will be automatically powered on after reset. |
| Change Screen Mode | Quick press on the power button.                                      |

5. Sensor Configuration

AM100 series sensor can be monitored and configured through one of the following methods:
- Mobile APP (NFC);
- Windows software (NFC or Type-C port).

In order to protect the security of sensor, password validation is required when turning on/off the sensor or changing configuration. Default password is **123456**.

5.1 Configuration via Smartphone APP

**Preparation:**
- Smartphone (NFC supported)
- Toolbox APP: APP can be downloaded on Google Play or Apple Store.

5.1.1 Read/Write Configuration via NFC

1. Enable NFC on the smartphone and open “Toolbox” APP.
2. Attach the smartphone with NFC area to the device to read basic information.

**Note:** Ensure your smartphone NFC area and it is recommended to take off phone case before using NFC.
3. When you perform one of the following operations, enter the password and attach the smartphone with NFC area to the device until the APP shows a successful prompt.
   - Turn on/off the sensor
   - Reset the sensor
   - Sync the time
   - Tap “Write” to change settings in “Device > Settings”.

4. Click “Read” to fetch the current data of sensor.

   ![Sensor Data Read]

5.1.2 Template Settings

Template settings are used for easy and quick device configuration in bulk.

**Note:** Template function works only for sensors with the same model and LoRa frequency band.

1. Go to “Template” page of APP and save current settings as a template.
2. Attach the smartphone with NFC area to another device.
3. Select the template file from Toolbox and click “Write”.
4. Enter password of this device and keep the two devices close until the APP shows a successful prompt.
5. Slide the template item left to edit or delete the template.

5.2 Configuration via PC

Preparation:
- Dedicated NFC Reader or Type-C USB cable
- PC (Windows 10 is recommended)

5.2.1 Log in the Toolbox

Make sure “Toolbox” is downloaded on your computer. Select one of the following methods to log in Toolbox.

**Type-C Connection**

1. Connect the AM100/AM102 sensor to computer via type-C port.

2. Select type as “General” and click password to log in Toolbox. (Default password: 123456)
NFC Connection

1. Connect the NFC reader to computer, then attach the sensor to NFC area of the reader.

2. Select type as “NFC” and serial port as NFC reader port on Toolbox.

5.2.2 Basic Configuration

1. Click “Read” to read current data of the sensor.

2. When you perform one of the following operations, type the password and click “Enter”, then wait a few seconds until toolbox shows a successful prompt. (Password is not needed if you connect it via type-C port)
   - Turn on/off the sensor
   - Reset the sensor
   - Sync the time
   - Click “Write” to change settings
   - Upgrade
5.2.3 Upgrade

1. Download AM firmware to your computer.
2. Go to “Maintenance -> Upgrade” page of Toolbox.
3. Click “Browse” and select the firmware from computer.
4. Click “Upgrade” to upgrade the device.

**Note:** If NFC connection is selected, please keep the two devices close and don’t move them in order to get the best connectivity as possible when upgrading.

5.2.4 Template and Reset

5.2.4.1 Template Configuration

**Note:** Template function works only for sensors with the same model and LoRa frequency band.

1. Go to “Maintenance -> Template and Reset” page of Toolbox.
2. Click “Export” to save the current settings as a template.
3. Click "Browse" to select the correct template from computer.
4. Click "Import" to import the template to the device.

5.2.4.2 Reset
Click the "Reset" to reset the setting to factory default.
5.3 Configuration Examples

5.3.1 LoRaWAN Channel Settings

The configuration of LoRaWAN channel of AM100/AM102 must match the LoRaWAN gateway’s. Refer to Appendix to check default channel settings of AM100/AM102.

Mobile APP Configuration:
Open Toolbox APP and go to “Device -> Setting -> LoRaWAN Settings” to change the frequency and channels.

Software Configuration:
Log in Toolbox and go to “LoRaWAN Settings -> Channel” to change frequency and channels.

Note: If frequency is one of CN470/AU915/US915, you can enter the index of the channel that you want to enable in the input box, making them separated by commas.

Examples:
1, 40: Enabling Channel 1 and Channel 40
1-40: Enabling Channel 1 to Channel 40
1-40, 60: Enabling Channel 1 to Channel 40 and Channel 60
All: Enabling all channels
Null: Indicates that all channels are disabled
5.3.2 Time Synchronization

Mobile APP Configuration:
Open Toolbox APP and go to “Device -> Status” to click “sync” to sync the time on the screen.

Software Configuration:
Log in Toolbox and go to “Status” page to sync the time on the screen.
6. Sensor Installation

6.1 Installation Note

In order to ensure the best detection and LoRaWAN communication effect, it is recommended to install AM100 series as follows:

- There should not be any isolates or barriers in PIR and light detection range.
- Do not mount the device where the temperature is below/above operating range and temperature varies greatly.
- Stay far away from any heat source or cold source like oven, refrigerator.
- Do not mount the device close to where airflow varies greatly like windows, vent, fan and air conditioner.
- Do not mount the device upside down.
- Do not place the device right to the window or door. If you have to, you’d better pull the curtain.
- It is recommended to install at least 1.5m high from floor.

6.2 Wall Mounting

1. Attach the mounting sticker to the wall.
2. Mark the wall where the two mounting holes are according to the sticker’s mark (around 88mm).
3. Drive two screws into wall at the marks using screw driver.
4. Mount the device on the wall.
7. Sensor Management via Ursalink Cloud

Ursalink cloud is a comprehensive platform that provides multiple services including device remote management and data visualization with the easiest operation procedures.

7.1 Ursalink Cloud Registration

Register and log in Ursalink Cloud.

Ursalink Cloud URL: https://cloud.ursalink.com/login.html

7.2 Add a Ursalink LoRaWAN Gateway

1. Enable “Ursalink” type network server and “Ursalink Cloud” mode in gateway web GUI.

Note: Ensure gateway has accessed the Internet.
2. Go to “My Devices->Gateway” of Ursalink Cloud and click “Add” to add gateway to Ursalink Cloud via SN.

3. Check if gateway is online in Ursalink Cloud.

7.3 Add AM100/AM102 to Cloud

1. Go to “Device->My Devices” and click “Add Device”. Fill in the SN of AM100/AM102 and select associated gateway.
2. After AM100/AM102 is connected to Ursalink Cloud, click "History Data" to check the data on Ursalink cloud.

3. Go to “Dashboard” page to add widgets to the dashboard.
Appendix

Default LoRaWAN Parameters

<table>
<thead>
<tr>
<th>DevEUI</th>
<th>24E124 + 2\textsuperscript{nd} to 11\textsuperscript{th} digits of SN e.g. SN = 61 26 A1 01 84 96 Then Device EUI = 24E124126A101849</th>
</tr>
</thead>
<tbody>
<tr>
<td>AppEUI</td>
<td>24E124C0002A0001</td>
</tr>
<tr>
<td>AppPort</td>
<td>0x55</td>
</tr>
<tr>
<td>NetID</td>
<td>0x010203</td>
</tr>
<tr>
<td>DevAddr</td>
<td>The 5\textsuperscript{th} to 12\textsuperscript{th} digits of SN e.g. SN = 61 26 A1 01 84 96 00 41 Then DevAddr = A1018496</td>
</tr>
<tr>
<td>AppKey</td>
<td>5572404C696E6B4C6F52613230313823</td>
</tr>
<tr>
<td>NwkSKey</td>
<td>5572404C696E6B4C6F52613230313823</td>
</tr>
<tr>
<td>AppSKey</td>
<td>5572404C696E6B4C6F52613230313823</td>
</tr>
</tbody>
</table>

Default Uplink Channels

<table>
<thead>
<tr>
<th>Model</th>
<th>Channel Plan</th>
<th>Channel Settings/MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>AM10x-433</td>
<td>EU433</td>
<td>433.175, 433.375, 433.575</td>
</tr>
<tr>
<td>AM10x-470</td>
<td>CN470</td>
<td>470.3~489.3 (All 95 channels)</td>
</tr>
<tr>
<td>AM10x-868</td>
<td>EU868</td>
<td>868.1, 868.3, 868.5</td>
</tr>
<tr>
<td>AM10x-915</td>
<td>AU915</td>
<td>915.2~927.1 (All 72 channels)</td>
</tr>
</tbody>
</table>

-END-