User Manual

Senseair ExploraPM$_{2.5}$
LoRaWAN
PM, temperature and relative humidity transmitter

General

Senseair ExploraPM$_{2.5}$ is designed to measure PM1.0, PM2.5, PM10, temperature and humidity in indoor environments. The sensor is intended for indoor climate control. It is optimised for reliable and secure measurements.
Standard measurement and reporting intervals are every 15 minutes, other reporting intervals can be configured over the air.

Document	Rev	Page
UMA9619	2	1 (4)

Table of contents

1 Opening of housing

See Installation manual

2 Installation and activation

See Installation manual

Configure the device in the LoRaWAN server, according to chapter 2.1, and power the device with 5–24VDC power e.g. USB charger or 24VDC. The cable can be routed through the cable canal or through the electronic board for junction box mount. The sensor starts and flashes 8 times during the boot-up sequence. The sensor is activated by pressing the push button for 3 seconds until the red LED makes two short flashes.
When the device has successfully joined the LoRaWAN network there will be a 2-second-long flash.
Attach the electronic board to the bottom piece and attach the plastic cover.

2.1 LoRaWAN Configuration

Configuration on the network server is done with
AppEUI: 70-B3-D5-D7-2F-F8-17-00 (a.k.a. JoinEUI)
It is possible to order a batch of devices configured with a customer unique AppEUI, contact Senseair for information.
The device is configured with device unique DevEUI and AppKey. The DevEUI is printed on device box and the AppKey is distributed by the sales team. The device is default configured for OTA provisioning. Contact Senseair for ABP configuration. The device follows the LoRaWAN standard related Join configuration parameters, such as RX1 and RX2 windows, RX2 downlink frequency etc.
The default setting is ADR enabled.

2.1.1 Frequency band

EU: 868 MHz *
USA, Australia: 915 MHz

*Other options will be available

See senseair.com

2.2 Sensor states and state check

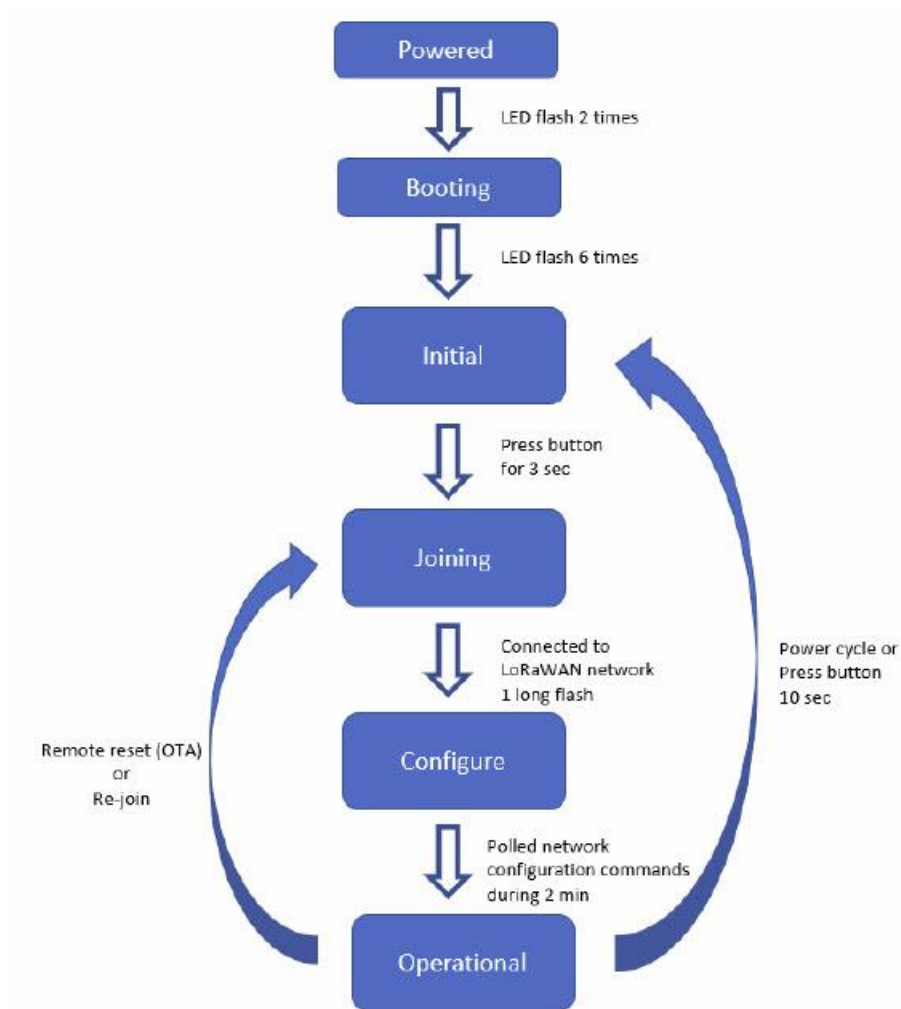The sensor has six states: Powered, Booting, Initial, Joining, Configure and Operational state.

Figure 1 Device states

When the unit is initially powered, the LED flashes 8 times, and tries to join the LoRaWAN network. A successful join is indicated with a 2 sec long flash.
To check the device state, press the button and hold it pressed until the red LED starts flashing after 0.5s.

State	Description	LED response
Initial	Low power state during transport. Radio not active	1 short flash (0.5 sec)
Joining	Trying to join a LoRaWAN network. The device will remain in this state until successfully joined a LoRaWAN network	2 short flashes (0.5 sec)
Configure	Enables quick over-the-air configuration, by polling server after configuration commands during 2 minutes. This is done by sending uplink status command (0x20).	1 long flash (2 sec)
Operational	Joined to a LoRaWAN network, measures temperature and humidity periodically, and sends measurement reports toward a LoRAWAN network.	1 long flash (2 sec)

2.2.1 Re-join functionality

The device supervises its connectivity to the network by monitoring that periodic downlink messages are received.
The device tries to re-join the network if it has not heard anything from the network for 288 uplinks (3 days @ 15-minute message interval). The device requests and normally gets a downlink ever 64th uplink due to the ADRAckReq functionality.

3 Security

The device has the following security features:
• Cryptographical coprocessor for ultra-secure hardware based key storage
• Secure boot
• Encrypted FW
• Message encryption (AES-128 bit)
• Message integrity (MIC AES-128 bit)
• No port access to device.

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