

FHF01

Foil heat flux sensor, flexible, 50 x 50 mm, with temperature sensor

FHF01 is a thin and flexible sensor for general-purpose heat flux measurement. FHF01 is very versatile: it has an integrated temperature sensor and a flexible sensor body fitting flat and curved surfaces. It is applicable over a temperature range from -40 to $+150$ °C. FHF01 measures heat flux from conduction, radiation and convection. It is often applied as part of a larger test- or measuring system.

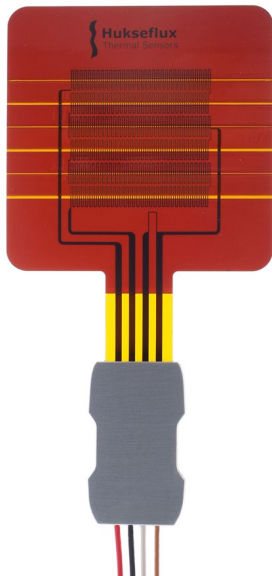


Figure 1 FHF01 heat flux sensor: thin, flexible, versatile



Figure 2 FHF01 being installed on a tube

Introduction

FHF01 is a sensor for general-purpose heat flux measurement. It is thin, flexible and versatile. FHF01 measures heat flux through the object in which it is incorporated or on which it is mounted, in W/m^2 . The sensor in FHF01 is a thermopile. This thermopile measures the temperature difference across the flexible body of FHF01. A type T thermocouple is integrated as well. The thermopile and thermocouple are passive sensors; they do not require power.

Using FHF01 is easy. It can be connected directly to commonly used data logging systems. The heat flux in W/m^2 is calculated by dividing the FHF01 output, a small voltage, by the sensitivity. The sensitivity is provided with FHF01 on its product certificate.

Unique features and benefits

- flexible (bending radius $\geq 25 \times 10^{-3}$ m)
- low thermal resistance
- wide temperature range
- fast response time
- large guard area
- integrated type T thermocouple
- robustness, including wiring with strain relief block
- IP protection class: IP67 (essential for outdoor application)

Robust and stable

Equipped with wires with strain relief, protective covers on both sides and potted so that moisture does not penetrate the connection block, FHF01 has proven to be very robust and stable.

Calibration

FHF01 calibration is traceable to international standards. The factory calibration method follows the recommended practice of ASTM C1130 - 17.

Working with heat flux sensors

When used under conditions that differ from the calibration reference conditions, the FHF01 sensitivity to heat flux may be different than stated on its certificate. See the user manual for suggested solutions.

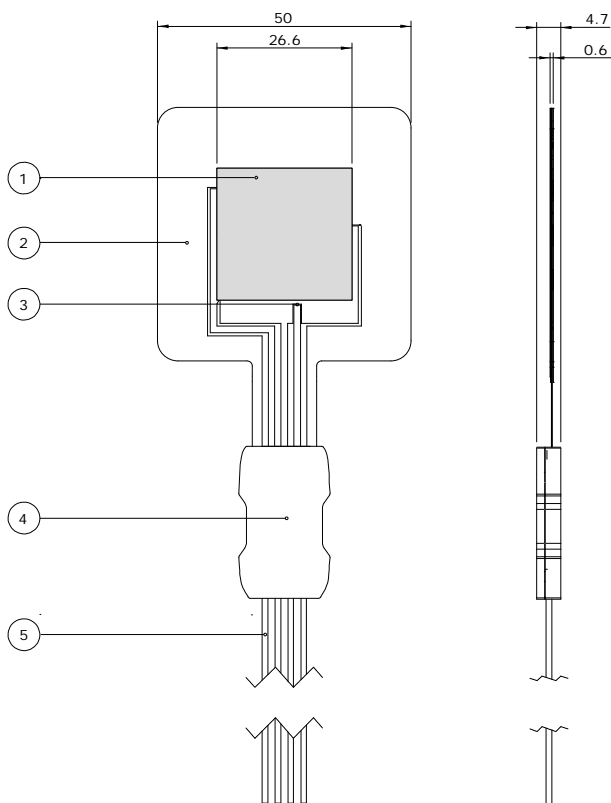


Figure 3 FHF01 heat flux sensor: (1) sensing area, (2) passive guard, (3) type T thermocouple, (4) strain relief block, (5) wires, standard length is 1.5 m. Dimensions in $\times 10^{-3}$ m



Figure 4 FHF01 fits flat and curved surfaces

FHF01 specifications

Measurand	heat flux
Measurand	temperature
Temperature sensor	type T thermocouple
Rated bending radius	$\geq 25 \times 10^{-3}$ m
Rated load on a single wire	≤ 1.6 kg
Sensing area	6.9×10^{-4} m ²
Sensor thermal resistance	24×10^{-4} K/(W/m ²)
Sensor resistance range	50 to 100 Ω
Sensor thickness	0.6×10^{-3} m
Uncertainty of calibration	$\pm 5\%$ (k = 2)
Measurement range	$(-10$ to $+10) \times 10^3$ W/m ²
Sensitivity (nominal)	4.5×10^{-6} V/(W/m ²)
Operating temperature range	-40 to +150 °C
IP protection class	IP67
Standard wire length	2 m
Options	longer wire length upon request

Options

- longer wire length
- **LI19** hand-held read-out unit / datalogger

See also

- **FHF02**, the standard model foil heat flux sensor
- model **HFP01** for increased sensitivity (also consider putting two or more FHF01's in series)
- view our complete **range of heat flux sensors**

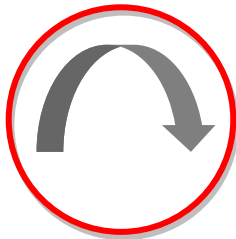
About Hukseflux

Hukseflux Thermal Sensors offers measurement solutions for the most challenging applications. We design and supply sensors as well as test & measuring systems, and offer related services such as engineering and consultancy. With our laboratory facilities, we provide testing services including material characterisation and calibration. Our main area of expertise is measurement of heat transfer and thermal quantities such as solar radiation, heat flux and thermal conductivity. Hukseflux is ISO 9001 certified. Hukseflux sensors, systems and services are offered worldwide via our office in Delft, the Netherlands and local distributors.

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

FHF01 outperforms competing models: how?

FHF01 is Hukseflux' most flexible heat flux sensor. Take a look at *FHF02* to see the standard model.



Most flexible

FHF01 may be bent to a radius of 25 mm.

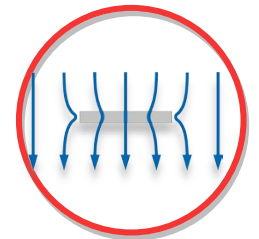
Large-area

Larger is better: sensitive area of 30 x 30 mm offers good averaging. FHF01 has a thermal guard around the sensitive area. The guard can also be used for mounting the sensor without disturbing the sensitive area.

Passive guard area, reducing deflection errors, also used for mounting

High accuracy: passive guard included

A passive guard, i.e. a non-sensitive part around the sensor is essential to avoid errors due to edge effects, FHF01 includes guard according to ISO 9869. Competing models often have sensitive parts running to the edge of the sensor, resulting in large potential measurement errors.



Corrosion-proof plastic cover protecting the thermal spreader

Durable: sturdy "student and installer-proof" connection

FHF01's cable-to-sensor connection is a specially designed metal connection piece. It withstands rough handling and repeated installation. Student- and installer-proof! Competing sensors often have wire connections on weak solder pads.

Thermocouple included

Best paperwork

Hukseflux has the paperwork covered; FHF01 is provided with formally traceable calibration certificates. We calibrate in accordance with ASTM C1130.



Stable: waterproof (IP67), corrosion-proof

FHF01's sensor connection is glued, 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.

Durable waterproof wires with strain relief, temperature resistant up to 150 °C

