HIOKI

HEAT FLOW LOGGER LR8432

NEW

Where does the heat go?

A Compact & Lightweight Heat Flow Logger

Ideal for evaluating insulation performance and analyzing the causes of temperature change

Measurement parameters

W/m² Heat flow | °C Thermocouple | V Voltage | Pulse | CE

* The heat flow sensor shown in the photograph is sold separately.

Making heat flow visible

What is heat flow?

With temperature fluctuation, there is always a migration of heat.
Heat is energy that causes a change in temperature, and it moves from high to low in the same way as water and electricity.

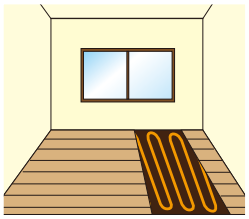
The degree of this migration is referred to as "heat flow" and is expressed as the amount of heat energy that flows through a given area over a given period of time (units: W/m^2).

Temperature is the result, while heat flow is the process.
Temperature fluctuation (heat generation or absorption) cannot be understood solely through temperature measurements using thermocouples and thermography.
To get the complete picture, use a heat flow sensor to visualize the movement and volume of heat energy as a leading indicator of temperature fluctuation.

The measurement of heat is useful for achieving more accurate air conditioning control and implementing measures against heat during product development.

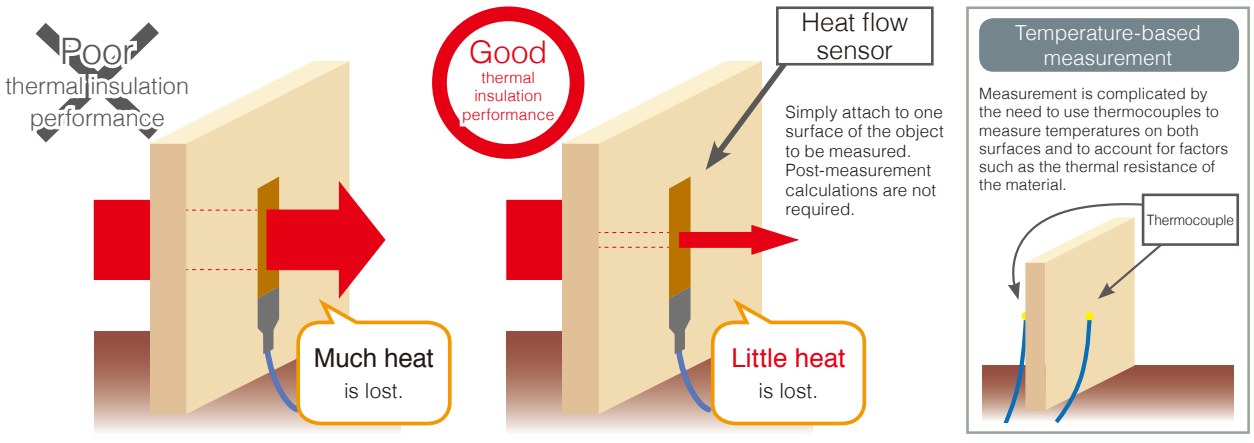
Construction and housing equipment

- ✔ Evaluation of ecological houses
- ✔ Evaluation of insulation and thermal barrier performance
- ✔ Evaluation of heating efficiency
- ✔ Evaluation of floor heating systems



Quantifying heat flow

Quantify heat flow with numerical values and waveforms. Use these numbers to evaluate thermal insulation performance and identify areas where heat flows in and out.



Automobiles

- ✔ Evaluate heat flow from engine rooms and exhaust pipes into a vehicle
- ✔ Evaluate automotive air conditioning
- ✔ Evaluate heat generated and dissipated in automotive parts

Agriculture and civil engineering

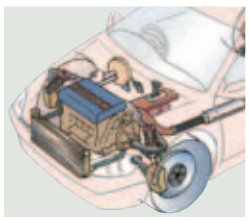
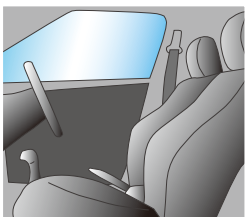
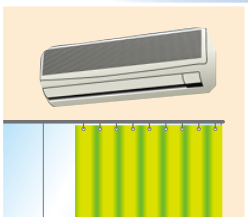
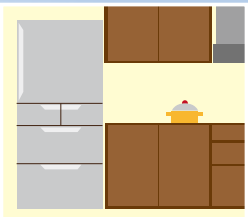
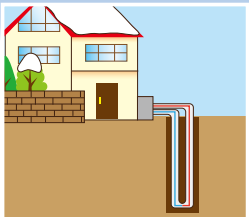
- ✔ Evaluation of geo-heat
- ✔ Evaluate the thermal characteristics of greenhouses

Research

- ✔ Manage heat
- ✔ Convert thermoelectricity
- ✔ Heat storage or unused heat (waste heat)

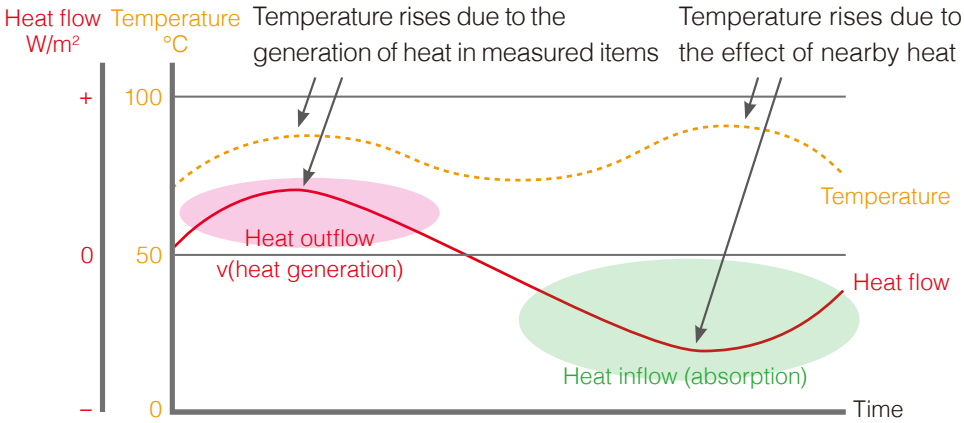
Electrical machinery

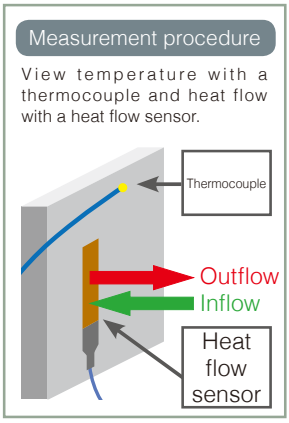
- ✔ Evaluate thermal insulation performance of consumer electronics
- ✔ Evaluate cooling and heating systems
- ✔ Evaluate of cooking appliances

Patterns of flow

Temperature alone cannot reveal the flow of heat (both in and out).
Use heat flow to discover the cause of rises in temperature.





Applications

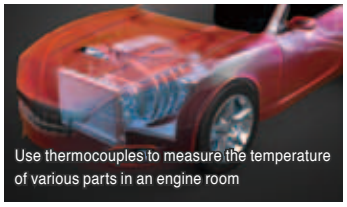
Visualize the underlying causes of temperature change.

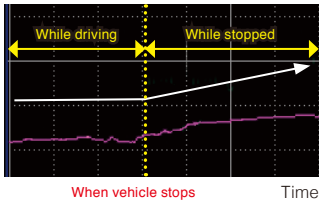
Temperatures change due to specific reasons. Heat flow measurement lets you pinpoint those reasons that have been difficult to identify until now.

Isolation of heat generated and dissipated in automotive parts

By identifying why temperature rises, you can design optimal insulation and heat dissipation characteristics.

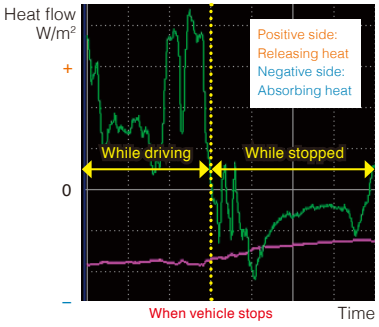
Conventional approach to measurement (thermocouple only)





- It's clear that the temperature increases but not why, making it difficult to develop thermal countermeasures.

New approach that adds heat flow measurement (thermocouple + heat flow sensor)



Heat flow graph when stopped changes from + to -.

Analysis

While driving ▶ Releasing heat

While stopped ▶ Absorbing heat

Optimal thermal countermeasures

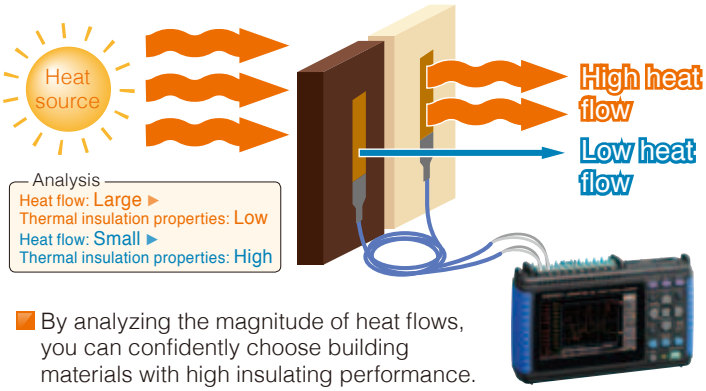
Lower temperature while driving▶ Heat dissipation measures

Lower temperature while stopped▶ Insulation measures

- By identifying whether heat is being released or absorbed, you can implement optimal thermal countermeasures.

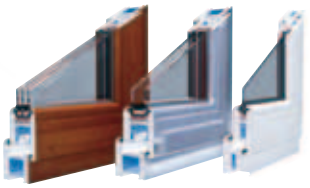
Evaluate the thermal performance of building materials

The performance of insulating materials can be compared in an effective manner.



- By analyzing the magnitude of heat flows, you can confidently choose building materials with high insulating performance.

- Differentiate between optimal thermal insulation material for exteriors, such as roofs and outer walls, and interiors, such as windows and walls.



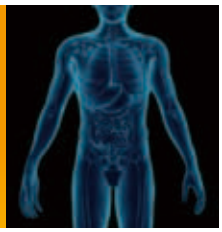
What heat flow measurement makes possible

Measure the energy efficiency of consumer electronics

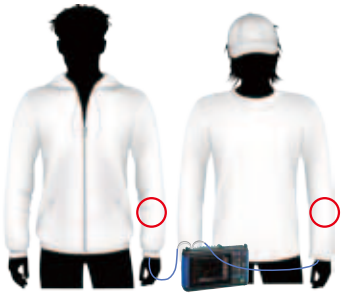
Measure multiple areas where heat is generated in order to combat heat sources in a variety of consumer electronics.

- In addition to large heat-generating parts used in electric appliances such as consumer electronics, you can measure a wide variety of parts down to small electronic boards.

Study the impact of body heat



Measure the flow of heat in human bodies to understand the conduction efficiency of heat in materials and fabrics under development.

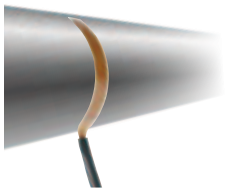


Applicable to the development of bathroom floor materials and clothing

- Use radiation sensors and solar radiation meters to measure the effects of heat from the ground and from the sun, which cannot be measured with thermography.

Diagnose the deterioration of insulation material in plant piping

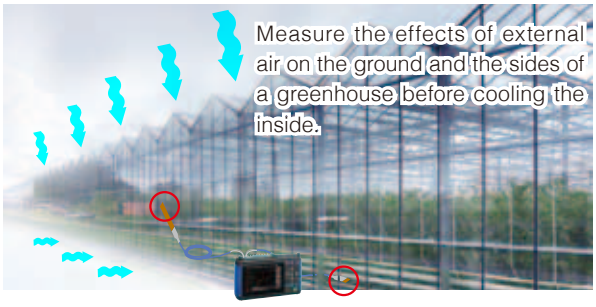
Regularly diagnose the heat flow of thermal insulation material used to understand the deterioration of thermal insulation performance over time.



- Sensor bends flexibly to measure rounded objects such as piping that could not be measured properly before

Index temperature fluctuation in agriculture and civil engineering

Predict room temperature management in greenhouses affected by external temperature fluctuation.



- Measure geothermal heat to improve energy efficiency for melting snow through road heating

Familiar operability and a variety of functions for heat flow measurement

Small

Most compact & lightweight body in its class

Compact and easy to carry in the palm of your hand
Dimensions: 176 mm (6.93 in) W x 101 mm (3.98 in) H x 41 mm (1.61 in) D
Mass: 550 g (19.4 oz)

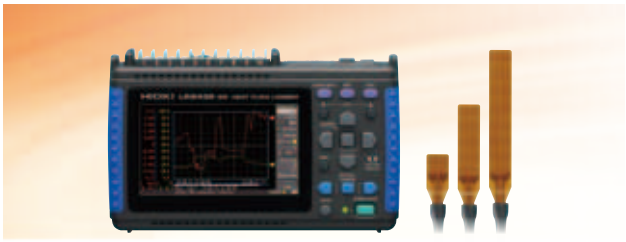
Beautiful

Wide QVGA-TFT LCD

Excellent visibility
Clear display on wide & high-intensity LCD screen

Sensitivity

High sensitivity of 10 mV f.s. for the measurement of minute heat flow



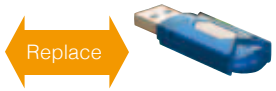
Take accurate and reliable measurements, even in areas with small temperature fluctuations and for the evaluation of high thermal insulation materials

Handling

Save the required information in time-based blocks

Change USB drive while recording

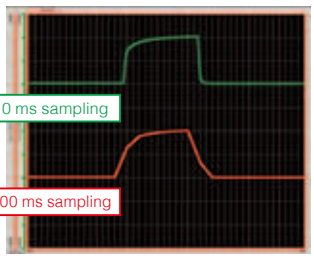
In addition, extract data at any point while continuing to take measurements.



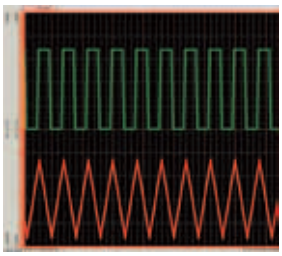
Use segmented calculations to determine and save average values and maximum values for each time block (units: minutes).

10 ms

10 ms high-speed sampling on all channels



Sampling of waveform with a sudden change in load



Sampling of 5Hz pulse waveform

Measuring sudden changes in load and sampling multiple channels at 10 ms is necessary for the development of electric cars, such as EV, HV, and PHV. Capture waveforms that cannot be sampled with conventional 100ms sampling.

Isolated

10-channel isolated analog input minimizes cross-channel interference

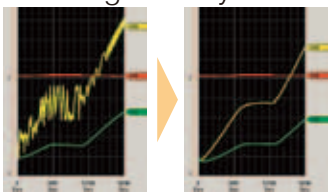
Take reliable temperature and voltage measurements of items with different potentials. There is no risk of interference or electric shock even when also using thermocouples to measure voltage input.
Use 4 pulse input channels to integrate rotational pulse and measure rotational speed.

* Semiconductor relays are used for isolation between channels. If voltage that exceeds product specifications, such as a lightning surge, is applied between channels, the semiconductor relays might short circuit. Be sure to take proper precautions to prevent this from occurring.

Noise

Noise-resistant measuring circuitry

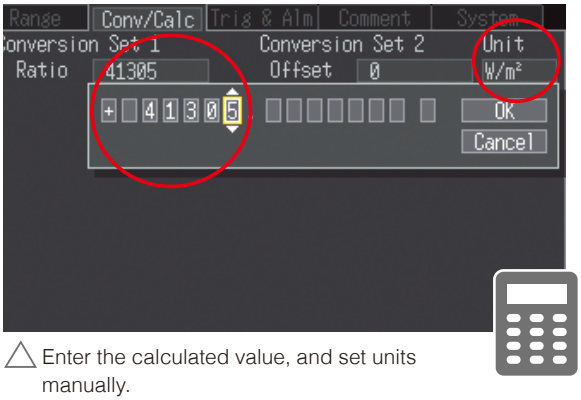
Reduce previous trouble caused by switching noise and 50/60 Hz hum noise in inverters



Simple settings for the heat flow sensor

Older systems

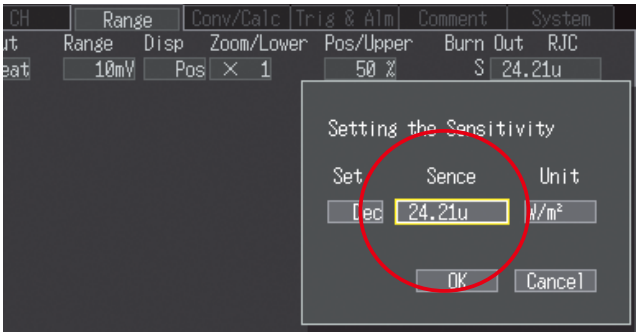
Since the sensitivity of heat flow sensors varies from sensor to sensor, it was necessary to calculate W/m² per 1V from sensor sensitivity to make scaling settings.



△ Enter the calculated value, and set units manually.

Heat flow logger LR8432-20

Avoid troublesome calculations by directly entering the sensitivity of the heat flow sensor.

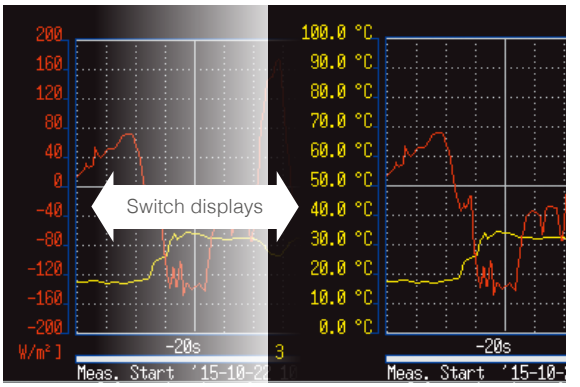


◯ Simply enter the sensitivity of the heat flow sensor to complete the settings.

Display heat flow and temperature gauges simultaneously

Older systems

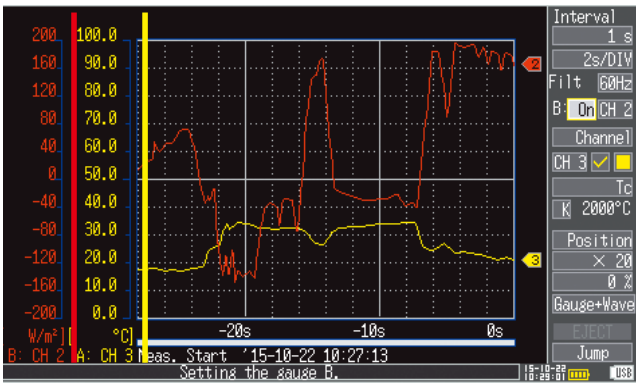
Until now it was possible to display only the heat flow sensor gauge or the temperature gauge, switching between them as necessary.



Heat flow (W/m²) Temperature (°C)

Heat flow logger LR8432-20

Display the gauges for data you want to compare at the same time in order to see changes in temperature and heat flow at a single glance.



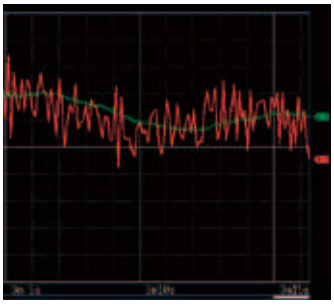
Heat flow (W/m²) Temperature (°C)

Real-time calculation function

Waveform processing

The LR8432-20 has a convenient, built-in waveform processing function for the analysis of temperature and heat flow. Record raw waveforms and post-calculation waveforms at the same time. (Simple average, moving average, integration, heat transmission coefficient)

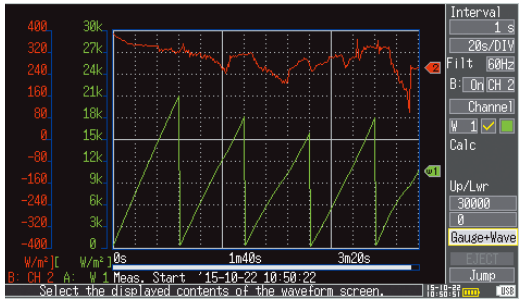
Real-time calculation of moving average



Moving average waveform

Raw waveform

Real-time calculation of integration

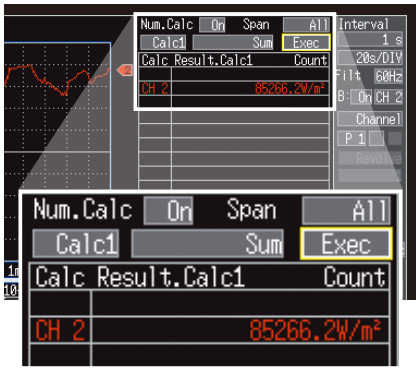


Integration at specified intervals

Numerical calculations

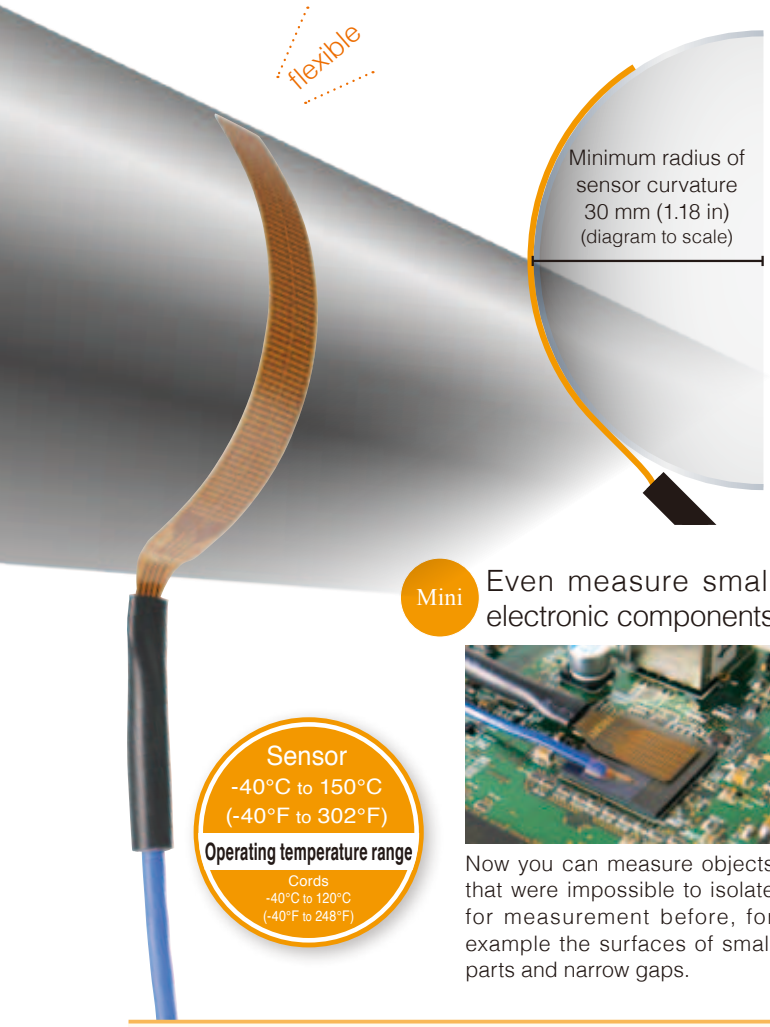
Integrate with numerical calculations. Display the sum of energy as a numerical value.

Real-time calculation of sum



Waterproof heat flow sensor that can measure curved surfaces

Sold separately

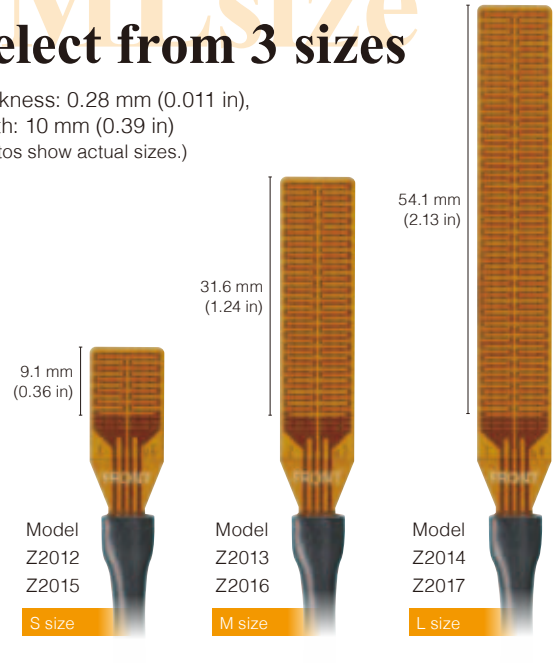


Reasonable Cost performance

More affordable than conventional heat flow sensors. Sensitivity has also been improved. (Compared with conventional models.)

SML size Select from 3 sizes

Thickness: 0.28 mm (0.011 in),
Width: 10 mm (0.39 in)
(Photos show actual sizes.)

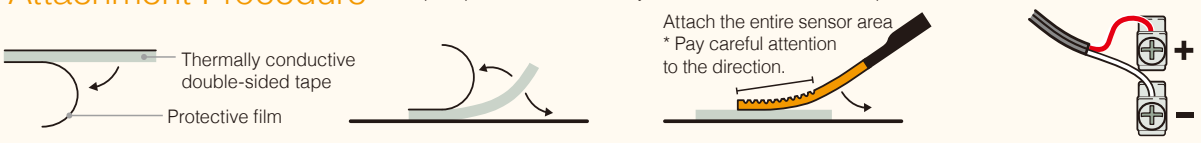


Mini Even measure small electronic components

Now you can measure objects that were impossible to isolate for measurement before, for example the surfaces of small parts and narrow gaps.

Attachment Procedure

Example option: Z5008 thermally conductive double-sided tape



1. Cut the thermally conductive double-sided tape to the required size, and remove the protective film from one side.
2. Attach the thermally conductive double-sided tape to the object to be measured, and remove the film from the other side.
3. Attach the full length of the back of the sensor (flat surface) to the thermally conductive double-sided tape.
4. Connect the red wire to the + terminal on the LR8432-20, and the white wire to the - terminal on the LR8432-20.

Note ▶ If heat moves from the rear of the sensor to the front of the sensor at this time, the graph is displayed with a + waveform.

Heat flow sensor (sold separately) Specifications

Model		Z2012 Z2015	Z2013 Z2016	Z2014 Z2017
Sensor dimensions (Approx.)	W	10.0 mm (0.3937 in)		
	L	9.1 mm (0.3583 in)	31.6 mm (1.2441 in)	54.1 mm (2.1299 in)
	T	0.28 mm (0.0110 in)		
Typical sensitivity		0.013 mV/W • m^{-2}	0.049 mV/W • m^{-2}	0.089 mV/W • m^{-2}
Operating temperature range		Sensor: -40°C to 150°C (-40°F to 302°F), Cords: -40°C to 120°C (-40°F to 248°F)		
Waterproof properties		IP06, IP07 (EN60529)		

Internal resistance (including cord)	3 Ω to 500 Ω	3 Ω to 1000 Ω	3 Ω to 1500 Ω
Minimum radius of curvature	30 mm (1.1811 in)		
Compression stress	4 MPa		
Thermal resistance	1.4×10^{-3} (m^2·K/W)		
Repeatable precision	±2%		
Cord lengths (Approx.)	1.5 m (4 ft 11 in) (Z2012, Z2013, Z2014)		
	5 m (16 ft 5 in) (Z2015, Z2016, Z2017)		

Logger Utility for flexible measurement and analysis

Accessory

A guide is displayed on the computer screen to make the setting procedure easy to understand.

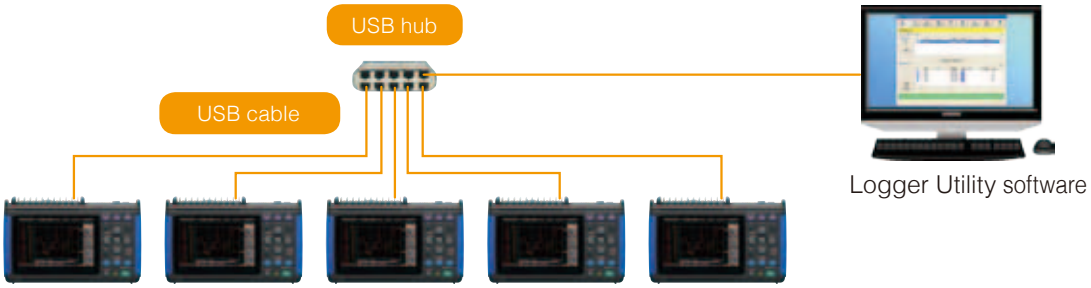
Easily navigate through logger settings

With this Logger Utility software, you can use a computer to easily make logger settings.

5 units

Simultaneously measure with up to 5 units connected by USB

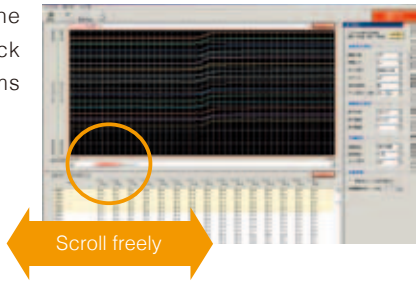
View graphs for up to 50 analog input channels and up to 20 pulse input channels in a single window at the same time.



Check

Display past data while measuring

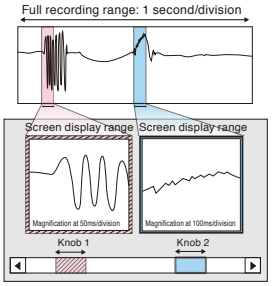
View trend graphs in the window, and scroll back through past waveforms even while recording.



Patented

Double knob functionality for easy analysis

Display independent waveforms in separate windows and use the knobs to change the time axis of each waveform — convenient for long-term data analysis.
* The technology for analysis using the double-knob function is patented by HIOKI.



Logger Utility (bundled software) Specifications

Operating system	Windows 8 (32/64bit) /7 (32/64bit) /Vista (32/64bit) /XP (SP2 or higher) **[Supported measuring instruments]** LR8432-20, LR8410-20, LR8400-20 series, LR8431-20, 8423, 8430-20
Real-time data collection	Control the measurement of multiple loggers connected via LAN or USB, and receive/display/save waveform data in real-time (up to a total of 10M samples). **[Total number of units controlled]** 5 (any supported measuring instrument) **[Display]** Waveform (time axis division), numerical values (logging), and warnings can be displayed at the same time. **[Numerical value monitor]** Displayed in a separate window. **[Scroll]** Scroll through waveforms while measuring. **[Data save destination]** Real-time data transfer to Excel, real-time data collection in files with proprietary format (LUW format). **[Event mark]** Record while measuring.
Data collection settings	**[Settings]** Make data collection settings for the logger **[Save]** Save the settings for multiple loggers in a single file (LUS format). **[Send/Receive logger settings]** Possible
Waveform display	**[Supported files]** Real-time data collection files (LUW format), logger measurement files (MEM format) **[Display format]** Display waveform (time axis division) and numerical values (logging) at the same time **[Maximum number of channels]** 675ch (measurement) + 60ch (waveform processing) **[Other]** Display, scroll, event mark recording, cursor, hard copies of the main screen, and numerical value displays are possible for 10 sheets of waveforms for each channel.

Data conversion	**[Supported data]** Real-time data collection files (LUW format), logger measurement files (MEM format) **[Conversion section]** All data, specified sections **[Conversion format]** CSV format (comma/space/tab delimited), transfer to Excel sheet **[Data thinning]** Simple thinning based on the desired thinning number
Waveform processing	**[Calculation items]** Four calculations **[Number of calculation channels]** 60 channels
Numerical calculations	**[Supported data]** Real-time data collection files (LUW format), logger measurement files (MEM format), data during real-time data collection, waveform processing data **[Calculation items]** Average value, peak value, maximum value, time to maximum value, minimum value, time to minimum value, ON time, OFF time, number of times ON, number of times OFF, standard deviation, integral, area value, integration
Search	**[Supported data]** Real-time data collection files (LUW format) Logger measurement files (MEM format) **[Search mode]** Event mark, date, maximum position, minimum position, ultra-maximum position, ultra-minimum position, warning position, level window, amount of change
Printing	**[Printer support]** Printers supported by the operating system **[Supported data]** Real-time data collection files (LUW format), logger measurement files (MEM format) **[Printing format]** Waveform image, report printing, list printing (channel settings, event, cursor value) **[Printing range]** Full range, can specify between A-B cursors **[Printing preview]** Possible

Functionality

- Heat flow, thermocouple measurements, or a variety of transducer outputs (DC voltage) over 10 channels
- 4 pulse (count) input channels, 1 alarm output channel
- Real-time save & long-term recording to CF card or USB memory

Terminal 2: Trigger Output

- Outputs a signal when triggering occurs
- Use for synchronous parallel triggering of multiple loggers

Terminal 3: External Trigger Input

- Causes triggering when signaled by an external trigger source
- Use for synchronous parallel triggering of multiple loggers

Terminal 4: Alarm Output

- Outputs a signal when alarm criteria are satisfied
- The output signal shares common ground with the logger
- Use for simultaneous control of an external alarm device

Note: Open drain output (active low, with voltage output)

Alarm

Terminal 1: GND

Pulse Inputs (measure integration/revolution count variations)

- Four input channels
- Pulse inputs share common ground with logger
- For measuring energy consumption and cumulative flow

Note: Uses special HIOKI input cable (CONNECTION CABLE 9641)

Pulse totalization revolution

Integration count 0 to 1000M (count)

RPM 0 to 5000/n (r/s)

Settable pulses per rotation: 1 to 1000

"n" above is the number of sensor output pulses per rotation

Heat Flow/Temperature/Voltage Measurement

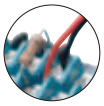
- Ten input channels
- Isolated walls around all input channel terminals (M3 dia. screws)
- Heat flow, temperature, or voltage measurement settings can be independently set up for each channel.

W/m² Heat flow — Heat flow ±10 mV to ±60 V, 1 to 5 V

Thermocouple — Thermocouple K, J, E, T, N, R, S, B -200°C to 2000°C (-328°F to 3632°F)

DC V — Voltage ±10 mV to ±60 V, 1 to 5 V

4-20mA



To record 4 - 20 mA instrumentation signals, attach a commercially available 250 Ω shunt resistance to the input terminals (between + and -) to convert the signals to 1 - 5 V. Then use the 1-5 V or the 10 V f.s. input range in the logger.

USB Memory (for real-time data saving)

USB Connector for Communication

USB cable

CF Card (for real-time data saving)

Supports HIOKI's 2 GB Card

For more reliable data protection, we recommend use of HIOKI CF cards, which are manufactured to strict industrial standards, for real-time saving of data or long-term storage of important data.

Note: The USB communications function cannot be used while saving data to a USB flash drive.

Note: Operation of non-HIOKI CF cards is not guaranteed.

Real-time recording time to storage media (binary format) Note: For CSV format, the recording time is shorter than 1/10 of the values below.

	Recording All Channels (ten analog, four pulse and one alarm) Note: No waveform processing			
Recording intervals	Internal memory (7 MB)	512 MB	1 GB	2 GB
10 ms	32 m	1 d 15 h 14 m	3 d 06 h 29 m	6 d 12 h 58 m
20 ms	1 h 04 m	3 d 06 h 29 m	6 d 12 h 58 m	13 d 01 h 57 m
50 ms	2 h 40 m	8 d 04 h 13 m	16 d 08 h 26 m	32 d 16 h 53 m
100 ms	5 h 21 m	16 d 08 h 26 m	32 d 16 h 53 m	65 d 09 h 47 m
200 ms	10 h 43 m	32 d 16 h 53 m	65 d 09 h 47 m	130 d 19 h 35 m
500 ms	1 d 02 h 49 m	81 d 18 h 14 m	163 d 12 h 29 m	327 d 00 h 59 m
1 s	2 d 05 h 39 m	163 d 12 h 29 m	327 d 00 h 59 m	"H"
2 s	4 d 11 h 18 m	327 d 00 h 59 m	"H"	"H"
5 s	11 d 04 h 16 m	"H"	"H"	"H"
10 s	22 d 08 h 33 m	"H"	"H"	"H"
20 s	44 d 17 h 06 m	"H"	"H"	"H"
30 s	67 d 01 h 39 m	"H"	"H"	"H"
1 m	134 d 03 h 18 m	"H"	"H"	"H"
2 m	268 d 06 h 36 m	"H"	"H"	"H"
5 m to 1 h	"H"	"H"	"H"	"H"

- Maximum recording time is inversely proportional to number of recording channels.
- Because the actual capacity of the external storage media is less than that indicated, and 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 365 days.

Product Specifications

Basic Specifications (Product guaranteed for 1 year; Accuracy guaranteed for 1 year; Post-adjustment accuracy guaranteed for 1 year)

Input system/channels	Analog inputs: 10, isolated (M3 mm dia. screw terminal block) * Electrically isolated between channels, and from chassis ground. Input impedance: 1 MΩ (when measuring heat flow, voltage, or temperature with a thermocouple and the burn-out detection is OFF), 800 kΩ (with thermocouple burn-out detection ON) Pulse inputs: 4 channels (requires CONNECTION CABLE 9641) Note: all pulse inputs share common ground with logger.
Analog inputs	Maximum rating: 60 V DC (max. voltage between input terminals without damage) Maximum rated voltage from isolated terminals to ground: 30 V AC rms, 60 V DC (max. voltage between input channel terminals, and from terminals to chassis ground without damage)
Pulse inputs	Input limits: 0 to +10 V DC (max. voltage between input terminals without damage), Non-isolated (common ground between pulse input channels, and with chassis) Pulse signal characteristic: No-voltage relay contact a, open collector or voltage input (High: 2.5 V or more, Low: 0.9 V or less), Period: at least 200 µs (both high and low periods at least 100 µs)
Alarm output	One channel, non-isolated: output from external control connector (common ground) Signal criteria: configurable high/low threshold levels, enter/exit threshold window, logical sum (OR) and logical product (AND) for every input channel. Output is refreshed each time recording starts. Signal characteristic: Open drain output (active low, with voltage output) Voltage levels: 4.0 to 5.0 V (H) and 0 to 0.5 V (L), Max. sink current: 5 mA DC, Max. applied voltage: 30 V DC
Internal memory	3.5 MWords (7 MB of two-byte data points, or four-byte pulse measurements)
External memory	CF card: CF card slot × 1 (Up to 2 GB) Data format: FAT, FAT32 USB memory: USB 2.0 High-speed capable, series mini-B receptacle, Data format: FAT, FAT32
Backup function (@25°C)	Backup battery life for clock and settings: approx. 5 years For measurement data: 100 hours with fully charged battery pack, or for as long as AC adapter is connected
Control terminals	External Trigger/Event Mark input (exclusion function), Trigger Output, Alarm Output
Display	4.3-inch WQVGA-TFT color LCD (480 × 272 dots)
Display languages	English, Japanese
External interface	One USB 2.0 series mini B receptacle Functions: Control from a PC (Ver 1.00 or later), Transfers internal data on the CF card to a PC
Environmental conditions (no condensation)	Temperature and humidity range for use: 0°C to 40°C (32°F to 104°F), (or 5°C to 30°C, 41°F to 86°F when battery charging), 80% rh or less Storage: -10°C (14°F) to 50°C (122°F), 80 % rh or less
Standard compliance	Safety: EN61010, EMC: EN61326, EN61000
Power supply	AC ADAPTER Z1005: 100 to 240 V AC, 50/60 Hz, 30 VA Max. (including AC adapter), 10 VA Max. (Logger only) BATTERY PACK 9780: 2.5 h continuous operating time (@25°C/77°F), 3 VA Max. External power source: 10 to 16 V DC, 10 VA Max. (Please contact HIOKI for connection cord. Max length 3 m/9.84 ft)
Continuous operating time	Approx. 2.5 hours (with Battery Pack Model 9780 while saving to the CF card) Charging time: Approx. 200 minutes (@5°C to 30°C/41°F to 86°F ambient)
Dimensions and mass	Approx. 176 mm (6.93 in) W × 101 mm (3.98 in) H × 41 mm (1.61 in) D, 550 g (19.4 oz) (HEAT FLOW LOGGER only)
Accessories	Measurement Guide × 1, AC ADAPTER Z1005 × 1, USB cable × 1, CD-R (Instruction Manual, data collection software "Logger Utility") × 1

Trigger Functions

Trigger source (selectable for each channel)	All analog and pulse channels P1 to P4, external trigger, logical sum (OR) and product (AND) of each trigger source
External trigger	Criteria: Short-circuit between external trigger input and ground, or voltage input (H-L transition from [3.0 – 5 V] to [0 – 0.8 V]) Pulse width: At least 1 ms (H), and 2 µs (L) Input limits: 0 to 7 V DC
Trigger timing	Start, Stop and Start/Stop (different trigger criteria can be set to start and stop)
Trigger types (Analog, Pulse)	Level: Triggers when rising or falling through preset threshold Window: Triggers when entering or exiting range defined by preset upper and lower thresholds
Level setting resolution	Analog: 0.025% f.s. (f.s. = 10 display divisions) Pulse: Totalization 1 count, Rotations 1/n [r.s] (n: pulses per rotation)
Pre-trigger	Records for a specified period before triggering; can be set for real-time saving
Trigger output	(1) Output signal at trigger occurred, (2) Output signal at start or trigger occurred, Selectable between mode (1) or (2) Open collector (active low, with voltage output, at least 10 ms pulse width, Voltage levels: 4.0 to 5.0 V (H) and 0 to 0.5 V (L), Max. sink current: 5 mA DC, Max. applied voltage: 30 V DC)

Measurement Settings

Recording intervals (sampling period)	10 ms to 1 hour, 19 selections Note: All input channels are scanned at high speed during every recording interval
Graph timebase scaling	100 ms to 1 day per division, 21 selections Note: These settings are different than recording interval.
Repeating recording	(ON/OFF) Enable to repeat recording after the specified recording time span has elapsed
Recording time	Enable continuous recording (continuous recording until the Stop key is pressed), or disable to record for a specified time span (days, hours, minutes and seconds)
Timer recording	(ON/OFF) Enable to record for a specified time span, or between specified start and stop times
Auto saving	Waveform data (binary or CSV): Real-time saving to CF card or USB memory while measuring Numerical calculation results: stores calculated values to the CF card or USB memory when finished measuring Note: Do not power down while data is saving
Real-time saving	Each recording can be saved in a separate file Delete and save: New data overwrites the oldest data when the storage media is full Divided saving: Save data at a specified interval (days, hours and minutes) Divided saving: Specified time (specify a time of day at which to start saving data to files at a specified interval) Note: Do not power down while data is saving
Load stored data	Stored data can be recalled by the logger in 3.5 MWord (7 MB) quantities (for a single channel; less for multiple channels)
Settable save/reload	Configure saving and reloading to and from CF card or USB memory or internal memory Ten types for internal memory, no limit for CF card and USB memory
Numerical calculations	Calculation 1 to Calculation 4, simultaneous calculation possible, Selections: average value, peak value, maximum value, minimum value, time to maximum value, time to minimum value, integration
Calculation range	After stopping: all data in internal buffer memory or between AB cursors While measuring: all data in internal buffer memory Time-delimited calculation: Calculate at the specified times, and display the latest calculated values (only while measuring)
Auto save of calculated results	Possible: Automatically save the final calculated values in text format to CF card or USB memory after measurement. Time-delimited calculation: Save calculation values in real-time at the specified times in text format to CF card or USB memory.
Selectable filters	50 Hz, 60 Hz, or OFF (digital filtering of high frequencies on analog channels)

Channel Settings

Channel settings	Enable/disable measurement (ON/OFF), selectable waveform color Analog channels (10): Voltage, Heat flow, Temperature (thermocouple only). Thermocouple types K, J, E, T, N, R, S, B Pulse input channels (4): Count Integration or revolutions Alarm output (1): Hold/not-hold, beeper enable/disable (ON/OFF), Show/hide alarm waveform display (ON/OFF) Waveform processing 10ch		
Accuracy guarantee conditions	Warm-up time: 30 minutes or more, after zero-adjustment Cutoff frequency setting: 10 Hz/50 Hz/60 Hz		
Measurement targets	Range	Range of measurements	Max. resolution
Voltage/Heat flow	10 mV f.s.	-10 mV to +10 mV	500 nV
	100 mV f.s.	-100 mV to +100 mV	5 µV
	1 V f.s.	-1 V to +1 V	50 µV
	10 V f.s.	-10 V to +10 V	500 µV
	20 V f.s.	-20 V to +20 V	1 mV
	100 V f.s.	-60 V to +60 V	5 mV
	1 to 5 V (Note)	1 V to 5 V	500 µV
	Accuracy: ±0.1 % f.s. (Note: 1 - 5 V range's f.s. = 10 V)		
Measurement targets	Range	Range of measurements	Max. resolution
Temperature (Thermocouples)	2000°C (3632°F) f.s.	-200°C to 2000°C (-328°F to 3632°F)	0.1°C (0.18°F)
Temperature input ranges (JIS C 1602-1995)	(K) -200°C to 1350°C (-328°F to 2462°F) (J) -200°C to 1200°C (-328°F to 2192°F) (E) -200°C to 1000°C (-328°F to 1832°F) (T) -200°C to 400°C (-328°F to 752°F) (N) -200°C to 1300°C (-328°F to 2372°F) (R) 0°C to 1700°C (32°F to 3092°F) (S) 0°C to 1700°C (32°F to 3092°F) (B) 400°C to 1800°C (752°F to 3272°F)		
Measurement accuracy	K, J, E, T: ±1.0°C (1.8°F) (-100°C/-148°F or more), ±1.5°C (2.7°F) (-200°C to -100°C/-328°F to -148°F) N: ±1.2°C (2.16°F) (-100°C/-148°F or more), ±2.2°C (3.96°F) (-200°C to -100°C/-328°F to -148°F) R, S: ±2.2°C (3.96°F) (300°C/572°F or more), ±4.5°C (8.1°F) (0°C to 300°C/32°F to 572°F) B: ±2.5°C (4.5°F) (1000°C/1832°F or more), ±5.5°C (9.9°F) (400°C to 1000°C/752°F to 1832°F) Reference junction compensation [RJC] accuracy: ±0.5°C (0.9°F) (horizontal), ±1°C (1.8°F) (vertical) Internal [RJC] (internal reference junction compensation at 0°C/32°F): Measurement accuracy = (temp. measurement accuracy) + (RJC accuracy) External [RJC] (using external junction compensation at 0°C/32°F): Measurement accuracy = temp. measurement accuracy only		
Temperature other functions	Thermocouple burn-out detection: ON or OFF		
Measurement targets	Range	Range of measurements	Max. resolution
Pulse (Integration count)	1000 M (count) f.s.	0 to 1000 M (count)	1 (count)
	Addition: integration value from start, Instantaneous value: instantaneous value during each recording period		
Pulse (RPM)	5000/n (r/s) f.s.	0 to 5000/n (r/s)	1/n (r/s)
	Settable pulses per rotation: 1 to 1000 ("n" above is the number of sensor output pulses per rotation)		
Slope setting	↑ (count of L-to-H pulse transitions), ↓ (count of H-to-L pulse transitions)		
Display range	Specified by position, or by upper/lower display limit values (Upper/lower limit values only at Totalization mode)		
Waveform processing	Use the four calculations between channels (+ − × ÷) to display as data for the calculated channels (W1 to W10) (only when measuring). Calculate the data for the set channels using simple averaging, movement averaging, integration, and heat transmission coefficient to display as data for the calculated channels (W1 to W10) (only when measuring).		
Shared Channel Settings			
Scaling	Decimal (display decimal values), Exponential (display base-10 exponents), or Off Method: Ratio (set by slope and intercept), or 2-point (set by input/output values at two points) Set the conversion ratio automatically based on the sensitivity of the heat flow sensor (only for measuring heat flow).		
Other	Enter comments for each channel, set start/stop triggers and alarm criteria		

Configuration of Various Options

HEAT FLOW LOGGER LR8432

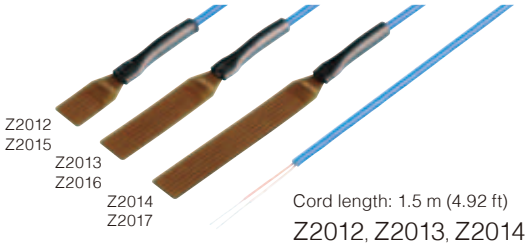
Order Code : LR8432-20 (English model)

Standard accessories

Measurement Guide × 1
CD-R (Instruction Manual, data collection software “Logger Utility”) × 1
USB cable × 1
AC ADAPTER Z1005 × 1

Heat flow measurement options

Measurement of small parts and curved surfaces of piping



Cord length: 1.5 m (4.92 ft)
Z2012, Z2013, Z2014

Cord length: 5 m (16.40 ft)
Z2015, Z2016, Z2017

Heat flow sensor

Waterproof characteristics
: IP06, IP07

Adhesive tape for accurate measurements

20 sheets

Thermally conductive double-sided tape
Z5008

Standard accessory

AC ADAPTER Z1005

100 to 240 V AC, when purchased additionally

CF card

For more reliable data protection we recommend use of HIOKI CF cards, which are manufactured to strict industrial standards, for long-term storage of important data.

PC card adapter included

PC Card Precaution

Use only PC Cards sold by HIOKI. Compatibility and performance are not guaranteed for PC cards made by other manufacturers. You may be unable to read from or save data to such cards.

PC CARD 2G 9830
PC CARD 1G 9729
PC CARD 512M 9728

Battery

Can remain mounted on the logger when charging the battery

BATTERY PACK 9780

NiMH, charges while installed in the main unit

Input

CONNECTION CABLE 9641

For pulse input; Cable Length: 1.5 m (4.92 ft)

Other

To prevent damage to the logger's display

PROTECTION SHEET 9809

For LCD protection, pairs of additional sheets

Case

SOFT CASE 9812

For storing small accessories; Neoprene rubber

CARRYING CASE 9782

For storing optional accessories; resin exterior

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All information correct as of Feb. 2, 2016. All specifications are subject to change without notice.
LR8432-20E1-62B Printed in Japan