Heat flux Data Logger Selection Guide Owner's Manual

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Introduction

Hukseflux offers a wide range of sensors for heat flux and temperature measurement. The thermopile heat flux sensor and thermocouple temperature sensor are both passive sensors; they do not require power. Such sensors can be connected directly to data loggers and amplifiers. The heat flux in W/m2 is calculated by dividing the heat flux sensor's output, a small voltage, by its sensitivity. The sensitivity is provided with the sensor on its certificate and can be programmed into the data logger

Optimise system design / reduce cost

The following text helps you to select the right electronics for your application. Selecting the right electronics – sensor combination helps reducing total system costs.

Figure 1 FHF05-50X50 foil heat flux sensor with thermal spreaders: thin, flexible and versatile.

Figure 1

Step 1

Visit the Hukseflux **YouTube** channel:

- **quick intro to heat flux** (3 min);
- **online course** (40 min);
- **separating radiation and convection** (2 min);
- **latest heat flux technology** (2 min).

Figure 2 Hioki LR8450: can handle up to 120 heat flux sensors each with its own temperature measurement and display the measurement results simultaneously on screen.

Figure 2

Step 2

Specify your measurement:

- describe the purpose of the experiment;
- estimate the heat flux levels in W/m2;
- estimate the temperature levels in °C;
- select a suitable sensor: most common examples are in Table 1.

Step 3

Estimate the output range of the heat flux sensor in [x 10-6 V] using Table 1:

Microvolt output range = heat flux range in [W/m2] x sensitivity in [x 10-6 V/(W/m2)].
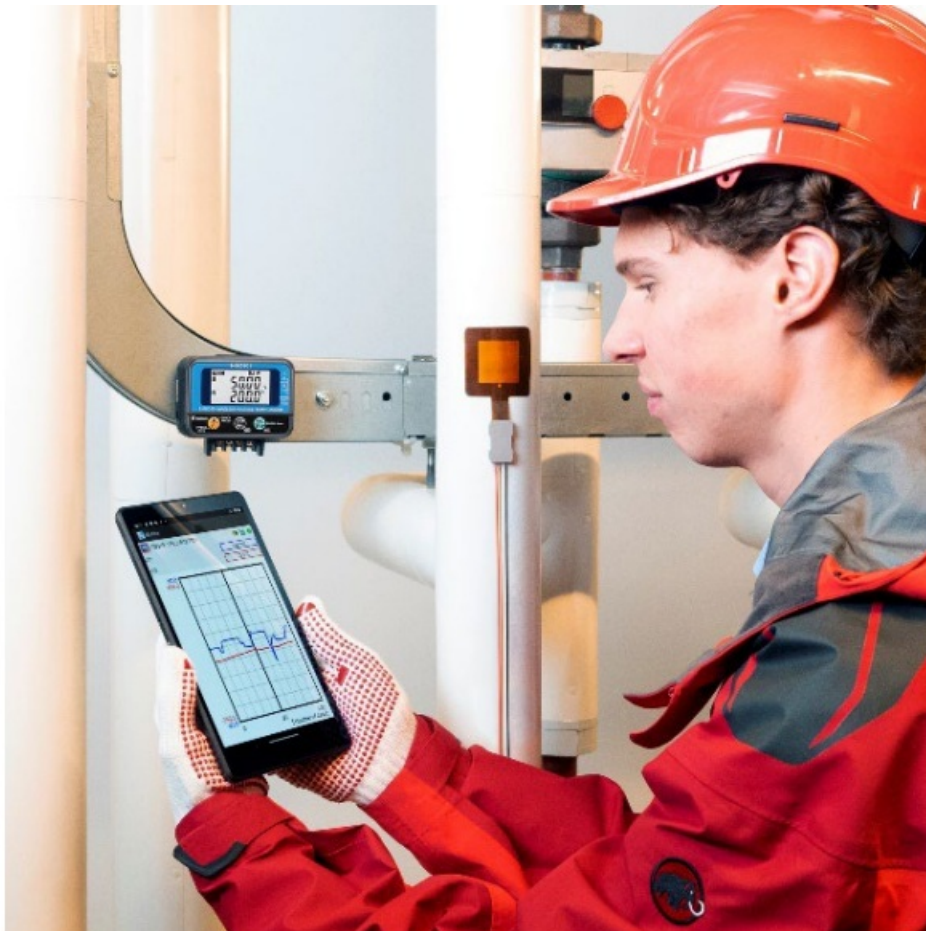
Step 4

Specify your electronics and sensors:

- look up the brand and model of data logger you have or want to use;
- estimate the number of heat flux – and temperature channels you need.

Step 5

Ask Hukseflux:

- send all information and specifications to Hukseflux, and ask for our input / suggestions.
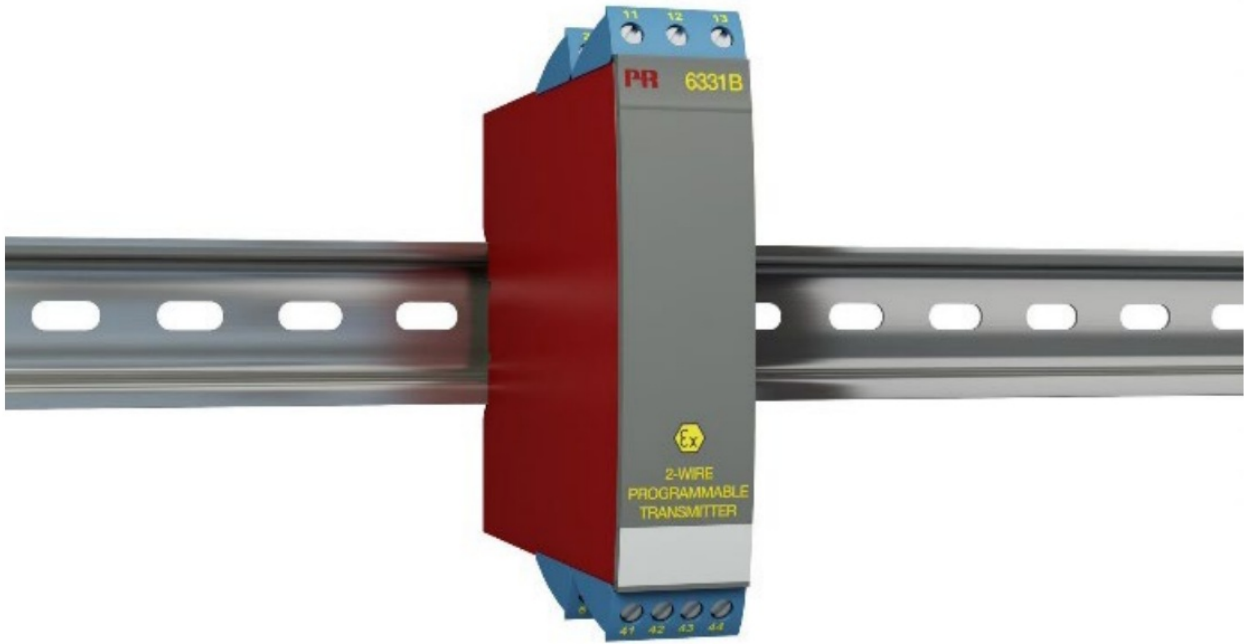

Figure 3

Figure 3 Hioki LR8515 can transmit measurements of 1 sensor and 1 thermocouple via Bluetooth.

Heat flux sensors and the Hioki loggers

Working with sensors and the logger is convenient. See the application notes for the Hioki **LR8432**, **LR8515** and **LR8450**. See the user manual for suggested solutions. See also our application note **how to install am heat flux sensor**. Read more about **Hioki data logger LR8450 and FHF05 series in Battery EV Thermal Management** .

Figure 4 PR electronics PR6331B programmable transmitter, can be mounted vertically or horizontally on a DIN rail
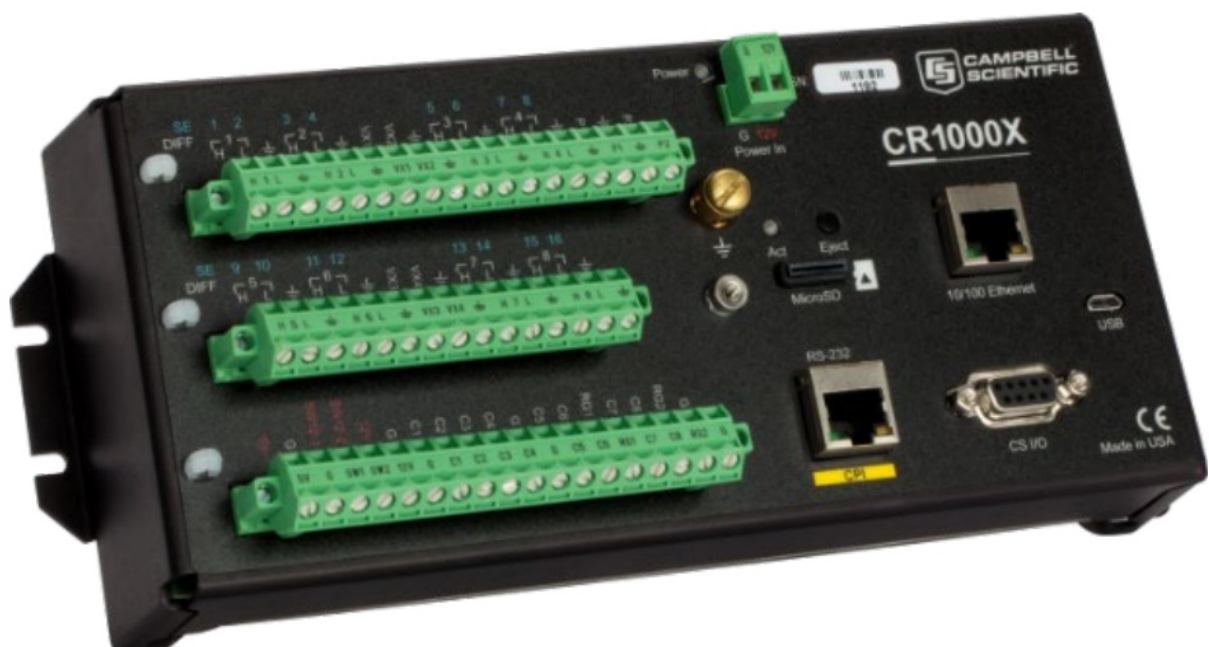
Figure 4

Suggested use

Heat flux + temperature sensors and loggers are used to analyse the causes of temperature change. Also, they are used to validate mathematical CFD simulations.

Figure 5

Figure 5 Campbell CR1000X: 8 differential sensor inputs, heat flux and thermocouples, Micro USB B connection, ethernet, MicroSD data storage expansion.

Figure 6

Figure 6 dataTaker: up to 15 sensor inputs, heat flux and thermocouples, USB memory for easy data and program transfers.

About Hukseflux

Hukseflux is the leading expert in measurement of energy transfer. We design and manufacture sensors and measuring systems that support the energy transition. We are market leaders in solar radiation- and heat flux measurement. Customers are served through the main office in the Netherlands, and locally owned representations in the USA, Brazil, India, China, Southeast Asia and Japan.

Interested in our products?
E-mail us at: **info@hukseflux.com**

Table 1 Examples of different Hukseflux heat flux sensors, their application, sensitivity, temperature sensors and rated operating ranges for temperature and heat flux. This table shows a summary only and does not show all sensor models, options and specifications. Contact Hukseflux for a final check of your proposed solution.

SENSOR	APPLICATION	RATED T RANGE	THERMOCOUPLE	SENSITIVITY HEAT FLUX	RATED HF RANGE**	OPTIONAL RADIATIVE/ CONVECTIVE
[model]	[description]	[°C]	[type]	[x 10–6 V/(W/m2)]	[± W/m2]	[y/n]

[FHF05-10X10](#)	high power microchips, flexible	-40 to +150	T	1	10 000	Y (stickers)
[FHF05-15X30](#)	high heat flux in ovens, flexible	-40 to +150	T	3	10 000	Y (stickers)
[FHF05-50X50](#)	general purpose heat flux, battery thermal management, flexible	-40 to +150	T	13	10 000	Y (stickers)
[FHF05-15X85](#)	vrapped around a pipe, flexible	-40 to +150	T	7	10 000	Y (stickers)
[FHF05-85X85](#)	low fluxes, insulation performance testing, low accuracy datalogger and amplifiers, flexible	-40 to +150	T	50	10 000	Y (stickers)
[FHF06-25X50](#)	heat flux in high temperature environments	-70 to +250	T	5	20 000	Y (coating)
[IHF01](#)	high temperature / high heat flux, industrial	-30 to 900	K	0.009	1 000 000	Y (coating)
[IHF02](#)	high temperature / low heat flux, industrial	-30 to 900	K	0.25	100 000	Y (coating)
[HFP01](#)	very low heat fluxes, buildings, soil	-30 to +70	N/A	60	2 000	Y (stickers)
[HFP03](#)	extremely low heat fluxes	-30 to +70	N/A	500	2 000	N
[SBG01-20](#)	low level fire and flame	water-cooled*	N/A	0.30	20 000	N
[SBG01-100](#)	fire and flame	water-cooled*	N/A	0.15	100 000	N
[GG01-250](#)	high intensity flame	water-cooled*	K	0.024	250 000	Y (sapphire window)
[GG01-1000](#)	concentrated solar, plasma, rockets, hypersonic wind	water-cooled*	K	0.008	1 000 000	N

Table 2 Examples of different electronics compatible with Hukseflux heat flux sensors. This brochure shows a summary only and does not show all relevant electronics specifications. Contact Hukseflux for a final check of

your proposed solution.

BRAND	MODEL	OUTPUT	INPUT	PRICE LEVEL	VOLTAGE MEASUREMENT ACCURACY*	COMMENTS
[name]	[model name]	[signal / protocol]	[# of channels, type]	[approximate EUR/ unit]	[x 10–6 V]	[comments]
Campbell Scientific	**CR1000X**	Ethernet Modbus stored data via USB	8 (HF + T)	2500	0.2	Optional outdoor and battery powered use. Specs valid from – 40 to + 70 °C. Channel extension with multiplexer
Keysight	**DAQ970A** + multiplexer	Digital to PC, USB, LAN or GPIB	14 (HF + T)	2000	0.1	Laboratory use, channel extension with multiplexer
Hioki	**LR8515**	Bluetooth to PC	2 (1 x HF, 1 x T)	500	10	2 channel standalone use battery powered
Hioki	**LR8432**	LCD screen, memory card	10 (HF + T)	1200	0.1	Laboratory use, immediate display
Hioki	**LR8450** **LR8450**-1	LCD screen, memory card	120 (HF + T)	2100, main unit	0.1	Modular logger, extension possible with various units (version -01 with wireless LAN)
PR Electronics	**5331A** transmitter	4-20 mA	1 (HF or T)	200	10	1 channel, programmable, industrial use, also ATEX
PR Electronics	**6331B** transmitter	2 x (4-20 mA)	2 (HF or T)	500	10	2 channel, programmable, industrial use, also ATEX
data Taker	**DT80**	Ethernet Modbus	5 (HF or T)	2000	0.2	Industrial use, channel extension with multiplexer
National Instruments	PXI series **4065**, **4070**	USB version available	1 (HF or T)	1500	10	Eurocard model, LabVIEW compatible
Fluke	**287**	LCD screen, memory card, USB and bluetooth **	1 (HF)	1000	12	Can handle type K thermocouple, not type T from FHF, optional Infra-Red temperature sensor

* For comparing purpose only. Calculation is a rough approximation order of magnitude.
** accessories required.

CUSTOMER SUPPORT

Documents / Resources

	Heat flux Data Logger Selection Guide [pdf] Owner's Manual Data Logger Selection Guide

References

- **{ Hukseflux | #1 in solar radiation & heat flux measurement**