

Technical Overview

LoRa is a wireless communication technology dedicated to long distance and low power consumption. Compared with other communication methods, LoRa spread spectrum modulation method greatly increases to expand the communication distance.

Features and Benefits

- NFC for configuration
- Over air configuration, pairing mode
- Long-range communication
- Excellent battery life
- Easy to configure/install

Product Codes

Temperature only

RF-LW-T-D	Duct mounted sensor
RF-LW-T-I	Immersion sensor
RF-LW-T-C	Clamp-on sensor
RF-LW-T-O	Outside air sensor
RF-LW-T-OR	Outside air with rad shield sensor
RF-LW-T-555	Flying lead sensor

Temperature & humidity

RF-LW-RH-D	Duct mounted sensor
RF-LW-RH-W	Wall mounted sensor
RF-LW-RH-O	Outside sensor

CO₂ (only)

RF-LW-CO2-D	Duct mounted sensor
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Accessory

RF-LS14500-S2	Lithium batteries, pack of 2
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Specification

Common Specification:

Radio output:	
Type	LoRaWAN [®]
Regions	EU863-870, US902-928, AU915-928
Security	Encryption AES 128 bit
Battery (non-rechargeable):	
2 x	3.6V AA Lithium *
Life	TBC, dependent on configuration & ambient conditions
Optional permanent supply	24Vac/dc ±10%, see installation notes
Output ranges:	
Temperature	-20 to +70°C
Humidity	0 to 100% RH
CO ₂	0-5000ppm
Housing:	
Material	PC/GF (Halogen free, flame retardant & UV stabilized)
Dimensions	123 x 103 x 54mm
Probe dimensions:	
“T-D” & “T-I”	150mm x 6mm dia.
“T-O”	10mm dia.
“T-C”	43 x 12 x 9mm Cable 2 meters
“T-OR”	40 x 16mm dia.
“T-555”	30 x 6mm dia. Cable 2 meters
“RH-D”	200 x 20mm dia.
“RH-W”	90 x 20mm dia.
“RH-O”	200 x 118mm dia. (shield)
“CO2-D”	200 x 20mm dia.
Environmental:	
Housing:	-30 to 50°C 0 to 95% non-condensing
Protection:	
RF-LW-RH-W	IP54
Others	IP65
Country of origin	UK
Conformity	LoRaWAN [®] , FCC-IC, EMC, CE & UKCA Marked

* Saft type ER14505Lithium 3.6 AA type recommended (optional)

WEEE Directive:



At the end of the products useful life please dispose as per the local regulations. Do not dispose of with normal household waste. Do not burn.



Sensor Characteristics

Temperature

Measurement range	-20 to +70°C	
Accuracy	(20 to 40°C)	±0.5°C
Long term stability	<0.02°C p.a.	

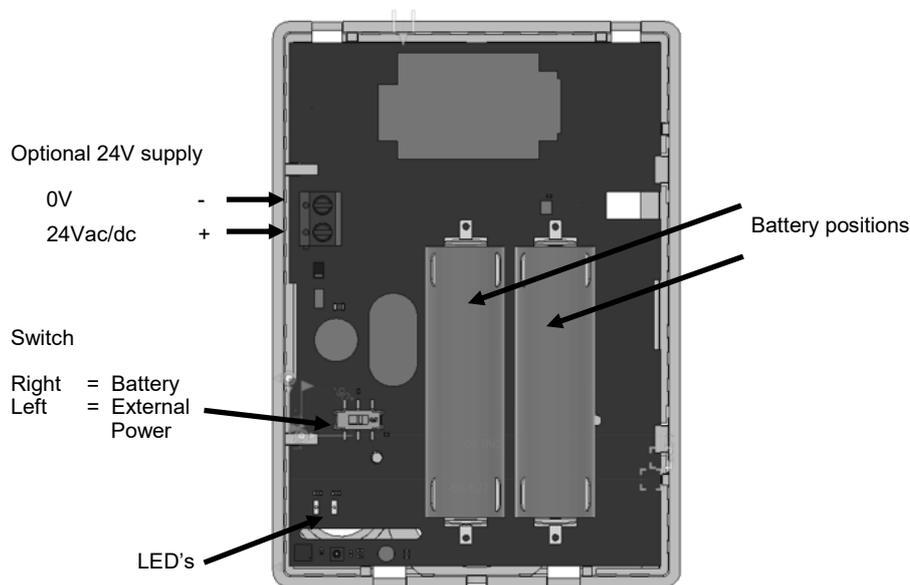
Humidity

Measurement range	0 to 100% RH	
Type	ASIC	
Accuracy (20 to 80% RH):	Typical	Maximum
	±3% RH	±4% RH
Long term stability	<0.5% RH p.a.	

Carbon Dioxide

Measurement range	0 to 5000ppm
Measurement interval	2 seconds
Accuracy	±30ppm ±3% of reading
Pressure dependency	+1.6% reading per kPa deviation from normal pressure
Response rate	2 minutes by 90%

PCB Layout



LED Status

- Pairing Both ERROR & STATUS LEDs blink once every 10 seconds
- Paired/Running STATUS LED blinks once every 30 seconds
- Error ERROR LED blinks once every 5 seconds

Battery's

Sensors require one or two Litium 3.6 AA batteries. One battery can be used, but it's recommended that you use two for best sensor operation and battery life. If one battery is being used, use either position.

Lithium-Thionyl Chloride batteries are **not rechargeable**, and should be stored in a clean, cool (not exceeding 30°C), dry and ventilated area.

Disposal of Batteries - Warning! Fire, Explosion and Burn Hazard.

Do not recharge, short-circuit, crush, disassemble heat above 100°C, incinerate, or expose the battery contents to water.

All batteries must be disposed of in accordance with EC Directive 2006/66/EC, amended by EU Directive 2008/12/EC.

Installation



Antistatic precautions must be observed when handling these sensors. The PCB contains circuitry that can be damaged by static discharge.

See page below (and next page) for individual installation depending on sensor type.

1. Release the snap-fit lid by gently squeezing the locking tab.
2. Install the battery(s), observing the correct polarity. The PCB has two sets of battery retaining clips, temperature only or temperature and humidity sensor types could be powered with one battery, CO₂ sensors require two. Sontay would recommend that for best performance and battery life is to fit two. If only one battery is used, use either battery position.

Note: When powering via battery ensure 2-way switch is set to "BAT" position.

The PCB also allows to be powered via a 24Vac/dc supply $\pm 10\%$ polarity must be observed when using a DC supply.

Note: When powering via 24V ensure 2-way switch is set to "EXT" position.

Duct (temperature only)

- Select a location in the duct where the sensor probe will give a representative sample of the prevailing air condition.
- Drill a 7mm diameter hole in the duct, then use the housing as a template mark the hole centres or use the dimensions below), drill and fix the housing to the duct with the screws supplied.

Immersion

- Select a location in the system where the liquid is to be measured, install pocket as per datasheet TT-PO.
- Insert the probe into the pocket and secure with the grub screw provided within the pocket.

Note: The immersion sensor must be used with a pocket, it is not designed for direct mounting.

Clamp-on

- Select a location in the system where the liquid temperature is to be measured, where the brass lug will make good contact with the surface of the pipe.
- Secure the sensor lug to the surface to the pipe using the clip provided. Wrap the clip around the pipe and place the lug under the strap and tighten the clip. It is good practice to ensure that good contact is made between the lug and the pipe, and apply insulation over the pipe and lug.

Outside Air (temperature only)

- "T-O" Select a suitable location preferably on a north facing wall, ensuring that the sensor is away from direct sunlight and any heat sources.
- "T-OR" Select a suitable location, the sensor has a radiation shield that helps minimizes error gains from direct sunlight.
- Fix the housing to the wall with appropriate screws.

Duct, Temp. RH & CO₂

- Select a location in the duct where the sensor probe will give a representative sample of the prevailing air condition.
- Drill a 22mm diameter hole in the duct, then use the housing as a template mark the hole centres, drill and fix the housing to the duct with the screws supplied.

Installation (continued)

Wall, RH

- Select a location where the sensor probe will give a representative sample of the prevailing air condition.
- Fix the housing to the wall with appropriate screws.

Outside, RH

- Fix the radiation shield to a suitable mast using the U bolts supplied.
- Insert the probe into the shield and tighten the gland.

Radiation Shield

The plate profiles are shaped to allow the minimum restriction of airflow while providing the necessary shielding from solar radiation and precipitation. All sensor shields produce an error due to temperature rise during high solar radiation; the error is reduced with higher wind speeds which provide ventilation. The figures given below are based on a radiation intensity of 1000W/m²; typical errors for the specified wind speeds would be: 0.4°C @ 3 m/s, 0.65°C @ 2 m/s, 1.4°C @ 1 m/s or slower.

Sensor Configuration

To connect the sensor to your hub, you can use the SORA app from Google Play which will allow you to configure the sensors settings with NFC (Near Field Communication) (*in progress, Beta trial customers will be sent a link to the store via e-mail*).

1. Go to the Google Play app store or Apple App store and download the "SORA Sensor Configurator" app on to a smart phone or tablet. The device MUST support NFC.
2. Switch on NFC on the smartphone then launch the app.
3. Hold the NFC antenna of the smartphone (position depending on the model of the device) onto the sensor in the area shown in the image on the right. Apple users press "Scan"
Hold the phone over the tag while the sensor is being read.
4. Current settings & sensors data will be shown in the app.
5. Make any changes to the settings as required on the app, then press "program".
6. When the smartphone shows "Tap Device", hold the smartphone over the NFC antenna of the sensor, new settings will then be written to the sensor. During Programming hold the phone over the tag until "Ready" appears above the SORA logo.



Note: If during scanning of a tag you have a pop up screen "device not recognised" click OK, and perform a factory reset of the sensor. Making sure you hold the phone over the tag.

7. Allow the sensor 10 seconds to reboot and apply the new settings. You can check that the sensor has updated the settings by tapping on the sensor once again.

	Default	CoV Thresholds
Transmission time	900 seconds	60 to 1800 seconds
Temperature	0.3°C	0.1 to 1.0°C
Humidity	5% RH	3 to 10% RH
CO ₂	400ppm	100 to 800ppm

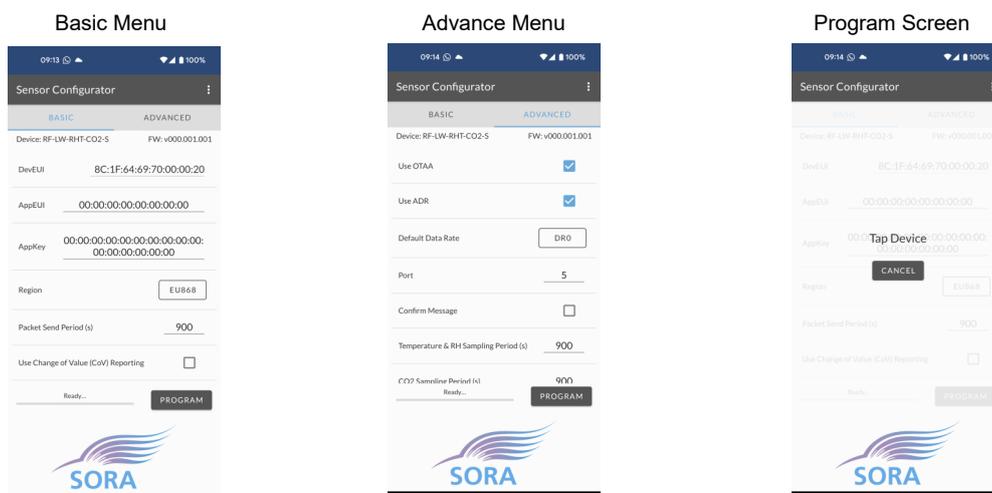
NOTE Consideration should be given to each sensor and how often it should send values and still maintain the required level of control to maximise battery life.

Temperature, RH & CO₂ can also be configured to send on a "Change of Value". If values rise/fall more than the than the saved values within the transmission time the sensor will automatically send the changed value.

App Parameter Meanings

Parameters	Description
DevEUI	Fixed 8-byte address unique to the sensor node itself. Also printed onto the product itself
AppEUI	Unique 8-byte key for the LoRaWAN® application. Usually all 00 or 01
AppKey	16-byte key used to link device and application. Can be generated by gateway or user. <ul style="list-style-type: none"> For more info, and for the details of the ABP keys NwksKey & AppSKey, see: https://www.thethingsnetwork.org/docs/lorawan/security/
Region	Set this to match your radio operating region: <ul style="list-style-type: none"> EU868 for Europe & UK US915 for US & Canada AU915 for Australia
Packet Send Period	Overall period of LoRaWAN® packet transmission. e.g. a value of 900 (seconds) will transmit a single packet every 15 minutes. Sending packets more often will be detrimental to battery life.
CoV Reporting	CoV reporting can be set up to trigger an extra packet send (outside of the Packet Send Period) if a sensor value has changed by a specified amount. If packet transmission is not triggered by CoV within one Packet Send Period, a LoRaWAN packet will be transmitted. Check boxes in the dialog to enable CoV per available sensor.
CoV Thresholds	Enter threshold values here to control the amount by which a sensor reading must change to trigger a CoV packet transmission. See next page for values.
Use OTAA	Check to OTAA pairing method (Uses DevEUI, AppKey & AppEUI). Uncheck to use ABP pairing mode (uses Device Address, NwksKey and AppSKey). Fields on BASIC tab update automatically as this box is changed
Use ADR	Enable Adaptive Data Rate feature (automatically adjusts radio parameters for best compromise of power consumption and signal quality)
Default Data Rate	Set the default radio data rate. Device will be fixed to this if ADR is not enabled
Port	LoRaWAN® data port. User can change this for networking purposes between 0 and 223. Ports 224 and above are reserved.
Confirm Message	If checked, the device will require confirmation of packet reception from the gateway. Default is to use Unconfirmed Data packets.
Sensor Sampling Periods	By default, these will match the Packet Send Period. User can alter these to sample sensors more often if desired, particularly useful if using CoV. Sampling sensors more often will be detrimental to battery life.

App Screen



Device Payload Decoder

Please visit the SORA products section on the Sontay web site to download the device payload data.

CO₂ Calibration

CO₂ sensor types are factory calibrated, but some times they require at least three ABC (Automatic Background Correction) periods to self-calibrate. The ABC works by measuring CO₂ levels over a 7 day period, during this period it is expected that levels fall to 400ppm i.e fresh air.

If your application is a 24/7 occupied facility, it would be necessary to switch off the ABC logic, please contact Sontay Technical Support. This has to be programmed at the time of manufacture and cannot be adjusted on site. If ABC isn't disabled you may then need to periodically (one to two years) move the sensor outside for 30 minutes to then be exposed to fresh air levels (400ppm approx.) then refit the sensor back to its original location.

Maintenance

Sensors have no serviceable parts, only battery replacement when low.

Revision History:

Rev.	Description of change	Page No.	Date
7.0	New product, pre-release	All	11/08/2022
7.1	Full release		08/12/2022

Whilst every effort has been made to ensure the accuracy of this specification, Sontay cannot accept responsibility for damage, injury, loss or expense resulting from errors or omissions. In the interest of technical improvement, this specification may be altered without notice.