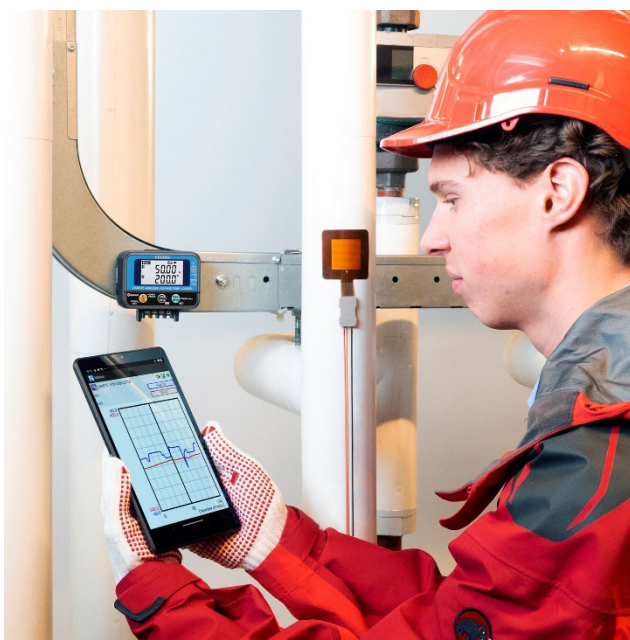


# Test report Hioki LR8515

Hioki datalogger LR8515 used with Hukseflux heat flux + temperature sensors

*This note explains how to use Hukseflux FHF heat flux sensors with a Hioki LR8515 datalogger. The FHF sensors have excellent compatibility with Hioki loggers. FHF sensors are 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. Hioki heat flow loggers are high-speed, easy to use and compact. Often heat flux sensors are combined with thermocouples. The Hioki datalogger is easy to use. Hioki LR8515 transmits data of one sensor wireless via Bluetooth.*



**Figure 1** Using Hioki LR8515 with Hukseflux FHF sensors is easy.



temperature  
+ heat flux  
(in millivolts)

**Figure 2** Hioki LR8515 can transmit measurements of 1 sensor via Bluetooth.

## 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

The five models of FHF05 series can be connected directly to the Hioki LR8515. The heat flux in W/m<sup>2</sup> 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.

## Specifications

Table 1 shows a summary of the most important specifications of the Hioki LR8515 used with Hukseflux FHF05 series. Contact Hukseflux for a final check of your proposed solution.

**Table 1** Most important specifications of Hioki LR8515 used with Hukseflux FHF05 series.

	LR8515
no. of input channels	2
voltage	y (heat flux calculated in post-processing)
temperature	y
voltage measurement accuracy	10 x 10 <sup>-6</sup> V
estimated heat flux resolution with FHF05 series	1 W/m <sup>2</sup>
temperature measurement accuracy	± 0.8 °C
wireless / Bluetooth	y
battery powered use	y

## Getting started

The following text describes how to instal the sensors on the datalogger. 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

- use AA/LR6 Alkaline battery 2 x for wireless use
- install [Logger Utility and Wireless Logger Collector](#) software on Windows PC
- or install Hioki datalogger app on an Android device

## Step 1

Suggested wire connection of FHF05:

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

## 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 verify if it matches LR8515 capabilities

## Step 3

Program your logger:

- connect the logger via Bluetooth to the Logger Utility software or smartphone app
- set Ch 1 : voltage, 50 mV range
- set Ch 2 : temperature type T, RJC internal
- send the measurement conditions to the instrument

## Step 4

Start your measurement:

- press the start button for 2 sec
- data from the two channels is displayed on the screen; please note the heat flux is displayed in millivolts.
- by pressing 'data info' the min/max and average values can be found
- data can be downloaded via Bluetooth and analyzed by the Wireless Logger Collector
- calculate the heat fux by dividing voltage by the sensor sensitivity

## Power supply

- the logger has a supplied AC adapter
- the logger has an internal battery pack, which can last for 2.5 hours at continuous use
- memory capacity for each channel is 500 000 data points

## 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 LR8450-01 and FHF05 series in Battery EV Thermal Management](#).

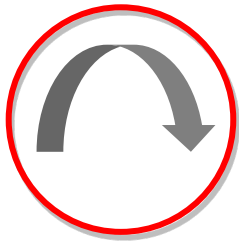
## About Hukseflux

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](mailto: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.

Corrosion-proof plastic cover protecting the thermal spreader

Thermocouple type T included

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



**Stable: waterproof (IP67), corrosion-proof**

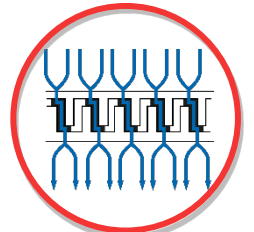
FHF05 series sensor connection is potted, and waterproof. Its protection class is IP67. Competing sensors often have wire connections with open contact to the environment. This is a large potential source of damage, as well as a starting point for measurement errors, corrosion, and sensor instability.

**FHF05-50X50**

Sensitive area with thermal spreaders reducing thermal conductivity dependence

**Sensitivity independent of environment because of thermal spreaders**

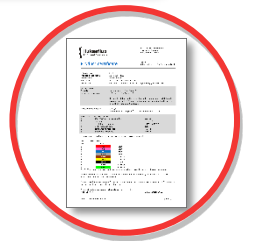
Unlike many competing sensors, FHF05 series sensors have thermal spreaders, i.e., conductive layers covering the sensor. These layers help reduce the thermal conductivity dependence of the measurement. By employing spreaders, the sensitivity of FHF05 series becomes independent of its environment.



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

**Best paperwork**

Hukseflux has the paperwork covered; all FHF series sensors are provided with formally traceable calibration certificates. We calibrate in accordance with ASTM.



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

