Test report Hioki LR8432

Hioki heat flow logger LR8432 used with Hukseflux heat flux + temperature sensors

The Hioki heat flow logger is easy and convenient in use. It can measure up to 10 channels and display the data of heat flux, voltage and temperature simultaneously. Our test shows that the latest FHF sensors have excellent compatibility with the Hioki LR8432 datalogger. FHF sensors are very versatile: integrated temperature sensor, thermal spreaders to reduce thermal conductivity dependence, applicable over a temperature range from –70 to +120 °C. The combined measurement of heat flux and temperature offers you a full picture of the thermal behaviour of a system.

Figure 1 *FHF's with BLK and GLD sticker used with Hioki LR8432.*

Figure 2 *Hioki LR8432 can handle 5 heat flux sensors each with its own temperature measurement and display the results simultaneously on screen.*

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.

Conclusion of testing

A total of 5 FHF sensors such as FHF05 series can be connected directly to the Hioki LR8432. The heat flux in W/m^2 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 directly into the datalogger.

Specifications

Table 1 shows a summary of the most important specifications of the Hioki LR8432 when used with Hukseflux FHF05 series. Contact Hukseflux for a final check of your proposed solution.

Table 1 *Most important specifications of Hioki LR8432 used with a Hukseflux FHF05 series.*

	LR8432
no. of input channels	10
temperature	y
heat flux	y
voltage measurement accuracy	0.1 x 10^{-6} V
estimated heat flux resolution with FHF05	0.01 W/m²
temperature measurement accuracy	± 0.8 °C
wireless / bluetooth	n
battery powered use	y

Hukseflux
Thermal Sensors

Getting started

The following text helps you to install the sensors to the datalogger and getting along. For more information see the sensor manual on our website or the Hioki user brochure. Visit also the Hukseflux YouTube channel for a quick introduction to heat flux or learn more about separation of radiation and convection.

Before use

- charge the internal battery pack for 2.5 hours continuous use or use the AC adapter.

Step 1

Suggested wire connection of FHF05 series:

- Ch 1 +: red (heat flux +)
- Ch 1 -: black (heat flux -)
- Ch 2 +: thermocouple (type T +)
- Ch 2 -: thermocouple (type T -)

The channels 5 to 10 can be used for four (4) additional FHF sensors.

Step 2

Specify your measurement:

- describe the purpose of the experiment;
- estimate the output range of heat flux sensor in [$\times 10^{-6}$ V] and program it into the logger;
- for Ch 1 choose as input 'heat' and enter sensitivity of heat flux sensor;
- for Ch 2 select as input 'Tc' and then Type T for temperature measurements;
- repeat previous steps in case more sensors are used.

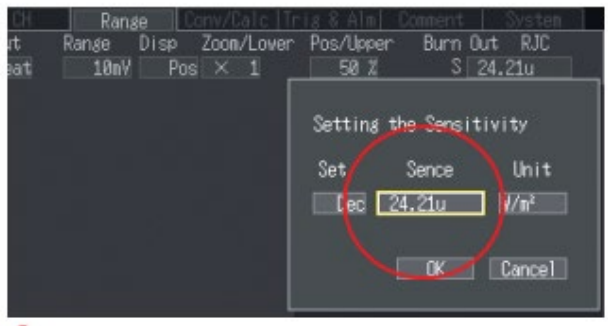
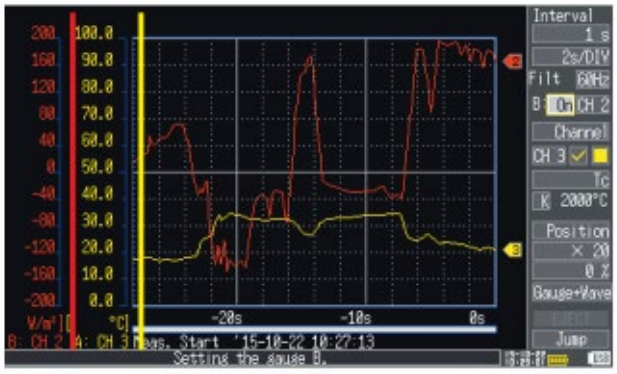


Figure 3 *Avoid troublesome calculations by simply entering the sensitivity of the heat flux sensor in the logger.*

Step 3

Start your measurement:

- press the start button;
- heat flow and temperature are displayed simultaneously on the same screen;
- optimise using display settings.



Heat flow (W/m²) Temperature (°C)

Figure 4 *Heat flow and temperature can be displayed simultaneously in the same graph.*

Step 4

Store data:

- USB flash drive
- USB connection to computer
- CF Card

Suggested use

Heat flux + temperature sensors and loggers are used to analyse the cause of temperature change. The five models of FHF05 series are sensors for general-purpose heat flux measurements, often applied as part of a larger test- or measuring system. Also, they are used to validate mathematical CFD simulations. Read more about Hioki data logger LR8450 and FHF05 series in Battery EV Thermal management.

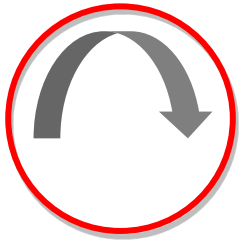
About Hukseflux

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 this product?
E-mail us at: info@hukseflux.com

FHF05 series outperforms competing models: how?

FHF05 series are Hukseflux' standard models for thin, flexible and versatile heat flux sensors.

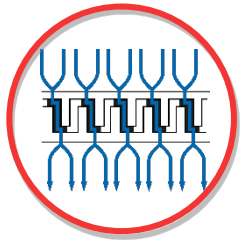


Flexible
FHF05 series is extremely flexible and may be bent to a radius of 7.5 mm.

Large area
Larger is better: FHF05-85X85's sensitive area of 70 x 70 mm offers good averaging, leading to increased sensitivity. FHF05 series have a thermal guard around the sensitive area. The guard can also be used for mounting the sensor without disturbing the sensitive area.

Sensitive area with thermal spreaders reducing thermal conductivity dependence

Sensitivity independent of environment: Thermal spreader included
Unlike many competing sensors, FHF series sensors have thermal spreaders, i.e. conductive layers covering the sensor. These layers help reduce the thermal conductivity dependence of the measurement. By employing spreaders, the sensitivity of FHF series becomes independent of its environment.



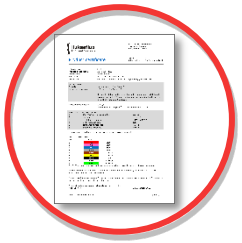
Corrosion-proof plastic cover protecting the thermal spreader

BLK and GLD stickers series matching FHF05 series to measure radiative and convective heat flux separately

Thermocouple type T included

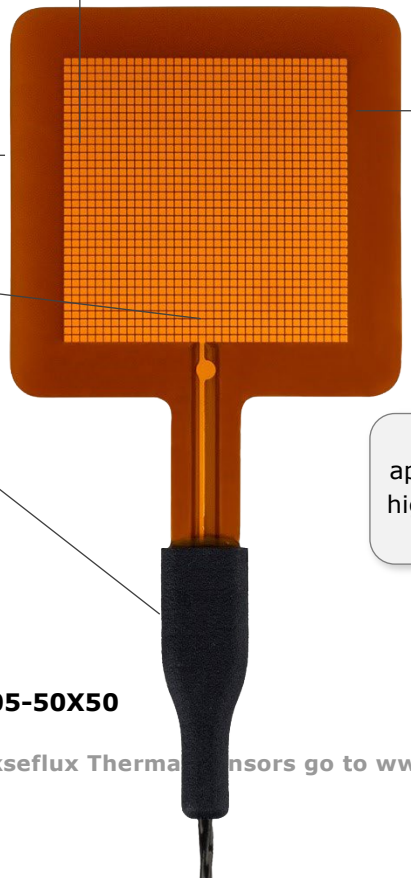
Durable waterproof wires with potted connection block, may be used as strain relief, temperature resistant up to 120 °C

Best paperwork
Hukseflux has the paperwork covered; all FHF05 series sensors are provided with formally traceable calibration certificates. We calibrate in accordance with ASTM. C1130 - 21.



5 sizes, covering most heat flux applications. Larger dimensions mean a higher sensitivity and a larger area over which the heat flux is averaged

Stable: waterproof (IP67), corrosion-proof
FHF05 series sensor connection is potted, and waterproof. Its protection class is IP67. Competing sensors often have wire connections with open contact to the environment. This is a large potential source of damage, as well as a starting point for measurement errors, corrosion, and sensor instability.



FHF05-50X50