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General Description

Lansitec temperature and humidity sensor is based on the advanced LoRa modulation and powered by lithium battery with 5-year operation time. It offers cost effective LoRaWAN end device for a variety of application. It's IP65 enclosure and long operation time offers low maintenance and is ideal for outdoor use. Sensor work mode can be adjusted via LoRa network.

Lansitec sensors family is fully compatible and plug & play for LoRaWAN network operation.

Applications

- Weather station
- Heating
- Drying
- Ventilation & air conditioning systems
- Smart Agriculture
- Building automation

Key features

- Powered by lithium thionyl chloride battery: 5 years of operation for 1 uplink 5 minutes.
- Extended industrial operating temperature:
 - -40°C to +85°C.
- Outdoor use: IP64 enclosure.
- Accuracy:
 - ±3% RH typically from 20% RH to 80% RH at 25°C.
 - ±0.3°C typically from +5°C to +60°C.
- LoRaWAN compatible:
 - Class A, uplink rate programmable from 10 seconds to 24 hours.
- Change uplink cycle via wireless, configurable by server via downlink command
- Operating frequency bands (Option at order):
 - 470MHz, < 50mW radiated power
 - 868MHz, < 25mW radiated power
 - 920MHz, < 25mW radiated power



1. Product specifications

The tables below give the electrical specifications and performance of the temperature and humidity measurement.

Table 1 General electrical characteristic

| ITEMs | Parameter | Specifications | Unit |
|---|---------------|---------------------------------------|-----------------------------------|
| Structure | Size | 84 X 114 X 55 | mm |
| Electrical Characteristics | power supply | 3.6V battery | V |
| | Sleep current | 20uA | uA |
| | | Transmit current | 120mA@17dBm set 45mA@14dBm set |
| | Uplink cycle | 5 minutes in default | minutes |
| | | Set by downlink command from server | |
| | Battery life | More than 5 years with 5minutes cycle | years |
| More than 10 years with 10minutes cycle | | years | |
| Operating Range | Temperature | -40 to 85 | °C |
| | Humidity | 0 to 100 | %RH |

Table 2 Temperature measurement performance

| Parameter | Condition | Min | Typ. | Max | Units |
|------------------------|-----------|-----|--------|-----|-------|
| Resolution | 14bit | | 0.01 | | °C |
| Accuracy | Typ. | | +/-0.3 | | °C |
| Operating Range | Extended | -40 | | 85 | °C |
| Long Term Drift | Normal | | <0.04 | | °C |

Table 3 Humidity measurement performance

| Parameter | Condition | Min | Typ. | Max | Units |
|------------------------|-----------|-----|--------|-----|-------|
| Resolution | 12bit | | 0.04 | | %RH |
| Accuracy | Typ. | | +/-3.0 | | %RH |
| Nonlinearity | | | <0.1 | | %RH |
| Operating Range | Extended | 0 | | 100 | %RH |
| Long Term Drift | normal | | <0.5 | | %RH |

2. Application Information

2.1 Function

The sensor supports both OTAA and ABP mode, works in Class A mode. DevEUI, AppEUI and AppKey, or DevAddr, NwkSKey and AppSKey are stored in the tracker and are necessary for joining a network. DevEUI or DevAddr is labeled at the back of the device. Lansitec will help to configure this before shipping.

After power on and join the Lora network, sensor will send registration message to Application Server(AS). If AS doesn't reply, sensor will retry for 5 times before switching to default mode (periodically report mode). Configuration information of the sensor is included in this registration message for AS to validate.

Sensor starts to work after receiving acceptance response or no AS reply after 5 times registration trial. Temperature and humidity will be reported to AS periodically. The duty cycle is configurable by commands from AS. Temperature and humidity acquisition and report period is 10 minutes by default.

According to LoRaWAN specification, downlink response time is decided by uplink duty cycle, user should refer the needed response time to choose uplink duty cycle. Detailed downlink and uplink definition are described below.

2.2 Uplink Message

2.2.1 Register

| | | | | | | |
|--------------|----------|----------|----------|----------|----------|----------|
| Bytes | 1 | 1 | 1 | 1 | 2 | 2 |
| Item | TYPE | SMODE | POWER | CFG | TH | CRC |

TYPE field

| Bit | Name | Value | Description |
|-----|------|-----------------|--|
| 7~4 | TYPE | 0x1 | Message type. AS can use it to identify different uplink messages. |
| 3 | ADR | 0: OFF 1: ON | ADR (Adaptive Date Rate) status |
| 2~0 | MODE | 0x01~0x07 | Current working scheme which should be one of SMODE |

| | | | |
|--|--|--|---|
| | | | 0x1: AU920 0x2: CLAA 0x3: CN470 0x4: AS923 0x5: EU433 0x6: EU868 0x7: US915 |
|--|--|--|---|

SMODE field

| Bit | Name | Value | Description |
|-----|-------|--|--|
| 7~0 | SMODE | 0x01: AU920 0x02: CLAA 0x04: CN470 0x08: AS923 0x10: EU433 0x20: EU868 0x40: US915 | Data scheme supported by tracker. This field is preserved by Lansitec and will be configured before shipping. |

POWER field

| Bit | Name | Value | Description |
|-----|----------|-------|--|
| 7~3 | POWER | 0~31 | Configured transmit power (dBm) |
| 2~0 | Reserved | 0x0 | Reserved for future use. If MODE is CLAA, it indicates the frequency sweep mode of the tracker: 1: A mode 2: B mode 3: C mode 4: D mode 5: E mode 6: All frequency sweep |

CFG field

| Bit | Name | Value | Description |
|-----|----------|-------|---|
| 7~4 | DR | 0~15 | Data Rate (DR0~DR15). |
| 3 | REPTIND | 0~1 | Indicates whether report the H&T if the value is the same. Default value is 0, means always report. |
| 2~0 | Reserved | 0x0 | Reserved for future use. |

TH field

| Bit | Name | Value | Description |
|------|------|---------|---|
| 15~0 | TH | 1~65535 | The period of temperature and humidity report, unit 10s, the default value is 30, i.e. 5 minutes. |

CRC field

| Bit | Name | Value | Description |
|-----|------|-------|-------------|
| | | | |

| | | | |
|------|-----|--|--|
| 15~0 | CRC | | CRC16 of previous fields with TYPE bits set to 0, the polynomial is $x^{16} + x^{15} + x^2 + 1$. AS only need to compare this data field with the AS stored one to judge whether configuration changed. |
|------|-----|--|--|

2.2.2 Periodical temperature and humidity

| | | | | | | | | |
|-------|------|-----|------|-----|----------|----------|----------|-----|
| Bytes | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 2 |
| Item | TYPE | VOL | RSSI | SNR | TEMP_INT | TEMP_FRA | HUMIDITY | CRC |

TYPE field

| Bit | Name | Value | Description |
|-----|------|---------|--|
| 7~4 | TYPE | 0x2 | Message type, AS can use it to identify different uplink messages. |
| 3~0 | VER | 0x0~0x1 | Version of the message type, 0 means no SNR field. 1 means SNR field included. |

VOL field

| Bit | Name | Value | Description |
|-----|------|-------|---------------------------------|
| 7~0 | VOL | 0~100 | Battery left (unit: percentage) |

RSSI field

| Bit | Name | Value | Description |
|-----|------|-------|---|
| 7~0 | RSSI | 0~160 | The downlink Received Signal Strength Indication detected and calculated by the sensor. (unit: -1dBm) |

SNR field

| Bit | Name | Value | Description |
|------|------|------------|---|
| 31~0 | SNR | -3000~3000 | The downlink Signal Noise Ratio, *0.01, i.e. -30.00~30.00 |

This field is introduced since version 1, not included in version 0. If version field is 0, there will be no such field, the message length will be 8 bytes.

TEMP_INT field

| Bit | Name | Value | Description |
|-----|----------|----------|--|
| 7~0 | TEMP_INT | -127~127 | Integer part of temperature. Bit7 indicates the sign, 1 means below zero. (unit: °C) |

TEMP_FRA field

| Bit | Name | Value | Description |
|-----|----------|-------|--|
| 7~0 | TEMP_FRA | 0~99 | fractional part of temperature (unit: °C) |

HUMIDITY field

| Bit | Name | Value | Description |
|-----|----------|-------|--------------------|
| 7~0 | HUMIDITY | 0~100 | Humidity (unit: %) |

CRC field

| Bit | Name | Value | Description |
|------|------|-------|--|
| 15~0 | CRC | | Same CRC16 as calculated in register message. This can be used for server to check if any configuration mismatch. |

2.2.3 Acknowledge

| | | |
|--------------|----------|----------|
| Bytes | 1 | 1 |
| Item | TYPE | MSGID |

TYPE field

| Bit | Name | Value | Description |
|-----|--------|--------------------------|--|
| 7~4 | TYPE | 0xF | Message type, AS can use it to identify different uplink messages. |
| 3~0 | RESULT | 0: success 1: failure | Process result of any downlink message that need acknowledge |

MSGID field

| Bit | Name | Value | Description |
|-----|-------|-------|---|
| 7~0 | MSGID | 0~255 | The MSGID field of corresponding downlink message |

2.3 Downlink

2.3.1 Register acceptance

| | |
|--------------|----------|
| Bytes | 1 |
| Item | TYPE |

TYPE field

| Bit | Name | Value | Description |
|-----|--------|--|---|
| 7~4 | TYPE | 0x1 | Message type, tracker can use it to identify different downlink messages. |
| 3~0 | RESULT | 0: success 1: illegal tracker 2: server busy | Register result |

2.3.2 LoRa configuration

| | | | |
|--------------|----------|----------|----------|
| Bytes | 1 | 1 | 1 |
| Item | TYPE | DR | MODE |

TYPE field

| Bit | Name | Value | Description |
|-----|----------|-----------------|--|
| 7~4 | TYPE | 0x8 | Message type, tracker can use it to identify different downlink messages. |
| 3 | ADR | 0: OFF 1: ON | ADR (Adaptive Date Rate) status |
| 2~0 | Reserved | 0x0 | Reserved for future use. If MODE is CLAA, it indicates the frequency sweep mode of tracker: 1: A mode 2: B mode 3: C mode 4: D mode 5: E mode 6: all frequency sweep |

DR field

| Bit | Name | Value | Description |
|-----|----------|-------|---|
| 7~4 | DR | 0~15 | Data Rate(DR0~DR15) |
| 3 | REPTIND | 0~1 | Indicates whether report the H&T if the value is the same. Default value is 0, means always report. |
| 2~0 | Reserved | 0 | Reserved for future use |

MODE field

| Bit | Name | Value | Description |
|-----|------|------------------------------------|-----------------|
| 7~5 | MODE | 0x1:AU920 0x2:CLAA 0x3:CN470 | Configure mode. |

| | | | |
|-----|-------|--|-------------------------------------|
| | | 0x4:AS923 0x5:EU434 0x6:EU868 0x7:US915 | |
| 4~0 | POWER | 0~31 | Configure transmit power (unit dBm) |

2.3.3 Sensor configuration

| | | |
|--------------|----------|----------|
| Bytes | 1 | 2 |
| Item | TYPE | TH |

TYPE field

| Bit | Name | Value | Description |
|-----|----------|-------|---|
| 7~4 | TYPE | 0x9 | Message type, tracker can use it to identify different downlink messages. |
| 3~0 | Reserved | 0x0 | Reserved for future use. |

TH field

| Bit | Name | Value | Description |
|------|------|---------|--|
| 15~0 | TH | 1~65535 | The period of temperature and humidity report, unit 10s. |

2.3.4 Command request

| | | |
|--------------|----------|----------|
| Bytes | 1 | 1 |
| Item | TYPE | MSGID |

TYPE field

| Bit | Name | Value | Description |
|-----|---------|--|--|
| 7~4 | TYPE | 0xA | Message type, tracker can use it to identify different downlink messages. |
| 3~0 | COMMAND | 0x1: register request 0x2: device reset | Requested command. 0x1 used to request the tracker to send register message. 0x2 used to reset the device. |

MSGID field

| Bit | Name | Value | Description |
|-----|-------|-------|---|
| 7~0 | MSGID | 0~255 | Server generated sequence number of downlink messages that need MSGID. Tracker will respond ACK with this number, otherwise AS should resend the message. |

3. Mechanical structure and Assembly

3.1 Dimension

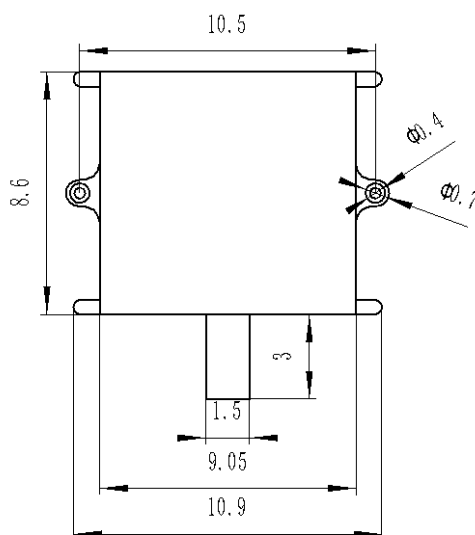


Figure 1: Dimension (mm)

3.2 Battery installation

Battery holder is inside the sensor. Just insert the 3.6V battery to the holder, the sensor will start work with a default cycle. Please follow steps below when install a new battery.

- Step1: Remove the cover.
- Step2: Install the battery.
- Step3: Reset the device.
- Step4: Close and fix the cover again.

3.3 Battery information

Lithium/thionyl chloride battery with PN ER34615 is used in the sensor, which could operate in -40 to +85°C.

4. Ordering Information

| P/N | Description |
|-----------|---|
| 100-00051 | Temperature and Humidity Sensor, CN470, 19Ah |
| 100-00139 | Temperature and Humidity Sensor, EU868, 19Ah |
| 100-00140 | Temperature and Humidity Sensor, US915, 19Ah |
| 100-00141 | Temperature and Humidity Sensor, AS923, 19Ah |
| 100-00155 | Temperature and Humidity Sensor, CLAA, internal ant, 19Ah |
| 100-00186 | Temperature and Humidity Sensor, CLAA, external ant, 19Ah |