

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



* 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.

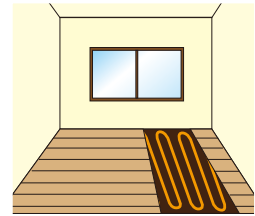
The degree of this migration is referred to as "heat flow" and is expressed as the amount of heat energy that flows through a given area over a given period of time (units: W/m^2).

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

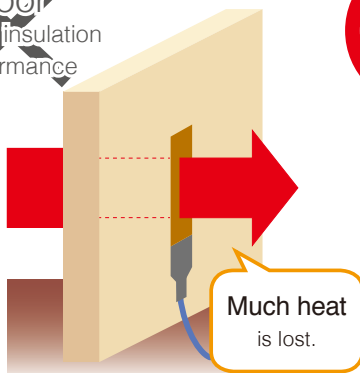
- ✓ Evaluation of ecological houses
- ✓ Evaluation of insulation and thermal barrier performance
- ✓ Evaluation of heating efficiency
- ✓ Evaluation of floor heating systems



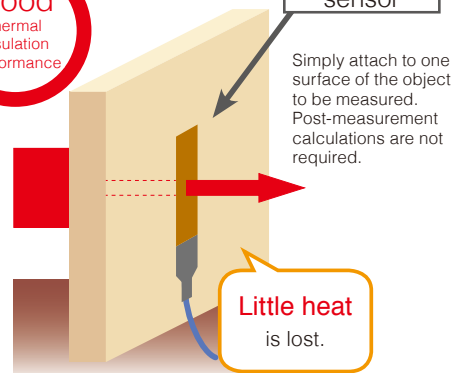
Quantifying heat flow

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.

~~Poor~~
thermal insulation performance



Good
thermal insulation performance

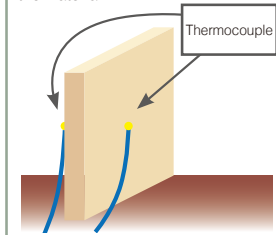


Heat flow sensor

Simply attach to one surface of the object to be measured. Post-measurement calculations are not required.

Temperature-based measurement

Measurement is complicated by the need to use thermocouples to measure temperatures on both surfaces and to account for factors such as the thermal resistance of the material.



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

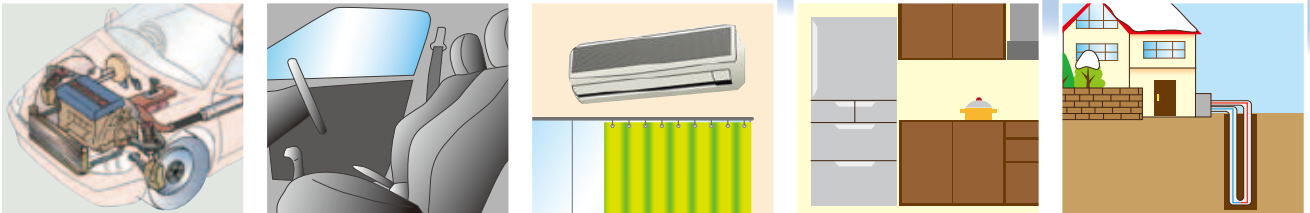
- ✓ Evaluation of geo-heat
- ✓ Evaluate the thermal characteristics of greenhouses

Research

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

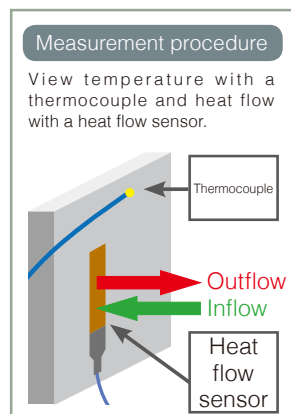
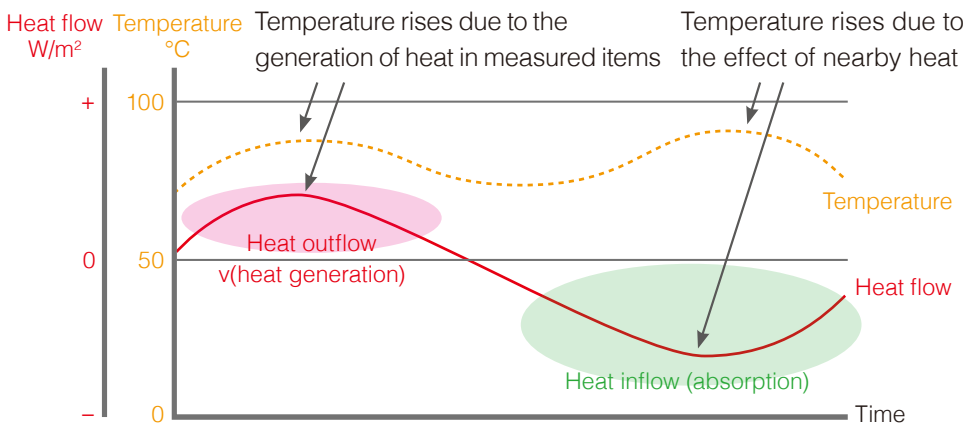
Electrical machinery

- ✓ 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.



Visualize the underlying causes of temperature change.

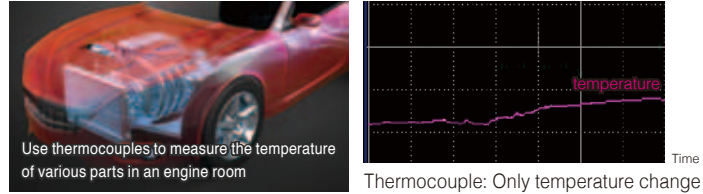
Temperatures change due to specific reasons. Heat flow measurement lets you pinpoint those reasons that have been difficult to identify until now.



Isolation of heat generated and dissipated in automotive parts

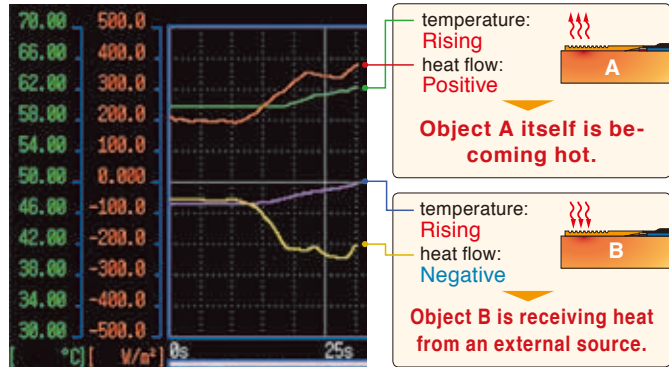
By identifying why temperature rises, you can design optimal insulation and heat dissipation characteristics.

Conventional approach to measurement (thermocouple only)



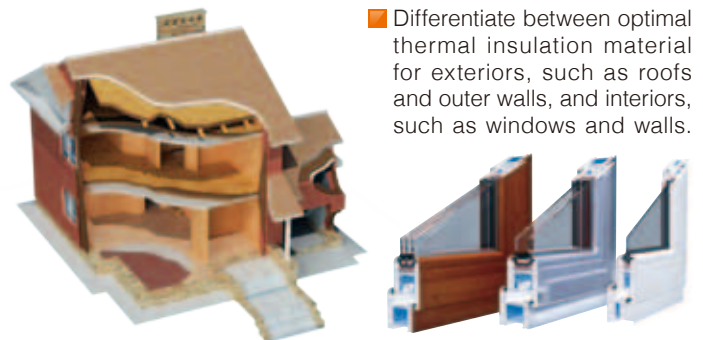
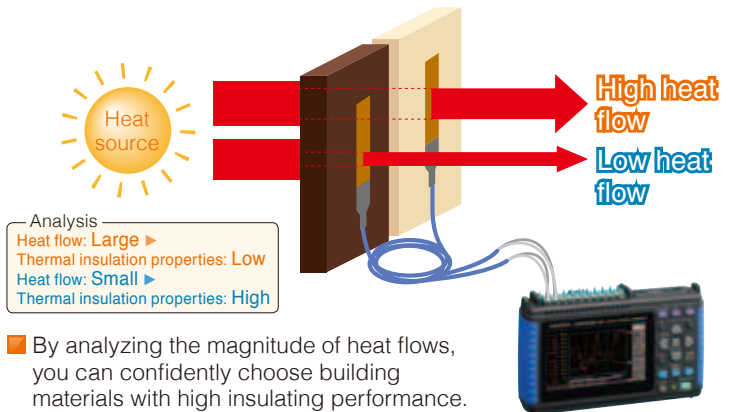
New approach that adds heat flow measurement (thermocouple + heat flow sensor)

By measuring temperature and heat flow it can be determined whether the cause of the temperature rise is exothermic or endothermic. As an example, suppose that targets A and B, which are characterized by rising temperatures, are measured.



Evaluate the thermal performance of building materials

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



What heat flow measurement makes possible

Measure the energy efficiency of consumer electronics

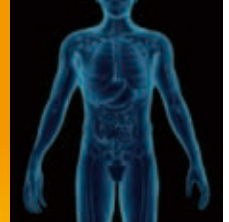


Measure multiple areas where heat is generated in order to combat heat sources in a variety of consumer electronics.



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

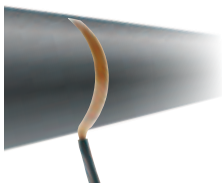


Use radiation sensors and solar radiation meters to measure the effects of heat from the ground and from the sun, which cannot be measured with thermography.

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.

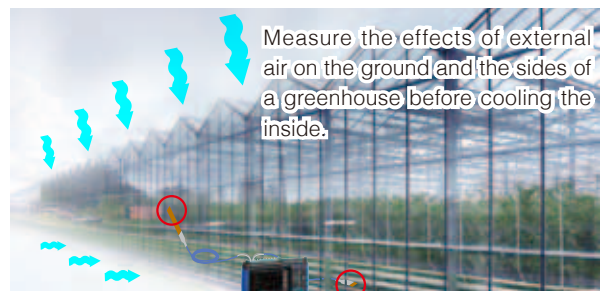


Sensor bends flexibly to measure rounded objects such as piping that could not be measured properly before

Index temperature fluctuation in agriculture and civil engineering



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



Measure the effects of external air on the ground and the sides of a greenhouse before cooling the inside.



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

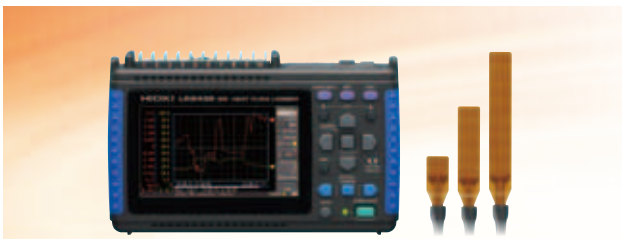
Compact and easy to carry in the palm of your hand
 Dimensions: 176 mm (6.93 in) W x 101 mm (3.98 in) H
 x 41 mm (1.61 in) D
 Mass: 550 g (19.4 oz)

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

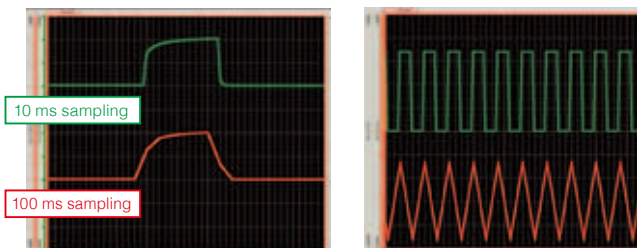


● Change USB drive while recording
 In addition, extract data at any point while continuing to take measurements.

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.

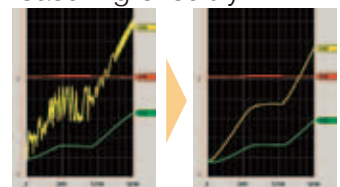


* Semiconductor relays are used for isolation between channels. If voltage that exceeds product specifications, such as a lightning surge, is applied between channels, the semiconductor relays might short circuit. Be sure to take proper precautions to prevent this from occurring.

Noise

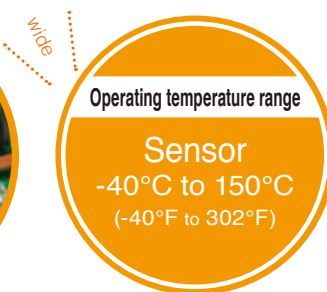
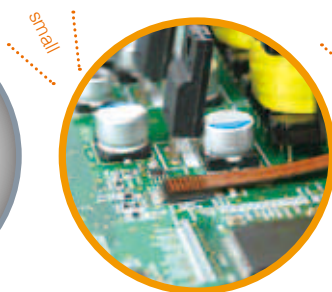
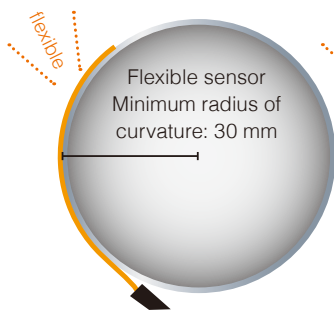
Noise-resistant measuring circuitry

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



Waterproof heat flow sensor that can measure curved surfaces

Sold separately



A heat flow sensor and thermocouple must be attached separately.



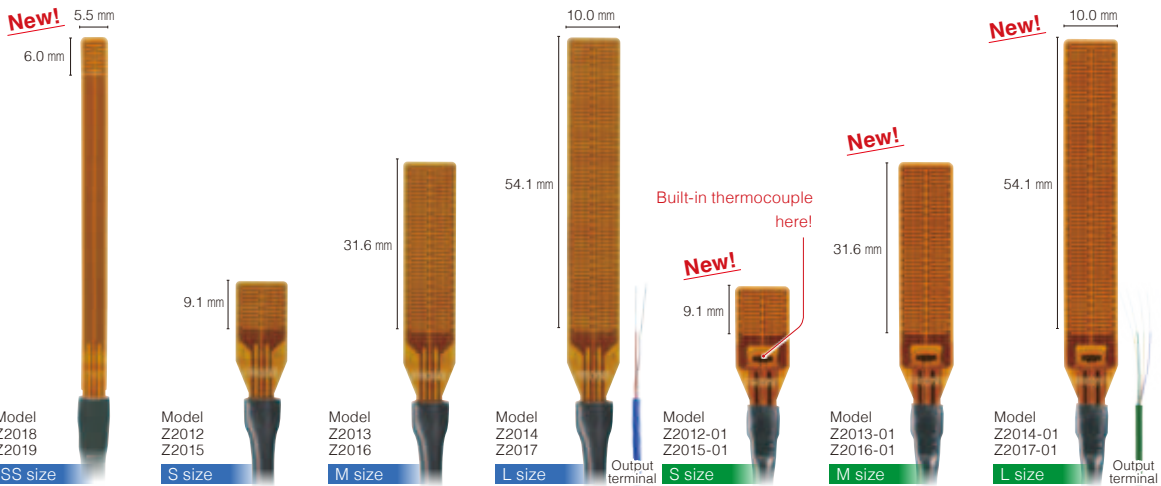
A built-in thermocouple makes attachment easy!

Standard model: Available in 4 sizes

Heat flow sensors measure the amount of heat energy flowing through the sensor. Small, thin, and flexible, they can be easily attached to electronic components or air ducts. And they're waterproof, so they can be used in agricultural applications and with food products.

Thermocouple-equipped model: Measure heat flow and temperature with a single sensor

These models add a K thermocouple to a heat flow sensor, providing a single sensor that can measure both temperature and heat flow. Installation is more efficient, too, since both devices can be installed in a single step.



Heat Flow Sensor Specifications

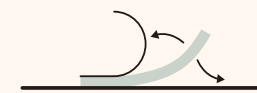
Model	Standard model						Thermocouple-equipped model							
	SS size		S size		M size	L size	S size		M size	L size				
Model No. (Order Code)	Z2018	Z2019	Z2012	Z2015	Z2013	Z2016	Z2014	Z2017	Z2012-01	Z2015-01	Z2013-01	Z2016-01	Z2014-01	Z2017-01
Cable length	1.5 m (4.92 ft)	5 m (16.41 ft)	1.5 m	5 m	1.5 m	5 m	1.5 m	5 m	1.5 m	5 m	1.5 m	5 m	1.5 m	5 m
Measured parameters	Heat flow						Heat flow and temperature (Class 2, K thermocouple)							
Sensor dimensions	W	5.5 mm (0.22 in)	10.0 mm (0.39 in)				10.0 mm (0.39 in)							
	L	6.0 mm (0.24 in)	9.1 mm (0.36 in)	31.6 mm (1.24 in)	54.1 mm (2.13 in)	9.1 mm (0.36 in)	31.6 mm (1.24 in)	54.1 mm (2.13 in)	9.1 mm (0.36 in)	31.6 mm (1.24 in)	54.1 mm (2.13 in)			
	T	0.25 mm (0.01 in)	0.28 mm (0.01 in)				0.25 mm (0.01 in)							
Representative sensitivity	0.003 mV/W·m ²		0.013 mV/W·m ²		0.049 mV/W·m ²		0.089 mV/W·m ²		0.01 mV/W·m ²		0.04 mV/W·m ²		0.08 mV/W·m ²	
Operating temperature range	Sensor: -40°C to 150°C (-40.0 °F to 302.0 °F) Cable: -40°C to 120°C (-40.0 °F to 248.0 °F)						Sensor: -40°C to 150°C (-40.0 °F to 302.0 °F) Cable: -25°C to 120°C (-13.0 °F to 248.0 °F)							
Internal resistance (including cable)	3 Ω to 500 Ω		3 Ω to 500 Ω		3 Ω to 1000 Ω		3 Ω to 1500 Ω		3 Ω to 500 Ω		3 Ω to 1000 Ω		3 Ω to 1500 Ω	
Thermal resistance	1.3 × 10 ⁻³ (m ² · K/W)		1.4 × 10 ⁻³ (m ² · K/W)						1.3 × 10 ⁻³ (m ² · K/W)					
Waterproof performance	IP06, IP07 (EN60529)													
Minimum radius of curvature	30 mm (1.18 in)													
Resistance to compressive stress	4 MPa													
Repeatability	±2%													

How to attach sensor

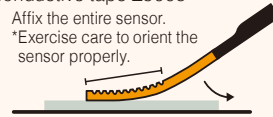


Cut the thermally conductive double-sided tape to the necessary size and peel off the protective film on one side.

Optional equipment used: Thermally conductive tape Z5008

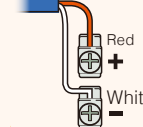


Apply the thermally conductive double-sided tape to the measurement target and peel off the film on the opposite side.



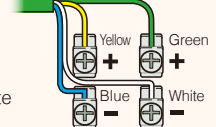
Affix the back of the sensor (the side with the flat surface) so that all of it is in contact with the thermally conductive double-sided tape.

Standard model



Heat flow

Thermocouple-equipped model



Heat flow

Temperature

Connect the sensor's output terminals to a data logger.

The sensor generates a positive output voltage when heat flows from its back to its front.

Logger Utility for flexible measurement and analysis

Accessory



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

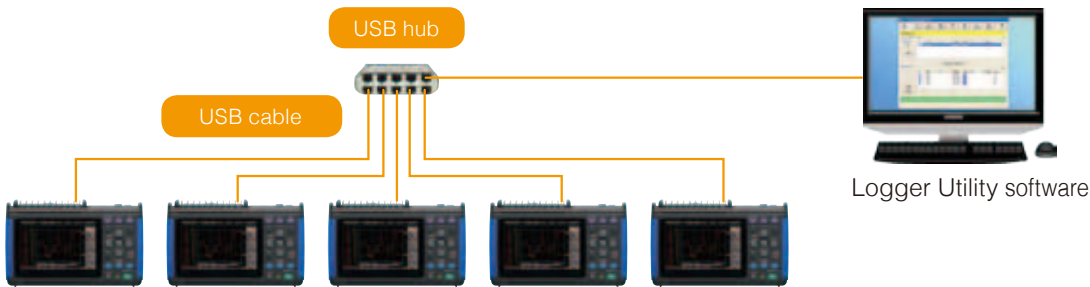
Easily navigate through logger settings

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

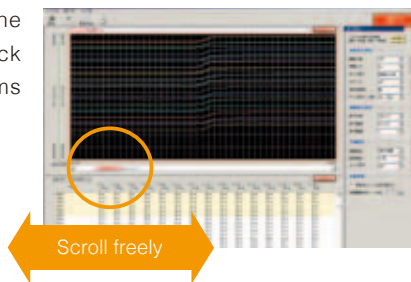
View graphs for up to 50 analog input channels and up to 20 pulse input channels in a single window at the same time.



Check

Display past data while measuring

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

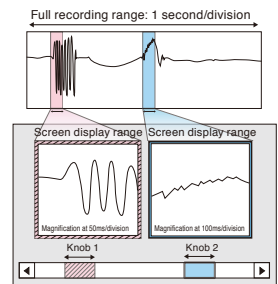


Patented

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.



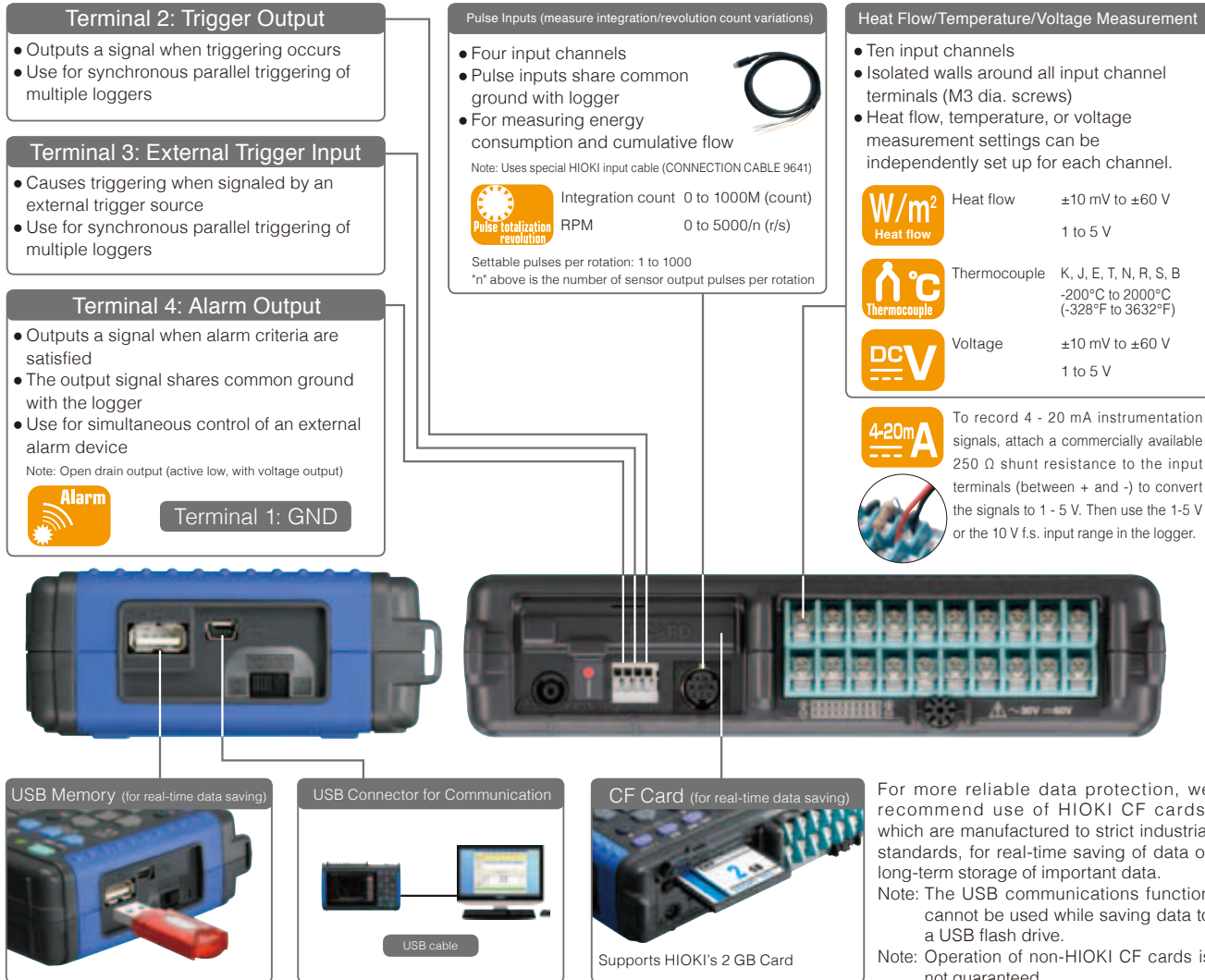
Logger Utility (bundled software) Specifications

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



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 intervals	Recording All Channels (ten analog, four pulse and one alarm) Note: No waveform processing			
	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 (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, CD-R (Instruction manual PDF, Logger Utility Instruction Manual PDF, Data acquisition application program Logger Utility) ×1, USB cable ×1, AC Adapter Z1005 ×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) (E) -200°C to 1000°C (-328°F to 1832°F) (N) -200°C to 1300°C (-328°F to 2372°F) (S) 0°C to 1700°C (32°F to 3092°F)	(J) -200°C to 1200°C (-328°F to 2192°F) (T) -200°C to 400°C (-328°F to 752°F) (R) 0°C to 1700°C (32°F to 3092°F) (B) 400°C to 1800°C (752°F to 3272°F)
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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 placement), ±1°C (1.8°F) (upright placement) 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).
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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



USB_{2.0}

CE

3 Year Guarantee

Model : HEAT FLOW LOGGER LR8432

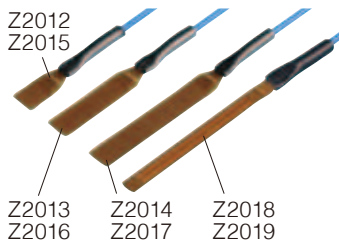
Model No. (Order Code) (Note)
LR8432-20 (10 ch, English model)

Accessories: Measurement Guide ×1, CD-R (Instruction manual PDF, Logger Utility Instruction Manual PDF, Data acquisition application program Logger Utility) ×1, USB cable ×1, AC Adapter Z1005 ×1



Configuration of Various Options

Heat flow measurement options



Heat Flow Sensor (Standard model)

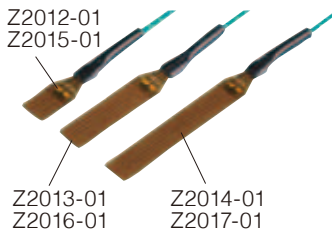
Waterproof characteristics: IP06, IP07. Measurement of small parts and curved surfaces of piping

Cord length: 1.5 m (4.92 ft)

Z2012, Z2013, Z2014, Z2018

Cord length: 5 m (16.40 ft)

Z2015, Z2016, Z2017, Z2019



Heat Flow Sensor (Thermocouple-equipped model)

These models add a K thermocouple to a heat flow sensor, providing a single sensor that can measure both temperature and heat flow.

Cord length: 1.5 m (4.92 ft)

Z2012-01, Z2013-01, Z2014-01

Cord length: 5 m (16.40 ft)

Z2015-01, Z2016-01, Z2017-01

Adhesive tape for accurate measurements



THERMALLY CONDUCTIVE TAPE Z5008

size : 15 mm (0.59 in) W x 70 mm (2.76 in) H

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 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)

Case



SOFT CASE 9812
 For storing small accessories; Neoprene rubber



CARRYING CASE 9782
 For storing optional accessories; resin exterior

Other

To prevent damage to the logger's display

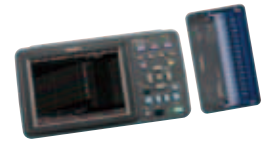


PROTECTION SHEET 9809
 For LCD protection, pairs of additional sheets

Related product



MEMORY HiLOGGER LR8400-20
 (English model)



WIRELESS LOGGING STATION LR8410-20
 (English model)

Note: Company names and Product names appearing in this catalog are trademarks or registered trademarks of various companies.

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