

IHF01

Industrial heat flux sensor

IHF01 industrial heat flux sensor measures heat flux and temperature, typically in industrial high-temperature environments. IHF01 is waterproof, withstands high pressures and is extremely robust. With signal wires electrically insulated from the sensor body, it complies with industrial safety standards, such as CE and ATEX for explosive areas. IHF01 is particularly suitable for trend-monitoring and comparative testing. The same technology can be used to manufacture heat flux sensors for different applications.



Figure 1 IHF01 industrial heat flux sensor

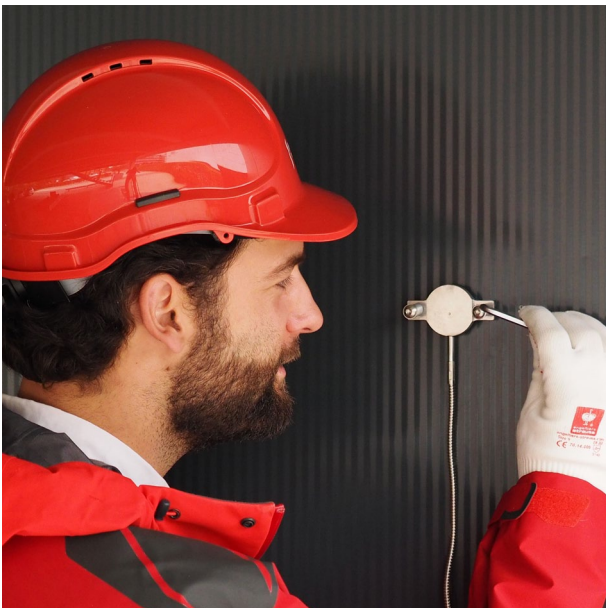


Figure 2 Example of an IHF01 industrial heat flux sensor mounted on a wall using tack-welded threads and spring-loaded bolts

Introduction

IHF01 measures heat flux and surface temperature of industrial equipment like furnaces, boilers, fluidised beds, distillation columns and ovens. The sensors inside IHF01, a thermopile and a thermocouple, are protected by a fully sealed stainless steel body. It is suitable for long-term use at one location as well as repeated installation when a measuring system is used at multiple locations. IHF01 measures heat flux through the object on which it is mounted, in W/m^2 , as well as the temperature in $^{\circ}C$. The sensors in IHF01 are a thermopile and a type K thermocouple. The thermopile measures the local heat flux.

The thermocouple measures the absolute temperature of the surface on which HF01 is mounted, as well as the approximate sensor body temperature. A thermopile and a thermocouple are passive sensors; they do not require power.

The part of the cabling closest to the sensor is a special high-temperature metal sheathed cable with an interlocked spiral stainless steel armour. The sensor as well as the high-temperature cable and armour withstand temperatures up to $900^{\circ}C$. The temperature range is reduced to $750^{\circ}C$ in case the optional black coating is used. The low-temperature extension cable has a jacket of PTFE type plastic.

Suggested use

trend-monitoring and comparative measurement of heat flux and surface temperature in industrial installations

IHF01 advantages

- robust
- suitable for use at high temperatures
- IP protection class: IP67
- signal wires electrically insulated from the sensor body

Operation

Using IHF01 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 IHF01 output, a small voltage, by the sensitivity. The sensitivity is provided with IHF01 on its product certificate. Equipped with heavy duty cabling, and having a fully stainless steel casing so that moisture does not penetrate the sensor, IHF01 has proven to be very reliable. It survives long-term outdoor installation.

Standards

IHF01 complies with the requirements of ASTM C1041-10 Standard Practice for In-Situ Measurements of Heat Flux in Industrial Thermal Insulation Using Heat Flux Transducers.

Options

- longer cable (specify total cable length for both cable types in m)
- EC type examination certificate (ATEX) II 2 G EEx d IIC T6
- black coating
- connector at IHF01 cable end
- low-temperature extension cable with 2 connectors, matching cable connector and chassis connector
- chassis connector with internal wiring (colour code of wiring identical to cable colour code)

IHF01 specifications

Measurand	heat flux
Measurand	temperature
Heat flux sensor	thermopile
Temperature sensor	thermocouple type K
Sensitivity (nominal)	$9 \times 10^{-9} V/(W/m^2)$
Calibration traceability	to SI units
Recommended number of sensors	2 per measurement location
Measurement range	$(-1000 \text{ to } +1000) \times 10^3 W/m^2$
Rated operating temperature ranges:	
sensor and high temperature cable	-30 to +900 °C
optional black coating	-30 to +750 °C
low temperature extension cable	-30 to +240 °C
IP protection class	IP67
Standard cable lengths:	
high-temperature cable	1 m (see options)
low-temperature extension cable	3 m (see options)
Order code	IHF01 - high temperature cable length in m - low temperature extension cable length in m

See also

- model [HF01](#) for a high temperature heat flux sensor with a high sensitivity
- model [HF05](#) for a heat flux sensor with a high sensitivity at a lower temperature range
- our complete [range of heat flux sensors](#)
- our [industrial heat flux sensors](#) (PDF)

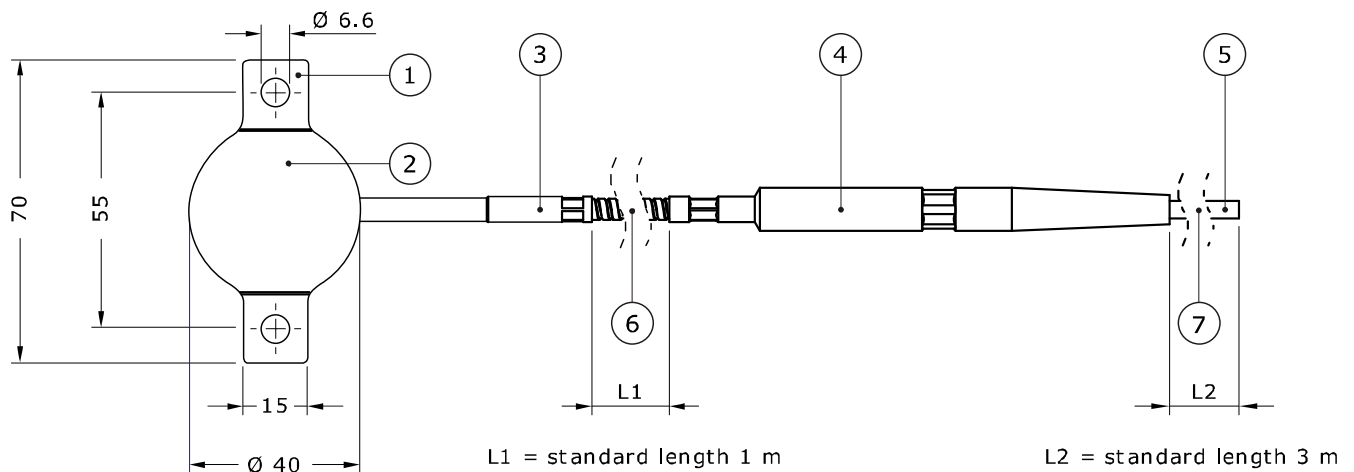


Figure 3 IHF01: the heat flux sensor consist of a stainless steel body (1) which is connected via a rigid stainless steel coupler (3) to a flexible high-temperature metal sheathed cable with interlocked spiral stainless steel armour (6). After a transition piece (4), wires are extended using a low-temperature extension cable (7). In the standard configuration, the cable ends in bare wires (5). Two mounting flanges (2) are attached to the body. Dimensions in $\times 10^{-3}$ m.

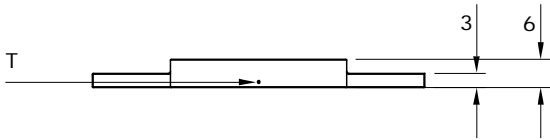


Figure 4 IHF01 dimensions in $\times 10^{-3}$ m. T marks the location of the thermocouple.

Trend monitoring and comparative measurement

IHF01 is most suitable for relative measurements, i.e. monitoring of trends relative to a certain reference point in time or comparing heat flux at one location to the heat flux at another location. If the user wants to perform accurate absolute measurements with IHF01, as opposed to relative measurements, the user must make his own uncertainty evaluation and correction for systematic errors.

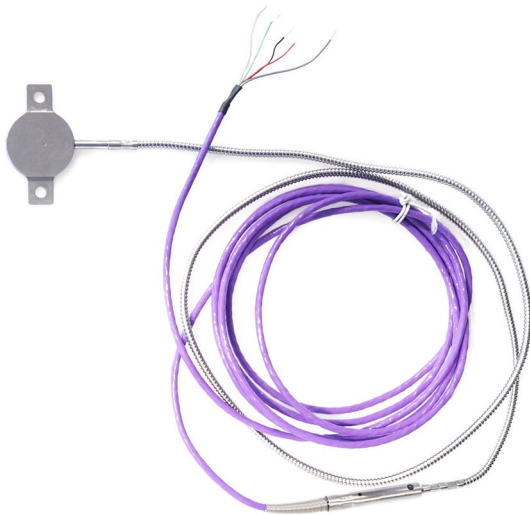


Figure 5 IHF01 as delivered in its standard configuration

Calibration

IHF01 calibration is traceable to international standards. The factory calibration method follows the recommended practice of ASTM C1130-07 (2012).

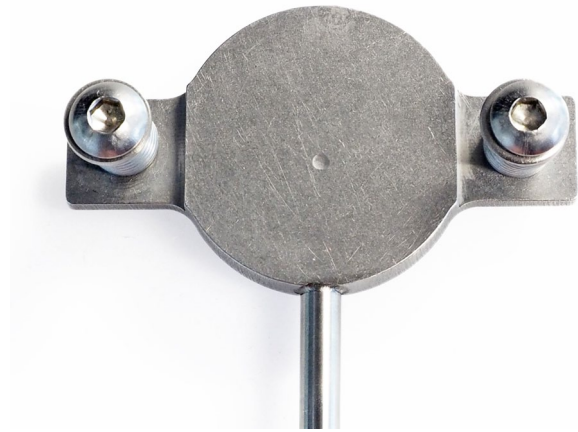


Figure 6 IHF01 with spring-loaded bolts for mounting on a well-prepared flat surface using tack-welded threads

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 9001:2015 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

IHF01 outperforms competing models: how?

The IHF industrial heat flux sensor product range is the best available for use in unfriendly environments and at high temperatures. This is why.



High temperature

The IHF range sensors may be used up to 900 °C.

Thermocouple included

Optional: Industry safety approvals

EC type examination certificate (ATEX)
II 2 G EEx d IIC T6 for use in explosive environments.



Practical mounting flanges

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

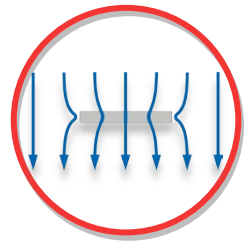


Durable: sturdy "installer-proof" connection

IHF01's cable to sensor connection is a specially designed high-temperature metal sheathed cable, with a strain relief by a hose. Installer-proof! Competing sensors often have weak and vulnerable wire connections. The connection from high temperature cable to low temperature extension cable is very sturdy and also has a strain relief with a spring.

High accuracy: passive guard included

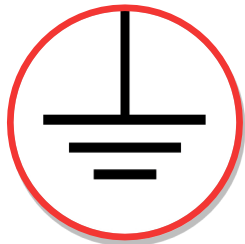
A passive guard, i.e. a non-sensitive part around the sensor, is essential to avoid errors due to edge effects. IHF01 includes guard according to ISO 9869. Competing models often have sensitive parts running to the edge of the sensor, resulting in large potential measurement errors.



Stable: waterproof (IP67), corrosion-proof, pressure resistant

IHF01s sensor to cabling connection is full metal, and waterproof, pressure resistant to 10 bar. The protection class is IP 67. 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 corrosion and sensor instability.

High temperature, withstands up to 900 °C
Housing completely sealed



Reliable and safe: electrically insulated signal wires

IHF01's signal wires are electrically insulated. This guarantees electrical immunity. Competing sensors often have wire connections with open contact to the environment. This is a large potential source of measurement error (zero offsets caused by ground loops) as well as potential safety issue.

Durable cable with strain relief, pressure and waterproof

Best paperwork

Hukseflux has the paperwork covered; IHF01 is provided with formally traceable calibration certificates. We calibrate in accordance with ASTM C1130.

