Wireless Data Collection

Featuring Bluetooth® wireless technology, faster wiring of multichannel input, and easy distributed setup.

Up to 105 channels*

*When used with LR8510 or LR8511 measurement units.
Easy expansion with an extensive selection of measurement units and loggers

Data is sent wirelessly to the wireless logging station from measurement units and wireless loggers.

Wireless loggers

- **WIRELESS PULSE LOGGER** LR8512
- **WIRELESS CLAMP LOGGER** LR8513
- **WIRELESS HUMIDITY LOGGER** LR8514
- **WIRELESS VOLTAGE/TEMP LOGGER** LR8515
Measurement units

<table>
<thead>
<tr>
<th>No. of input channels</th>
<th>Voltage</th>
<th>Temperature</th>
<th>Humidity</th>
<th>Resistance</th>
<th>Pulse</th>
<th>Current</th>
</tr>
</thead>
<tbody>
<tr>
<td>LR8510</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>LR8511</td>
<td>✔</td>
<td>✔</td>
<td>✔ ✔</td>
<td>✔</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LR8512</td>
<td>2</td>
<td>✔</td>
<td>✔ ✔</td>
<td>✔</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LR8513</td>
<td>2</td>
<td>✔</td>
<td>✔ ✔</td>
<td>✔</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LR8514</td>
<td>2</td>
<td>✔</td>
<td>✔ ✔</td>
<td>✔</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LR8515</td>
<td>2</td>
<td>✔</td>
<td>✔ ✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
</tbody>
</table>

Communication range: 30 m, line of sight

Number of units: Up to 7
(including mixture of measurement units and wireless loggers)

Measurement units and wireless loggers

- **Voltage**: Fully isolated input channels
  - Maximum rated voltage to earth: 300 VAC, DC
  - Max. inter-channel voltage: 300 VDC

- **Thermocouple**: K, J, E, T, N, R, S, B, W
  - Measurement range varies with thermocouple type (see specifications page).

- **Pt100/ JPt100**: 0 to 100°C
  - 3-wired/ 4-wired, 1mA testing current
  - Measurement range: 10/20/100/200°C

- **Resistance**: 0 to 200 Ω
  - Measurement ranges: 10/20/100/200Ω

- **Humidity**: 5.0 to 95.0 %rh
  - Requires Humidity Sensor Z2000 (option).
Wireless data transmission for superior ease of use

1. Making the wiring process faster while minimizing costs

Have you dealt with problems like these?
Recording a large number of channels means you’ll have to deal with a mess of wires. In addition to increasing the cost of connection cables and thermocouples, long wires make setup more time-consuming.

Resolved with wireless data transmission
The lack of wiring around the instrument makes for a clean installation. Minimal wiring means lower costs and faster setup.

Long wires are used to connect the instrument to the measurement locations.

Data is sent wirelessly from measurement units to the LR8410.

2. Make measurements where it would not be practical to wire equipment directly.

Have you dealt with problems like these?
Running a large number of thermocouples from a logger to the ceiling or crawlspace would mean a wiring nightmare. Data can’t be viewed during measurement, and data download is virtually impossible. Logging for extended periods requires extra power, something traditional loggers can't support.

Resolved with wireless data transmission
There’s no need to connect measurement units to the Wireless Logging Station LR8410 with long wires. Instead, you can install the logging module in an attic or crawlspace and check data from the LR8410’s screen while measurement is ongoing.

Monitoring the temperature near wall-mounted air-conditioners, in high places such as roof spaces, or in crawls spaces.
3. Make measurements of interior conditions from the outside, with the door closed.

**Have you dealt with problems like these?**
We can’t close the windows or doors due to all the wires. As a result, there’s a gap in the gasket, and the vehicle cannot be sealed.

**Resolved with wireless data transmission**
Wires do not protrude outside the vehicle, allowing the windows and doors to be closed so that the vehicle can be tested under airtight conditions.

![Conventional wiring](image1)
Long wires are used to connect the instrument to the measurement locations.

![Data transmission](image2)
Data is sent wirelessly from measurement units and wireless loggers to the LR8410.

4. Synchronize measurement data

**Have you dealt with problems like these?**
Installing individual loggers on test equipment means each set of measured data is on its own time line, making it hard to compare the data with respect to a single time axis. Conventional data loggers are sometimes too bulky and difficult to fit into test equipment.

**Resolved with wireless data transmission**
You can observe measurement results from multiple pieces of experimental equipment as part of the same time series. Logging modules are small enough to fit almost anywhere.

![Data synchronization](image3)
Data can be viewed and analyzed as part of a single time-series.

![Measurement results](image4)
Confirmed spaces are no longer a problem.

![Configuration](image5)
Batch collection and management with the logging station.

![Measurement results](image6)
Check the logged data on the central display while measuring.

Traditional data loggers are installed on each device.
Applications in diverse fields

Introducing three-way power, including extended measurement on battery power!

**AC adapter, battery, or DC power supply**

Measurement units or wireless loggers can operate on a rechargeable battery pack or alkaline batteries, respectively, close to the measurement target, enabling their use even in locations where AC power is not available.

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**Continuous operating time (LR6 Alkaline battery)**

<table>
<thead>
<tr>
<th>Recording intervals</th>
<th>LR8512</th>
<th>LR8513</th>
<th>LR8514</th>
<th>LR8515</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1 sec *1</td>
<td>Approx. 5 day</td>
<td>Approx. 5 day</td>
<td>Approx. 5 day</td>
<td>Approx. 2 day</td>
</tr>
<tr>
<td>1 sec</td>
<td>Approx. 7 days</td>
<td>Approx. 7 days</td>
<td>Approx. 7 days</td>
<td>Approx. 4 days</td>
</tr>
<tr>
<td>1 min</td>
<td>Approx. 10 days</td>
<td>Approx. 10 days</td>
<td>Approx. 10 days</td>
<td>Approx. 10 days</td>
</tr>
</tbody>
</table>

*LR8513, LR8514: 0.5 sec

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**Continuous operating time (BATTERY PACK Z1007)**

<table>
<thead>
<tr>
<th>Recording intervals</th>
<th>LR8510/LR8511</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 ms</td>
<td>Approx. 24 hours</td>
</tr>
<tr>
<td>1 min</td>
<td>Approx. 120 hours</td>
</tr>
</tbody>
</table>

*Use of the AC adapter is recommended when recording data over an extended period of time.
(The Wireless Logging Station LR8410 operates using an AC adapter.)

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Measurement units and wireless loggers have an operating temperature range of -20°C to 60°C.

Measurement units and wireless loggers can be used with confidence and peace of mind in hot environments such as the interior of a car during the summer as well as in cold-weather testing in the subzero temperatures of winter.

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Ensuring a safe measuring environment by closing doors

Distribution panels and control panels can be measured and data recorded safely by placing a measurement unit inside the enclosure, closing the door, and placing the LR8410 outside the enclosure.

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Data is protected by a battery and backup function!

**If the power goes out during measurement**

If the Wireless Logging Station loses power

If the start backup setting is enabled, the instrument will resume measurement automatically when power is restored. If data is saved in real time to the SD memory card, the instrument’s built-in high-capacity capacitor will maintain power until all data has been downloaded, making it extremely unlikely that data will be lost or the file system corrupted. Additionally, if a battery is installed while operating with the AC adapter, the logging station will automatically switch to battery power in the event of an outage.

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If the measurement unit or wireless logger loses power

When power is restored, measurement will pick up where it left off. (Data for the outage period is assumed to have been lost.) The device will automatically switch power supplies if you install a battery pack (LR8510/LR8511) or LR6 alkaline batteries (LR8512 to LR8515) while using an AC adapter.

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If communication is temporarily interrupted

Measurement units and wireless loggers have built-in buffer memory so that measurement data can be saved if communication is temporarily disrupted. This data is resent once communication is restored, allowing the measurement data to be stored in the Wireless Logging Station. For example, if 15 channels of data are measured at a recording interval of 1 second, data integrity can be preserved throughout a communication outage of up to about 72 minutes. Additionally, alarms can be output and emails sent to notify the operator in the event that communication is interrupted or the logging module’s remaining battery life is low.

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*Number of data points that can be stored in the internal memory: When recording n channels, (65,536/n) data points
*Data collected using the logger utility is not restored during measurement. Load restored data that has been saved to an SD memory card or other media with the instrument.
Remote control from a computer via the HTTP/FTP server function

- **Data acquisition via FTP**
  - Download data files from the instrument's internal buffer memory, SD memory card, and USB memory stick to a computer.
  - Note: Waveform data cannot be downloaded from internal memory while measuring.

- **Data transfer via FTP**
  - Data files stored on the Wireless Logging Station’s SD memory card or USB memory stick are automatically sent to an FTP server regularly while measurement is in progress or after measurement is complete.

- **Get notifications via E-mail**
  - The Wireless Logging Station can send an e-mail message to a network-connected computer or mobile phone when a communications error occurs, when the any of the device's remaining battery life runs low, when the media or the internal memory is full, when a stop trigger occurs, and when an alarm occurs. E-mail messages can also be sent on a regular basis.

- **Remote control through HTTP server function**
  - Using a Web browser, you can monitor screens and operate the instrument remotely, including to configure settings and download data.
  - You can also perform configuration and measurement tasks using communications commands.
  - Note: Waveform data cannot be downloaded from internal memory while measuring.

Data collection software "Logger Utility" (Accessories)

- LAN network
  - Download and automatically send data files and control instrument operation remotely without the need to install special application software on the computer.

Recording data in real time on a computer

- **Data collection software "Logger Utility"**
  - By connecting a computer to the LR8410 using the instrument’s USB or LAN interface, you can observe data in real time as it is recorded and scroll backwards through past waveform data.

Recording data in real time on an SD memory card

- Waveform data collected wirelessly from measurement units and wireless loggers is recorded by the LR8410 on an SD memory card or USB flash drive at an interval of about 1 minute. (If the recording interval is longer than 1 minute, data is saved at the recording interval.)

Replace storage media during real-time recording

- Storage media can be switched without stopping measurement. When the new media is inserted, any data remaining in the instrument’s internal buffer memory is saved as a separate file.

Maximum recording time

<table>
<thead>
<tr>
<th>Recording intervals</th>
<th>100 ms</th>
<th>200 ms</th>
<th>500 ms</th>
<th>1 s</th>
<th>2 s</th>
<th>5 s</th>
<th>10 s</th>
</tr>
</thead>
<tbody>
<tr>
<td>LR8410 Internal memory (16 MB)</td>
<td>7h 46m</td>
<td>15h 32m</td>
<td>1d 14h 50m</td>
<td>3d 5h 40m</td>
<td>6d 1h 20m</td>
<td>16d 4h 21m</td>
<td>32d 8h 43m</td>
</tr>
<tr>
<td>SD Memory Card Z4001 (2 GB)</td>
<td>4d 10h 12m</td>
<td>8d 20h 24m</td>
<td>20d 3h 1m</td>
<td>*H*</td>
<td>*H*</td>
<td>*H*</td>
<td>*H*</td>
</tr>
</tbody>
</table>

*Use only Hioki SD Memory Cards that are guaranteed to operate with the Wireless Logging Station for continuous long-term recording.

*Maximum recording time is inversely proportional to number of recording channels.

*Because the header portion of waveform files is not included in capacity calculations, expect actual maximum times to be about 90% of those in the table.

**H** exceeds 1 year.

New function

**LR8410 Link**

Use the Wireless Logging Station LR8410 to collect data from LR8410 Link-compatible products in real time.

Easy scaling

- The setup process is simple: just search for and pair LR8410 Link-compatible products.
- Since the settings on paired devices are automatically received by the LR8410, there’s no need to manually configure troublesome scaling settings. And since this process occurs wirelessly, you spend less time on wiring work.

No degradation in accuracy caused by D/A output

- Since measured values are sent as data, there is no degradation in accuracy.

Simultaneous measurement of power, temperature, and other data

- The LR8410 can be used with a broad range of modules and LR8410 Link-compatible products. Since you can pair it with up to seven devices, you can measure a large number of channels and parameters along with power meter data.

LR8410 Link-compatible products

- PW6001
- PW3390
- PW3335
- PW3335-01
- PW3300
- PW2302
- PW2300

*Use only Hioki SD Memory Cards that are guaranteed to operate with the Wireless Logging Station for continuous long-term recording.

*Maximum recording time is inversely proportional to number of recording channels.

*Because the header portion of waveform files is not included in capacity calculations, expect actual maximum times to be about 90% of those in the table.

**H** exceeds 1 year.

*Contact HIoki for more information.*
WIRELESS LOGGING STATION LR8410
(Accuracy guaranteed for 1 year, Post-adjustment accuracy guaranteed for 1 year)

General specifications

Controlled devices
- LR8510, LR8511, LR8512, LR8513, LR8514, LR8515

No. of controlled devices
- Max. 7 units (up to 105 channels when used with the LR8510 or LR8511)

Control and communications (data interface)
- Bluetooth® 2.1 + EDR (between Wireless Logging Station and logging modules); communication range: 30 m (line of sight, SSP security)
- Internal memory: 8 MWords volatile RAM (SDRAM)

Clock functions
- Auto-calendar, clock accuracy: ±0.3 s/day (±23°C, 73.4°F)
- Time accuracy: ±0.2 s/day while measuring (±23°C, 73.4°F)

Backup battery life
- At least five years for clock and settings (±23°C, 73.4°F)
- Preparing temperature & humidity: 10 to 28 VDC (Please contact your HIOKI distributor for connection cord)

External power
- Battery
- AC adapter
- Selectable from 100, 70, 40, or 25 % LCD Brightness

Display section
- Dimensions and Mass: 290 mm (9.06in) x 215 mm (8.46in) x 66 mm (2.6in)
- LCD Brightness: Selectable from 100, 70, 40, or 25 %

Communication functions
- LAN Interface:
  - IEEE802.3 Ethernet 100BASE-TX DHCP, DNS
  - Data acquisition and measurement criteria setting with the Logger Utility
  - Setting and measurement by communications commands
  - Manual file transfer by FTP server
  - (from the instrument memory or removable storage)
  - Auto sending files by FTP client
  - Remote control by HTTP server
  - E-Mailing

- USB Interface:
  - USB 2.0 compliant High Speed, Series-min B receptacle
  - Data acquisition, condition settings used with the Logger Utility software (data standard)
  - Configure the unit and manage using communications commands
  - Transfer data from the SD memory card to a PC via USB drive mode (data transfer not possible from USB memory sticks)

- Display:
  - 5.7 inch TFT color liquid crystal display (640 x 480 pixel), horizontal 16 division, vertical 10 division, selectable between English and Japanese displays, back light saver available

- Power supplies
  - AC adapter: Using the AC Adapter Z000 (supplied as standard, 100 to 240 VAC, 50/60 Hz)
  - Power consumption: 8 W (with battery pack removed and maximum brightness)

- Battery:
  - Using the Battery Pack Z007 (Li-ion 7.2V 2710mAh) (optional accessory, AC adapter has priority when used in combination with battery pack), continuous operation time: 3 hours (at 23°C, LCD brightness 25 %)
  - Fast recharging time: 7 hours (the AC Adapter or a 10 to 28 VDC external power supply can be connected while the Battery Pack Z007 is installed.)

- External power
  - 10 to 28 VDC (Please contact your HIOKI distributor for connection cord)
  - LCD (when battery is charged), and when LCD max. brightness

- Trigger functions
  - Trigger mode, timing:
    - Modes: Single / Repeat, Timing: Start / Stop, Start & Stop, Logical sum (AND) of each trigger source, selectable for each channel
    - Up to 105 channels, depending on how many Wireless Voltage/ Temp Units LR8510 and Wireless Universal Units LR8511 are connected (U1-1 to U7-15)
    - Level trigger] Triggers when rising or falling through preset level
    - Window][Triggers when entering or exiting range defined by preset upper and lower limit values
    - Pattern trigger] Triggers the appliance when a pattern defined in terms of 1, 0, +, and values is matched (Setting only available when using logic measurement with the LR8512)
    - Internal trigger
      - Set year, month, date, hour, minute and second (triggers when specified measurement interval is passed)
      - Open-drain output, Trigger output terminal: Push-button type terminal block
      - V voltage output, active, low pulse: at least 100 ms
      - Output response time: Recording interval + 3 sec. or less, with 1 measurement unit, good communications
      - Recording interval + 5 sec. or less (with 7 measurement units, good communications)

- Alarm output
  - Number of channels
    - 4 channels, non-isolated (common ground with chassis)
  - Alarm source
    - Analog input: Up to 105 channels, depending on how many Wireless Voltage/ Temp Units LR8510 and Wireless Universal Units LR8511 are connected (U1-1 to U7-15)
    - When thermocouple burn-out detection is enabled, when the Wireless Voltage/ Temp Unit LR8510 or Wireless Universal Unit LR8511 battery is low, or when a communications error occurs
  - Alarm type
    - Level, window, output latch/no latch, cancel alarm while measuring
  - Alarm sound
    - buzzer, ON/OFF possible
  - Alarm output
    - Open drain output (with V pull-up, active low), output response time: Recording interval + 3 sec. or less, with 1 measurement unit, good communications
    - Recording interval + 5 sec. or less, with 7 measurement units, good communications
  - Output sink current
    - 200 mA at 5 V to 30 VDC

Measurement settings

- Recording length (sampling period)
  - Enables continuous recording (records until the Stop key is pressed), or continuous recording OFF (enable a specific time span)
  - Saved in the SD memory card

- Time drift
  - 200 ms to 1/day/divisions

- Voltage axis
  - Select by position (magnification can be x100 to x12, 0 Position
    - The LR8511 battery is low, or when a communications error occurs
  - Time response: Recording interval + 5 sec. or less

- Waveform scanning
  - Time-axis scanning is available by left-right arrow keys while measuring and when measurement stops (waveform drawing period)
  - The data update rate of the LR8513 is 100 ms, of the LR8514 is 200 ms

- Jump function
  - Select the displayed span of the waveform.

- Monitor function
  - Confirm instantaneous waves and waveforms without recording data.

- Battery life remaining display
  - Displays the remaining battery life for wirelessly connected units as 1 of 3 levels.

- Signal strength display
  - Displays the signal strength for wirelessly connected units as 1 of 3 levels.

Data saving

- Select a SD memory card or USB memory (use only SD memory cards sold by HIOKI).
- Data transfer from the SD memory card or USB memory as a text file.

- Data protection
  - Overwriting save: New file overwrites the oldest file when the SD memory card or USB memory capacity runs short
  - All input channels are scanned at high speed during every recording interval
  - The data update rate of the LR8513 is 100 ms, of the LR8514 is 200 ms

- Data saving
  - Simple divide: Save waveform data at pre-set times into separate files from the time measurement starts.
  - On schedule: Designate a reference time within 24 hours and save data into separate files at every set time period starting from the reference time.

- Data transfer
  - Simple divide: Save waveform data at pre-set times into separate files from the time measurement starts.
  - On schedule: Designate a reference time within 24 hours and save data into separate files at every set time period starting from the reference time.

- Save types
  - Setting condition, waveform data (binary or text style), calculation of numerical value, screen data (compressed BMP), reservation settings

- Reloading data
  - Stored binary data can be recalled by the logging station in 8 MB quantities.

Calculation functions

- Numerical value calculations
  - Six calculations are available at the same time.
  - Average value, peak value, maximum value, time to maximum value, minimum value, time to minimum value

- Data range of calculation
  - During measurement or after stopping: Applies calculations to all data in internal buffer memory, or to the time-span specified by A/B cursors.
  - Interval calculation: Calculate values at pre-determined 1 sec or 1 day intervals and display the latest value.

- Calculation value save
  - Possible: After measuring the last calculated value is automatically saved to the SD memory card or USB memory as a text file.
  - Touched save: Save calculated data at pre-determined time to 1 day intervals as text data to the SD memory card or USB memory in real time.
  - (Calculations: sum, difference, product, quotient, etc.)
  - The data update rate of the LR8513 is 100 ms, of the LR8514 is 200 ms

- Waveforms calculations
  - Calculations: sum, difference, product, quotient, etc.
  - Possible: Waveforms are saved approximately every one minute as binary or text data to the SD memory card or the USB memory if sampling rate is slower than 1 minute, waveforms are saved at each interval.

Other functions

- Event marking
  - Search: Move to the number entered and display the waveforms appearing before and after event.
  - Number of events: Maximum 1000 per measurement period
  - Time difference between A/B cursors
  - Measured value difference, cursor measured value, time, types: Select trace, vertical, or horizontal.

- Scaling
  - Convert and display the measurement value of each channel as a scaled value.

- Rate adjustment function
  - Scaling can be set for a channel so that its value is the same as that for US31/CHI

- Comment entry
  - Enter a title or a comment for each channel

- Others
  - Start backup, save 5 types setting conditions into main unit, auto start, set top key lock, key-lock, beep sound, schedule, Quick Set function
### Basic specifications

<table>
<thead>
<tr>
<th>No. of input channels</th>
<th>LR8510</th>
<th>M3 screw type terminal block (2 terminals per channel)</th>
<th>LR8511</th>
<th>Push-button terminals (4 terminals per channel)</th>
</tr>
</thead>
</table>

**Input terminals**

- LR8510
- LR8511

**Measurement objects**

- LR8510: Voltage/Thermocouple
- LR8511: Voltage/Thermocouple/RTDs/Resistance/Humidity

**Supported devices**

- Wireless Logging Station LR8410-20

**Control and communications**

- Bluetooth® 2.1+EDR
- Bluetooth® 2.1+EDR (Communications range: 30 m, line of sight, security: SSP)

**Backup memory**

- When recording n channels: \((65,536/n)\) data points

**Operating temperature and humidity**

- Temperature: -20°C to 60°C (-4°F to 140°F)
  - JPt 100: 500°C f.s. 0.05°C - 200 to 500°C ±0.8°C
  - JPt 100: 2000°C f.s. 0.1°C -200 to 800°C ±1.0°C
  - JPt 100: 100°C f.s. 0.01°C -100 to 100°C ±0.8°C

**Storage temperature and humidity**

- Temperature: -20°C to 60°C (-4°F to 140°F)
  - JPt 100: 500°C f.s. 0.05°C - 200 to 500°C ±1.0°C
  - JPt 100: 2000°C f.s. 0.1°C -200 to 800°C ±1.0°C

**Input resistance**

- 1 MΩ±5% (voltage and thermocouple measurement)
- 2 MΩ±5% (RTD and resistance measurement)

**Maximum input voltage**

- ±100 VDC

**Maximum inter-channel voltage**

- 300 VDC (Channels are not isolated during resistance, humidity, or resistance measurement.)

**Maximum rated voltage to earth**

- 300 VAC, DC

**Digital filter**

- Select OFF/50 Hz/10 Hz (In order to remove harmonic components, during analog input the cut-off frequency is automatically set according to the sampling rate)

**Applicable standards**

- EMC: EN61326 Class A, EN61000-3-2, EN61000-3-3
- Vibration endurance: JIS D 0619:1995 5.3, Category 1, Vehicle, Condition: Category A equivalent
- Dimensions and mass
  - Approx.150W×90H×56D mm (5.91"W × 3.54"H × 2.2"D)
  - Approx. 340 g (12.0 oz.)

**Power source**

- AC adapter Z1008 (bundled accessory, 12 VDC)
- Battery Pack Z1007 (Li-ion 7.2V 21.70 mAh)
- Battery: 100 to 240 VAC, 50/60 Hz

**Battery**

- Typical power consumption: 1.0 VA (unit only)
- Continuous operating time: Approx. 24 hours (with a recording interval of 100 ms, @23°C, 73.4°F)
- Charging time: Approx. 7 hours (@23°C, 73.4°F)

**External power**

- 10 to 28 VDC
- Maximum rated power: 7 VA (when battery is charged)

### LR8511 input specifications

**Temperature Resistance Temperature Detector (RTD): PI 100/JP 100; connection: 3-wire input; measurement current: 1 mA**

<table>
<thead>
<tr>
<th>Type</th>
<th>Range</th>
<th>Max. Resolution</th>
<th>Measurable Range</th>
<th>Measurement Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pt 100</td>
<td>100 °C f.s.</td>
<td>0.01 °C</td>
<td>-100 to 100 °C</td>
<td>±0.6 °C</td>
</tr>
<tr>
<td>500 °C f.s.</td>
<td>0.05 °C</td>
<td>-200 to 500 °C</td>
<td>±0.8 °C</td>
<td></td>
</tr>
<tr>
<td>1000 °C f.s.</td>
<td>0.1 °C</td>
<td>-200 to 800 °C</td>
<td>±1.0 °C</td>
<td></td>
</tr>
</tbody>
</table>

**Humidity**

- Connection: 4-wire; measurement current: 1 mA
- 100% r.f.f.s. | 0.1%rh | 5.0 to 95.0%rh | ±10%rh |

### Analog input section

- (Including cover), [LR8510] approx. 320 g (11.3 oz.), [LR8511] approx. 340 g (12.0 oz.),
- Push-button terminals (4 terminals per channel)

**Voltage**

<table>
<thead>
<tr>
<th>Range</th>
<th>Max. Resolution</th>
<th>Measurable Range</th>
<th>Measurement Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 mV f.s.</td>
<td>500 μV</td>
<td>-10 mV to 10 mV</td>
<td>±10 μV</td>
</tr>
<tr>
<td>20 mV f.s.</td>
<td>1 μV</td>
<td>-20 mV to 20 mV</td>
<td>±20 μV</td>
</tr>
<tr>
<td>100 mV f.s.</td>
<td>5 μV</td>
<td>-100 mV to 100 mV</td>
<td>±100 μV</td>
</tr>
<tr>
<td>200 mV f.s.</td>
<td>10 μV</td>
<td>-200 mV to 200 mV</td>
<td>±200 μV</td>
</tr>
<tr>
<td>1 V f.s.</td>
<td>50 μV</td>
<td>-1 V to 1 V</td>
<td>±1 mV</td>
</tr>
<tr>
<td>2 V f.s.</td>
<td>100 μV</td>
<td>-2 V to 2 V</td>
<td>±2 mV</td>
</tr>
<tr>
<td>10 V f.s.</td>
<td>500 μV</td>
<td>-10 V to 10 V</td>
<td>±10 mV</td>
</tr>
<tr>
<td>20 V f.s.</td>
<td>1 mV</td>
<td>-20 V to 20 V</td>
<td>±20 mV</td>
</tr>
<tr>
<td>100 V f.s.</td>
<td>5 mV</td>
<td>-100 V to 100 V</td>
<td>±100 mV</td>
</tr>
<tr>
<td>1 – 5 V f.s.</td>
<td>500 μV</td>
<td>1 V to 5 V</td>
<td>±10 mV</td>
</tr>
</tbody>
</table>

**Temperature (Thermocouples)**

Various ranges, maximum error values (for linear range) are shown. (See Humidity Accuracy Table)

**Humidity Sensor Z2000 accuracy**

- Connection: 4-wire; measurement current: 1 mA
- 100% r.f.f.s. | 0.1%rh | 5.0 to 95.0%rh | ±8%rh |

Reference junction compensation: Internal/External, at INT RJC, total accuracy = 3% + 0.5°C. Thermocouple burn-out detection: Enable/disable thermocouple burn-out detection at each recording interval (The burnout detection setting cannot be used with a recording interval of 100 ms.)
### Wireless Loggers LR8512, LR8513, LR8514, LR8515

**Shared specifications**

<table>
<thead>
<tr>
<th>Control and communications</th>
<th>Bluetooth® 2.1+EDR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal memory</td>
<td>Nonvolatile memory (Flash memory)</td>
</tr>
<tr>
<td>Storage capacity</td>
<td>500,000 data items for each channel</td>
</tr>
<tr>
<td>Standard compliance</td>
<td>Same as Wireless Logging Station LR4410</td>
</tr>
</tbody>
</table>

**Functions**
- Alarm, Scaling, Recording operation host function, Erroneous operation prevention, Comment recording function, Energy saving function, Authentication function, Free Run (excluding LR8512) |

**Vibration endurance**
- JIS D 0601:1995 ±3 (Category 1: Vehicle, Condition Category A equiv.)
  - Temperature: -20 to 60 °C (-4 to 140 °F), Humidity: 80% rh or less (non-condensing), Depends on battery and current sensor specifications when they are used

**Power supplies**
- AC Adapter Z2003 (sold as a separate option), Vibration endurance
  - AC Adapter Z2003 (sold as a separate option), Vibration endurance

**Accessories**
- CD-R (Instruction Manual, Logger Utility) × 1, Measurement Guide × 1, Caution for Using Radio Waves × 1, AA alkaline batteries (LR6) ×2, Guide ×1, Note: Only included with the LR8512: Connection Cable L1010 × 2

---

### WIRELESS PULSE LOGGER LR8512

**Basic specifications** (Accuracy guaranteed for 1 year, Post-adjustment accuracy guaranteed for 1 year)

<table>
<thead>
<tr>
<th>No. of input channels</th>
<th>2 channels (common GND)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measurement modes</td>
<td>Integrating (cumulative/Instant), Revolution, Logic (Records an 1/0 for each recording interval)</td>
</tr>
<tr>
<td>Measurement ranges</td>
<td>Totalization: 1000 pulse f.s. (1 pulse)</td>
</tr>
<tr>
<td>Measurement accuracy</td>
<td>No. of revolutions: 5000 [n]/[f.s. (1 n/pulse)]</td>
</tr>
<tr>
<td>Recording format</td>
<td>*n is the number of pulses, 1 to 1000, per revolution.</td>
</tr>
<tr>
<td>Recording intervals</td>
<td>0.1 to 30 sec, 1 to 60 min, 16 selections</td>
</tr>
<tr>
<td>Recording modes</td>
<td>Instantaneous value</td>
</tr>
<tr>
<td>Dimensions</td>
<td>85W×61H×31D mm (3.35W×2.40H×1.22D in)</td>
</tr>
<tr>
<td>Mass</td>
<td>95 g (Not including the battery)</td>
</tr>
</tbody>
</table>

---

### WIRELESS CLAMP LOGGER LR8513

**Basic specifications** (Accuracy guaranteed for 1 year, Post-adjustment accuracy guaranteed for 1 year)

<table>
<thead>
<tr>
<th>No. of input channels</th>
<th>2 channels (common GND)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measurement modes</td>
<td>AC load current, DC load current, AC leak current (using current sensor)</td>
</tr>
<tr>
<td>Effective value</td>
<td>Software calculates the true RMS value</td>
</tr>
<tr>
<td>Measurement ranges</td>
<td>AC500.0 mA to 2000 A (By current sensor), DC10.00 A to 2000 A (By current sensor)</td>
</tr>
<tr>
<td>Measurement accuracy</td>
<td>Current and leak current that occur intermittently cannot be measured</td>
</tr>
<tr>
<td>Recording intervals</td>
<td>0.5 to 30 sec, 1 to 60 min, 14 selections</td>
</tr>
<tr>
<td>Recording modes</td>
<td>Instantaneous value, average value, Maximum value recording</td>
</tr>
<tr>
<td>Dimensions</td>
<td>85W×75H×38D mm (3.35W×2.95H×1.50D in)</td>
</tr>
<tr>
<td>Mass</td>
<td>126 g (Not including the battery)</td>
</tr>
</tbody>
</table>

---

### WIRELESS VOLTAGE/TEMP LOGGER LR8515

**Basic specifications** (Accuracy guaranteed for 1 year, Post-adjustment accuracy guaranteed for 1 year)

<table>
<thead>
<tr>
<th>No. of input channels</th>
<th>2 ch (isolated, select voltage of thermocouple for each channel)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measurement items</td>
<td>Voltage/Thermocouple (K, T)</td>
</tr>
<tr>
<td>Input terminals</td>
<td>M3 screw type terminal block (2 terminals per channel)</td>
</tr>
<tr>
<td>Measurement ranges</td>
<td>Voltage: 50 mV/500 mV/5 V/50 V, Thermocouple: 1000°C (1832°F)</td>
</tr>
<tr>
<td>Measurements</td>
<td>Maximum input voltage, DC±50 V</td>
</tr>
<tr>
<td>Inter-channel voltage</td>
<td>DC 60 V</td>
</tr>
<tr>
<td>Recording intervals</td>
<td>0.1 to 30 sec, 1 to 60 min, 16 selections</td>
</tr>
<tr>
<td>Recording modes</td>
<td>Instantaneous value</td>
</tr>
<tr>
<td>Dimensions</td>
<td>85W×75H×38D mm (3.35W×2.95H×1.50D in)</td>
</tr>
<tr>
<td>Mass</td>
<td>126 g (Not including the battery)</td>
</tr>
</tbody>
</table>

---

**WIRELESS HUMIDITY LOGGER LR8514**

**Basic specifications**

*The temperature and humidity sensors affect the measurement accuracy and are subject to calibration. The LR8514 logger does not require calibration.*

<table>
<thead>
<tr>
<th>No. of input channels</th>
<th>2 ch for temperature + 2 ch for humidity (2 sensors can be attached)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measurement items</td>
<td>Temperature, humidity</td>
</tr>
<tr>
<td>Measurement ranges</td>
<td>±0.5°C (10°C to 60°C), using Z2010/Z2011</td>
</tr>
<tr>
<td>Humidity measurement accuracy</td>
<td>If outside above temperature range: ±3% rh (20°C to 30°C, 20% to 90% rh), If outside above range, see Figure 1.</td>
</tr>
<tr>
<td>Hysteresis</td>
<td>±1% rh (Added to the humidity measurement accuracy)</td>
</tr>
<tr>
<td>Recording intervals</td>
<td>0.5 to 30 sec, 1 to 60 min, 14 selections</td>
</tr>
<tr>
<td>Recording modes</td>
<td>Instantaneous value</td>
</tr>
<tr>
<td>Dimensions</td>
<td>85W×61H×31D mm (3.35W×2.40H×1.22D in)</td>
</tr>
<tr>
<td>Mass</td>
<td>95 g (Not including the battery)</td>
</tr>
</tbody>
</table>

---

**Humidity measurement accuracy (fig. 1)**

*The accuracy of values indicated by the * mark is not guaranteed (reference values).*

<table>
<thead>
<tr>
<th>Temperature[°C]</th>
<th>Humidity [%]</th>
<th>±12%rh*</th>
<th>±10%rh*</th>
<th>±±8%rh*</th>
<th>±±6%rh*</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>5%</td>
<td>±12%rh*</td>
<td>±10%rh*</td>
<td>±±8%rh*</td>
<td>±±6%rh*</td>
</tr>
<tr>
<td>10</td>
<td>10%</td>
<td>±12%rh*</td>
<td>±10%rh*</td>
<td>±±8%rh*</td>
<td>±±6%rh*</td>
</tr>
<tr>
<td>20</td>
<td>40%</td>
<td>±12%rh*</td>
<td>±10%rh*</td>
<td>±±8%rh*</td>
<td>±±6%rh*</td>
</tr>
<tr>
<td>30</td>
<td>70%</td>
<td>±12%rh*</td>
<td>±10%rh*</td>
<td>±±8%rh*</td>
<td>±±6%rh*</td>
</tr>
</tbody>
</table>

---

**WIRELESS VOLTAGE/TEMP LOGGER LR8515**

**Basic specifications**

*The temperature and humidity sensors affect the measurement accuracy and are subject to calibration. The LR8514 logger does not require calibration.*

<table>
<thead>
<tr>
<th>No. of input channels</th>
<th>2 ch (isolated, select voltage of thermocouple for each channel)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measurement items</td>
<td>Voltage/Thermocouple (K, T)</td>
</tr>
<tr>
<td>Input terminals</td>
<td>M3 screw type terminal block (2 terminals per channel)</td>
</tr>
<tr>
<td>Measurement ranges</td>
<td>Voltage: 50 mV/500 mV/5 V/50 V, Thermocouple: 1000°C (1832°F)</td>
</tr>
<tr>
<td>Measurements</td>
<td>Maximum input voltage, DC±50 V</td>
</tr>
<tr>
<td>Inter-channel voltage</td>
<td>DC 60 V</td>
</tr>
<tr>
<td>Recording intervals</td>
<td>0.1 to 30 sec, 1 to 60 min, 16 selections</td>
</tr>
<tr>
<td>Recording modes</td>
<td>Instantaneous value</td>
</tr>
<tr>
<td>Dimensions</td>
<td>85W×75H×38D mm (3.35W×2.95H×1.50D in)</td>
</tr>
<tr>
<td>Mass</td>
<td>126 g (Not including the battery)</td>
</tr>
</tbody>
</table>

---

**Measurement objects**

<table>
<thead>
<tr>
<th>Range</th>
<th>Max. Resolution</th>
<th>Measurable Range</th>
<th>Measurement Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage</td>
<td>50 mV f.s.</td>
<td>0.01 mV</td>
<td>±0.05 mV</td>
</tr>
<tr>
<td></td>
<td>500 mV f.s.</td>
<td>0.1 mV</td>
<td>±0.5 mV</td>
</tr>
<tr>
<td></td>
<td>5 V f.s.</td>
<td>1 mV</td>
<td>±5 mV</td>
</tr>
<tr>
<td></td>
<td>50 V f.s.</td>
<td>10 mV</td>
<td>±50 mV</td>
</tr>
<tr>
<td>Thermocouples</td>
<td>1000 °C f.s.</td>
<td>0.1 °C</td>
<td>±1.5 °C</td>
</tr>
<tr>
<td></td>
<td>-100 °C to +100 °C</td>
<td>±1.0 °C</td>
<td>±1.0 °C</td>
</tr>
</tbody>
</table>

Reference contact compensation: Switchable between internal and external
Reference contact compensation accuracy: ±0.5°C (When using internal compensation, add to thermocouple measurement accuracy)
Temperature characteristics: Add (measurement accuracy × 0.1)/°C to measurement accuracy.
### Logger Utility specifications

**Bundled application software (CD-R)**

<table>
<thead>
<tr>
<th>Supported units</th>
<th>Operating environment</th>
<th>Real-time data acquisition</th>
<th>Data acquisition settings</th>
<th>Waveform display</th>
<th>Data conversion</th>
<th>Waveform processing</th>
<th>Parameter calculations</th>
<th>Search functions</th>
<th>Print functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model 8423, 8430, LR8431, LR8432, LR8400, LR8401, LR8402, and LR8409</td>
<td>Windows 10/8/7 (32bit/64bit), Vista (32bit/64bit), XP SP2 or later (32bit)</td>
<td>Measurements on multiple loggers connected by LAN or USB can be controlled to sequentially acquire, display and save waveform data (for recording up to 10 million samples) Number of controllable instruments up to 5 units (This software is compatible only with the LR8410, LR8400 series, LR8431, 8423, and 8430) Display: Waveforms (time-axis divided display possible), numerical values (logging), and alarm status can be displayed at the same time Numerical value display: Can be monitored in a separate window Scroll: Waveform scroll while measuring Data saving destination: Real-time data transfer to Excel, or Real-time data acquisition file (LUW format) Event marks: Can be set while measuring</td>
<td>Data acquisition settings for the logger or logging station Data acquisition settings for the logger or logging station can be saved together in one file (LUS format); Instrument configuration settings can be sent and received</td>
<td>Processed data file: Real-time data acquisition file (LUW format), Record to internal memory data (MEM format) Display format: Simultaneously display waveform and numerical value, (time-axis divided display possible) Maximum number of channels: 675 channels (measurement data) + 60 channels (waveform processing data) Others: Display each channel’s waveform on 10 sheets, scroll, record event mark, cursor, screen hard copy, numerical value display</td>
<td>Target data: Real-time data acquisition file (LUW format), record to internal memory data (MEM format) Converted sections: All data, designation section Format: CSV format (separate by comma, space, tab), transfer to Excel spreadsheet, arbitrary data thinning</td>
<td>Processing items: Four arithmetic operations Number of processing channels: 60 channels</td>
<td>Target data: Real-time data acquisition file (LUW format), record to internal memory data (MEM format) Calculation items: Average, peak, maximum values, time to maximum values, minimum values, time to minimum values, ON time, OFF time, count the number of ON time and OFF time, standard deviation, integration, area values, totalization</td>
<td>Supported printer: Printer compatible with the OS Target data: Real-time data acquisition file (LUW format), record to internal memory data (MEM format) Print format: Waveform image, report format, list print (channel settings, event, cursor value) Print area: The entire area, area between cursors A and B Print preview: Supported</td>
<td></td>
</tr>
</tbody>
</table>

### Model: WIRELESS LOGGING STATION LR8410

**Model No.** LR8410-20

(English model, main unit only)

**Accessories:** Instruction manual +1, Measurement guide +1, SD Memory Card (2GB) Z4001 +1, CD-R (data collection software “Logger Utility”) +1, USB cable +1, AC Adapter Z1008 +1

Measurement cannot be performed using the LR8410 alone. Measurement requires an LR8510/LR8511 measurement unit or an LR8512 or other wireless logger series. (One LR8410 can control from one to seven units [different models can be mixed].)

### Measurement units

**Model: WIRELESS VOLTAGE/TEMP UNIT LR8510**

**Model No.** LR8510

(For the LR8410)

An optional AC adapter for the LR8512 to LR8520 is available for separate purchase.

### Wireless loggers

**Model: WIRELESS PULSE LOGGER LR8512**

**Model No.** LR8512

(2 ch)

For pulse count, rotation, 1/0 signal measurement, L1010 cable bundled

**Model: WIRELESS CLAMP LOGGER LR8513**

**Model No.** LR8513

(2 ch)

For AC/DC load current, AC leak current measurement, sensor is sold separately

**Model: WIRELESS VOLTAGE/TEMP LOGGER LR8515**

**Model No.** LR8515

(2 ch)

Voltage / Thermocouple (K, T) measurement, sensor is sold separately

**Model: WIRELESS FUNGAL LOGGER LR8520**

**Model No.** LR8520

(2 ch)

Record fungal index, growth prediction, alarm 1 channel, temperature measurement, humidity sensor is sold separately

**Model: WIRELESS HUMIDITY LOGGER LR8514**

**Model No.** LR8514

(2 ch)

2 ch Temperature/ 2 ch Humidity measurement, sensor is sold separately

**Model: WIRELESS UNIVERSAL UNIT LR8511**

**Model No.** LR8511

(For the LR8410)

**Model: WIRELESS CLAMP LOGGER LR8513**

**Model No.** LR8513

(2 ch)

For AC/DC load current, AC leak current measurement, sensor is sold separately

**Model: WIRELESS HUMIDITY LOGGER LR8514**

**Model No.** LR8514

(2 ch)

2 ch Temperature/ 2 ch Humidity measurement, sensor is sold separately

Use your tablet*, smart phone*, or PC via Bluetooth® to collect data from Wireless Mini Loggers. (*Android™ only)*

Transfer data even during recording, or check data and fluctuating waveforms on the spot.
**Options for the Wireless Logging Station LR8410**

- **AC ADAPTER Z1008**
  - 100 V to 240 V AC

- **SD MEMORY CARD 2GB Z4001**
  - For storing measurement data

- **SD MEMORY CARD 8GB Z4003**
  - For storing measurement data

- **BATTERY PACK Z1007**
  - Li-ion, Charges while installed, 7.2 V/2170 mAh

- **CARRYING CASE C1007**
  - Holds one LR8410 and four measurement units

- **FIXED STAND Z1009**
  - For wall hanging and slanted bench mounting

- **LAN CABLE 9642**
  - Straight Ethernet cable, supplied with straight to cross conversion adapter, 5 m (16.4 ft) length

**Shared options for the LR8510/ LR8511**

- **AC ADAPTER Z21008**
  - 100 V to 240 V AC

- **BATTERY PACK Z1007**
  - Li-ion, Charges while installed, 7.2 V/2170 mAh

**Options for the LR8510/ LR8511**

- **AC FLEXIBLE CURRENT SENSOR CT7731**
  - 100 A AC, φ33 mm (1.30 in)

- **AC FLEXIBLE CURRENT SENSOR CT7732**
  - 200 A AC/DC, φ33 mm (1.30 in)

- **AC FLEXIBLE CURRENT SENSOR CT7742**
  - 200 A AC/DC, φ55 mm (2.17 in)

- **5000 A AC, φ100/180/254 mm (3.94/7.09/10.00 in)**

**Options for the LR8513**

- **AC/DC AUTO-ZERO CURRENT SENSOR CT7731**
  - 100 A AC/DC, φ33 mm (1.30 in)
  - *AC adapter is bundled with the LR8510/8511*

- **HUMIDITY SENSOR Z2010**
  - 50 mm (1.97 in) length

- **HUMIDITY SENSOR Z2011**
  - 1.5 m (4.92 ft) cord length

- **AC FLEXIBLE CURRENT SENSOR CT7642**
  - 2000 A AC/DC, φ33 mm (1.30 in)

- **AC FLEXIBLE CURRENT SENSOR CT7643**
  - 5000 A AC, φ100 mm (3.94 in), Not CE marked

- **AC FLEXIBLE CURRENT SENSOR CT7644**
  - 5000 A AC, φ180 mm (7.09 in)

- **AC FLEXIBLE CURRENT SENSOR CT7645**
  - 5000 A AC, φ254 mm (10.00 in)

**Shared Options for the LR8512 to LR8520**

- **AC ADAPTER Z2003**
  - 100 V to 240 V AC

- **MAGNETIC STRAP Z5004**

- **MAGNETIC STRAP Z5020**

**Use of the Wireless Logging Station**

The LR8510/ LR8511 measurement units, the LR8512 LR8513 LR8514 LR8515 LR8520 wireless loggers, and the LR8410 Wireless Logging Station use the 2.4 GHz band. No radio station license is required in order to use these products, but the following precautions should be observed:

- Do not use with systems required to exhibit a high level of safety or reliability.
- Do not use in proximity to other devices that use the same frequency band, for example wireless networking devices, transmission and reception of data may become unreliable, and product operation may be affected by the other devices.
- Do not use with systems required to exhibit a high level of safety or reliability.
- Do not use in proximity to other devices that use the same frequency band, for example wireless networking devices, transmission and reception of data may become unreliable, and product operation may be affected by the other devices.

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