

# IHF02

## Ultra sensitive industrial heat flux sensor

*IHF02 ultra sensitive industrial heat flux sensor measures heat flux and temperature, typically in industrial high-temperature environments. The instrument is waterproof, withstands high pressures and is extremely robust. IHF02 is 25 times more sensitive than model IHF01, making it suitable for use at relatively low heat flux levels. It replaces model HF01 high temperature heat flux sensor. IHF02 complies with industrial safety standards, such as CE and ATEX for explosive areas, and is particularly suitable for trend-monitoring and comparative testing.*



**Figure 1** IHF02 ultra sensitive industrial heat flux sensor



**Figure 2** IHF02 industrial heat flux sensor mounted on an object using its easy-to-use optional magnet frame

### Introduction

IHF02 measures heat flux and surface temperature of industrial equipment like furnaces, boilers, fluidised beds, distillation columns and ovens. The sensors inside IHF02, a thermopile and a type K thermocouple, are protected by a fully sealed stainless steel body. It is suitable for long-term use at one location as well as surveys at multiple locations. IHF02 measures heat flux through the object on which it is mounted, in  $W/m^2$ , as well as the temperature in  $^{\circ}C$ . An optional magnet frame is offered for easy mounting on metal surfaces.

IHF02 is 25 times more sensitive than model IHF01, so that, with the same measurement accuracy of its output voltage, it can be used to measure much lower heat flux levels. When equipped with the optional magnet frame and optional black coating, IHF02 replaces model HF01 high temperature heat flux sensor.

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  $650^{\circ}C$  in case the optional black coating is used. The magnet frame can be used up to  $500^{\circ}C$ . The low-temperature extension cable has a jacket of PTFE type plastic.

### IHF02 advantages

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

### Suggested use

trend-monitoring and comparative measurement of heat flux and surface temperature in industrial installations, such as the shell of aluminium reduction cells.

## IHF02 operation

Using IHF02 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 IHF02 output, a small voltage, by the sensitivity. The sensitivity is provided with IHF02 on its product certificate. The temperature sensor is a conventional type K thermocouple. Equipped with heavy-duty cabling and a fully stainless steel casing, preventing moisture from penetrating the sensor, IHF02 has proven to be very reliable. It survives long-term outdoor installation.

## Standards

IHF02 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

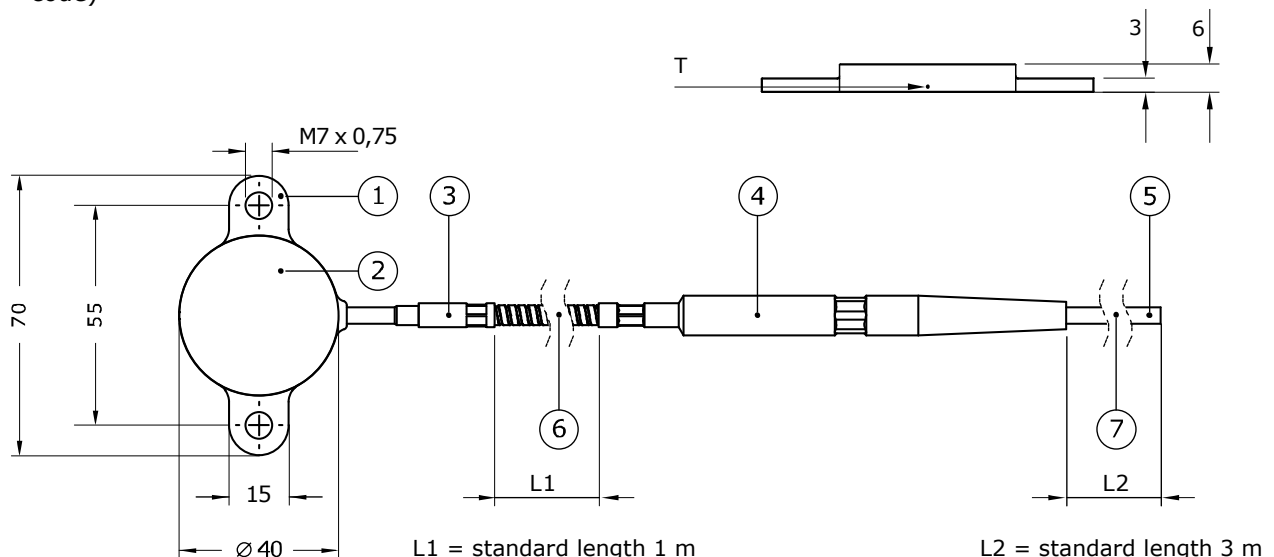
- magnet frame
- longer cable
- EC type examination certificate (ATEX) II 2 G EEx d IIC T6
- black coating
- connector at IHF02 cable end
- low-temperature extension cable with 2 connectors, matching cable connector and chassis connector
- chassis connector with internal wiring (colour code of wiring identical to cable colour code)

## IHF02 specifications

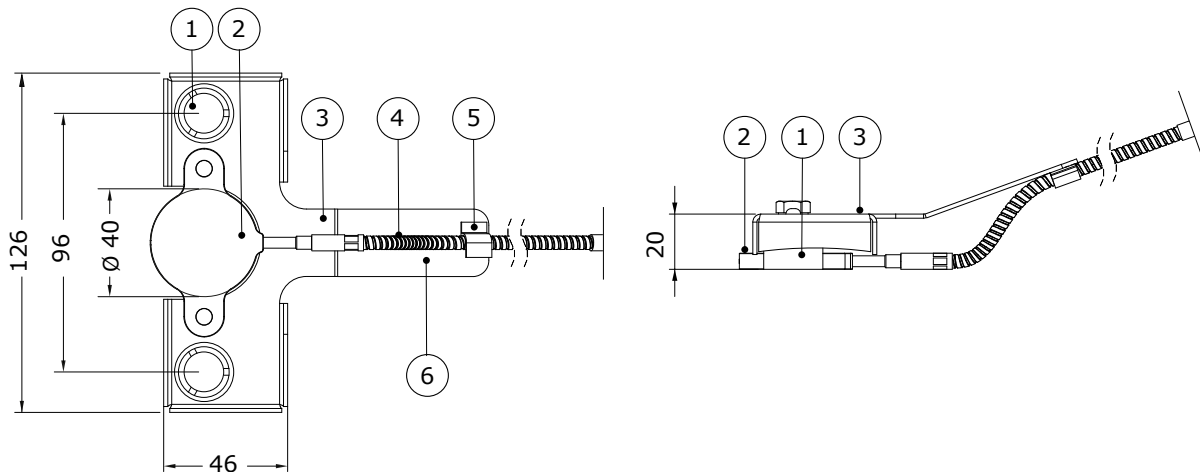
Measurand	heat flux
Measurand	temperature
Heat flux sensor	thermopile
Temperature sensor	thermocouple type K
Sensitivity (nominal)	$250 \times 10^{-9} V/(W/m^2)$
Calibration traceability	to SI units
Recommended number of sensors	2 per measurement location
Measurement range	$(-100 \text{ to } +100) \times 10^3 W/m^2$
Rated operating temperature ranges:	
sensor and high temperature cable	-30 to +900 °C
optional black coating	-30 to +650 °C
optional magnet frame	-30 to +500 °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	IHF02 - high temperature cable length in m - low temperature extension cable length in m

## See also

- model **IHF01** for an industrial heat flux sensor, less sensitive than IHF02, but more economic
- 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** IHF02: the heat flux sensor consists of a stainless steel body (2) 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 (1) are attached to the body. Dimensions in  $\times 10^{-3} m$ . T marks the location of the thermocouple.



**Figure 4** IHF02 with optional magnet frame. The magnet frame's two magnets (1), spring-loaded bolts and housing (3) ensure the IHF02 sensor (2) can be positioned easily and firmly on the object to be measured. The interlocked spiral stainless steel armoured high-temperature cable (4) is held in place by the cable strain relief (5). The handle (6) allows for easy manual removal of the instrument. Dimensions in  $\times 10^{-3}$  m.

### Trend monitoring and comparative measurement

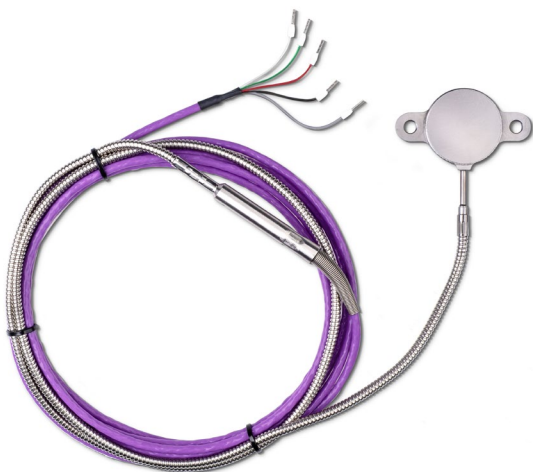
IHF02 is most suitable for relative measurements, i.e. monitoring of trends relative to a certain reference point in time or comparing heat flux at one location to the heat flux at another location. If the user wants to perform accurate absolute measurements with IHF02, as opposed to relative measurements, the user must make his own uncertainty evaluation and correction for systematic errors.

### Calibration

IHF02 calibration is traceable to international standards. The factory calibration method follows the recommended practice of ASTM C1130-17. IHF02 is calibrated at room temperature, mounted on a metal heat sink.



**Figure 6** IHF02 with its optional magnet frame for easy mounting on magnetic surfaces



**Figure 5** IHF02 as delivered in its standard configuration

### 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. 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](mailto:info@hukseflux.com)

# IHF02 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 and high sensitivity**  
Suitable for use at relatively low heat flux levels. The IHF range sensors may be used up to 900 °C.

Practical mounting flanges. The optional magnet frame makes mounting even easier

Thermocouple included

**Optional: Industry safety approvals**  
EC type examination certificate (ATEX) II 2 G EEx d IIC T6 for use in explosive environments.



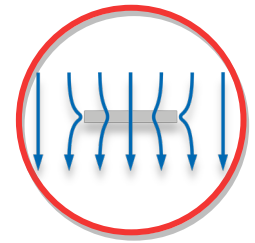
Passive guard area, with flanges reducing deflection errors, also used for mounting



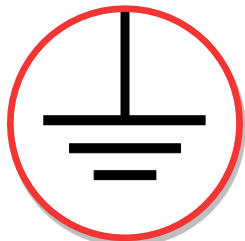
**Durable: sturdy "installer-proof" connection**  
IHF02's cable-to-sensor connection is a specially designed high-temperature metal sheathed cable, with strain relief. Installer-proof! Competing sensors often have weak and vulnerable wire connections. The connection from high-temperature cable to low-temperature extension cable is very sturdy and also has strain relief.

**Stable: waterproof (IP67), corrosion-proof, pressure resistant**  
IHF02's sensor-to-cable connection is full metal, waterproof and pressure resistant to 10 bar. The 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 corrosion and sensor instability.

**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. IHF02 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.



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



**Reliable and safe: electrically insulated signal wires**  
IHF02'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 a potential safety issue.

Durable cable with strain relief, pressure- and waterproof

**Best paperwork**  
Hukseflux has the paperwork covered; IHF02 is provided with formally traceable calibration certificates. We calibrate in accordance with ASTM C1130.

