# RL4 Wireless Sensor Device

**Data Sheet v1.1**

## Features

- Wireless sensor device supporting a wide range of applications
- Multiple on-board sensors: ambient temperature, relative humidity, acceleration, tilt, impact (shock), vibration, gyroscope, magnetic (proximity), light, sound, motion (PIR), non-contact object temperature (IR), volatile organic compounds (VOC), equivalent CO2
- Configurable sensor parameters
- Seamless interface to RedLore IoT platform: IoT Engine, Positioning Engine, RedBoard™ Dashboards
- Connects directly to enterprise systems (ERP, WMS, BMS,..) and dashboards through API, MQTT,…
- Direct and local communication for alerts and data logs with Smartphone App through BLE and NFC
- Low-power mesh network protocol (Wirepas)
- Connects to cellular, WIFI or Ethernet gateway
- Over-the-Air reconfigurable and reprogrammable
- Long-life (up to 10 years) industrial-grade rechargeable battery
- Indoor Positioning and Proximity-detection
- Off-line logging and alerts

## Description

Aimed at a wide variety of applications. Each RL4 variant (see next page) packs a number of sensors for specific applications. Custom variants can be made to meet specific requirements.

Implements the Wirepas Mesh Network communication protocol: Every device is a wireless router and can act as a repeater for other devices. Networks with 1000's of devices can be built as long as every device can connect to a device that is closer to the gateway. At the same time every device remains low power and can work uninterruptedly for years on a small battery.

Off-line mode logs critical data and alerts on the device for later uploading and local retrieval via NFC or BLE.

The accompanying smartphone app connects locally through the built-in NFC 'tap'-interface and/or BLE interface, allowing configuration, diagnostics and data retrieval. The same functions are available remotely through the RedLore IoT Engine and its API.

All devices have built-in capability for indoor location tracking. A device can be configured either as a *fixed position device* – to assist in tracking the location through the positioning engine – or as an *asset tag*, whose location is tracked.

Contains a long-life, industrial-grade, replaceable, commercial-off-the-shelf, AA-size LiSOCl2 battery with 2700mAh capacity for up to 10 years of battery life.

## Applications

- Transport & Supply Chains
  - Cold Storage Monitoring
  - In-Transit Condition Monitoring of Pallets and Boxes
  - Cold chain monitoring
  - Container & IBC tracking
  - Asset Monitoring & Tracking
- Warehousing
  - Asset Monitoring & Tracking
  - Consignment Stocking
  - Rack Impact Detection
  - Forklift Monitoring & Tracking
  - Pick Notification
- Manufacturing
  - Machine Monitoring
  - Predictive Maintenance
  - Spare Parts Management
  - Environmental Monitoring
- Building automation
  - HVAC
  - Environmental Monitoring
- Infrastructure
  - Integrity Monitoring
  - Control & Automation

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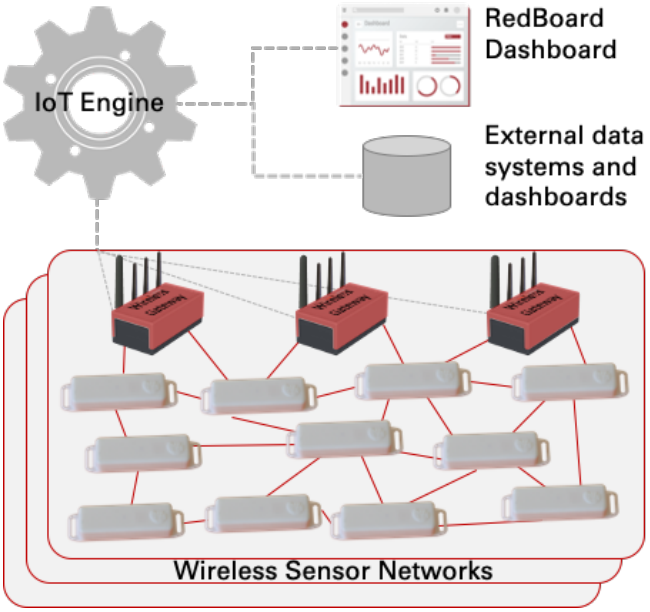
## Network

The RL4 devices send the sensor data to one or more gateways on site or in the building. The gateways in turn forward the data to the cloud via a cellular (4G/LTE) connection, WIFI or Ethernet.

A single gateway supports up to 1000 devices. Multiple gateways per site optimizes message latency and device battery lifetime.

RL4 wireless sensor devices needn't have a direct link to the gateway but can hop their messages across other devices.

The IoT Engine ingests and processes the messages, and provides IoT services to applications. Application can be built using the RedBoard dashboard platform or in 3rd party back-end systems.




## Product Variants

| Variants / Sensors | C HVAC | B Comfort | O Air Quality | Q Comfort+ | L Motion | M Motion & HVAC | H Anchor & Asset Tag | G Asset monitor | N Vibration adv. | R Temp. external | S Non-contact temp. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Temperature | ✓ | ✓ | ✓ | ✓ | | ✓ | | ✓ | | ✓ | |
| Relative humidity | ✓ | ✓ | ✓ | ✓ | | ✓ | | | | | |
| Light | | ✓ | | ✓ | | | | ✓ | | | |
| Sound | | ✓ | | ✓ | | | | ✓ | | | |
| VOC Volatile Organic | | | ✓ | ✓ | | | | | | | |
| eCO2 equivalent CO2 | | | ✓ | ✓ | | | | | | | |
| Motion (PIR) | | | | | ✓ | ✓ | | | | | |
| IR (infrared) | | | | | | | | | | | ✓ |
| Acceleration 3-axis | | | | | | | | ✓ | ✓ | | |
| Gyroscope 3-axis | | | | | | | | | ✓ | | |
| Magnetic | | | | | | | | ✓ | | | |

| Other features | |
|---|---|
| Interfaces | Wirepas Low—Power Mesh, NFC (Smartphone 'tap'), Bluetooth Low Energy (BLE) |
| RGB LED | ✓ |
| Off-line logging and alerts | ✓ |
| Battery | LiSOCl2– 2700mAh – Up to 10 years life-time – COTS replaceable – AA size |
| Dimensions | 72 x 23 x 26mm (2.8 x 0.9 x 1") + flanges of 9mm (0.4") each<br>variant R 'Temp. external': 88 x 53 x 28mm (3.5 x 2.1 x 1.1") + flanges 10mm (0.4") each |
| Ingress Protection | IP20 to IP65 depending on variant |

# Operating parameters and tolerances[1]

## General

| | | |
|---|---|---|
| Operating temperature | -30°C…+85°C (variants B, D, G) | -40°C…+65°C (variants O, Q) |
| | -30°C…+70°C (variants L, M) | -40°C…+85°C (other variants) |
| | -55°C…+100°C (external temperature probe of variant R) | |
| Data update rate | 10 seconds to 10 days | |
| Configuration | Remotely through API or through NFC | |

## Temperature sensor

| | | | |
|---|---|---|---|
| Operating temperature | -40°C…+85°C (all variants except N and R) | | |
| | 0°C…+50°C (variant N) | | |
| | -55°C…+100°C (variant R) | | |
| Accuracy tolerance | *variant G, N* | *variant R* | *other variants* |
| | 2°C | ±0.5°C (-10 to +85°) | ±0.2°C (15…50°C) |
| | | | ±0.3°C (-25…85°C) |
| | | | ±0.5°C (< -25°C) |
| Measurement procedure | single measurement at update rate interval | | |

## Humidity sensor

| | |
|---|---|
| Operating range | 0…100%RH |
| Accuracy tolerance (@30°C) | ±2 %RH between 10%...80 %RH, ±3 %RH otherwise |
| Long term stability | 0.25 %RH/year |
| Measurement procedure | single measurement at update rate interval |

## Light sensor

| | |
|---|---|
| Operating range | 0.01…64,000 Lux |
| Viewing angle | ~ 100° at 71% intensity |
| Spectral response | close to human eye, rejects 50/60Hz flicker |
| Measurement procedure | single measurement at update rate interval |

## Microphone

| | |
|---|---|
| Operating sound level | 30..75 dB |
| Frequency | 100…20kHz |
| Measurement procedure | average of burst measurements, configurable 1/s to 1/min |
| Filtering | on request: LP, HP, BP, FFT, sound signature detection |

*[1]Accurancy tolerances specifies are typical and may vary from one product to another and depending on the application and installation.*

### Accelerometer

| | |
|---|---|
| Operating range | ±2/±4/±8/±16 g for all 3 axes (configurable) |
| Accuracy tolerance | down to 1mg (depends on variant and configuration) |
| Measurement procedure | 12Hz measurement, reporting min, avg, and max at update rate interval |
| Special modes | shock (impact) detection, vibration monitoring, FFT signal analysis, vibration signature detection |

### Gyroscope

| | |
|---|---|
| Operating range | ±125/±250/±500/±1000/±2000 dps (all 3 axes, configurable) |
| Accuracy tolerance | ±3% of full-scale operating range |
| Measurement procedure | 12Hz measurement, reporting min, avg, and max at update rate interval |

### Magnetic sensor

| | |
|---|---|
| Operating range | 20 mT and 200 mT (configurable) Note: 1 Gauss = 0.1 mT |
| Measurement procedure | single measurement of magnetic field at update rate interval, or, switch-mode (message sent when magnet presented), or count-mode (pulse counting,…) |

### PIR motion sensor

| | |
|---|---|
| Operating range/sensitivity | 1 to 5m (configurable) |
| Field of view | ~ 100° |
| Directional sensitivity | 1 dimension |
| Measurement procedure | continuous measurement with trigger counting |

### IR (infrared) sensor *Available on request for special variants*

| | |
|---|---|
| Operating temperature | -20°C…+85°C |
| Accuracy tolerance | ±3°C |
| Field of view | ~ 120° at 50% intensity |
| Measurement procedure | single measurement at update rate interval |

### Volatile Organic Compound (VOC) sensor

| | |
|---|---|
| Operating range | 0…1000ppm (ethanol in air) (0..90%RH) |
| Repeatability | ±10% |

### Equivalent Carbon Dioxide (eCO2) sensor

| | |
|---|---|
| Operating range | 400…5000ppm |
| Accuracy tolerance | ±25% |



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