

HFS01

High heat flux sensor for concentrated solar radiation and flames, water cooled

HFS01 is a water-cooled sensor that measures high-level radiative and convective heat fluxes. It is designed for studies of concentrated solar irradiance (800 x concentrated direct solar radiation) and high-intensity flames (gas burners, coal fires, etc.). HFS01 has a very robust all-metal / ceramics instrument body and sensor, and is equipped with a high-temperature cable to survive the extreme conditions of a typical experiment.

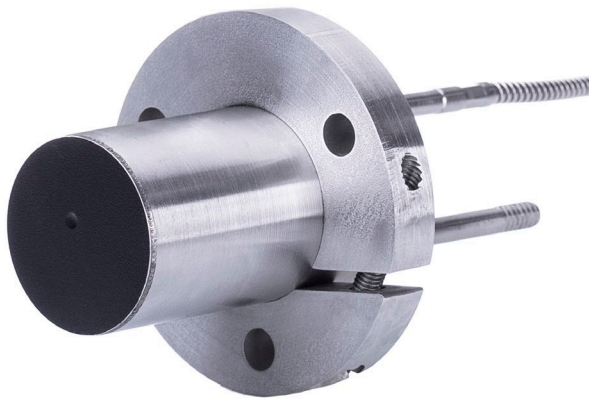


Figure 1 HFS01 high heat flux sensor, water cooled

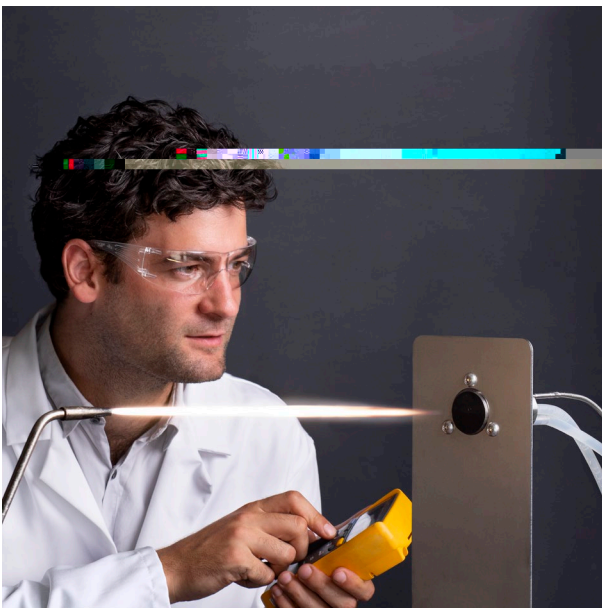


Figure 2 HFS01 is the sensor of choice for studies of concentrated sun and high-intensity flames

Introduction

HFS01 measures heat flux in the range of (0 to 800) x 10³ W/m²; the extremely high fluxes as generated by flames and solar concentrators.

Equipped with a black absorber, it is designed for measurement in an environment in which heat flux includes radiation as well as convection. HFS01's thermopile sensor generates an output voltage proportional to the total absorbed heat flux. The sensor must be water-cooled. Water cooling is usually supplied by tap water. A removable flange that can be used for mounting is supplied with the sensor. Also, a type K thermocouple is included, to measure the sensor body temperature.

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 high-temperature cable and armour withstand temperatures up to 900 °C. Because the sensor body is water cooled, it will remain relatively cool. The surface temperature of the sensor may reach 650 °C. The low-temperature extension cable has a jacket of PTFE type plastic.

The HFS01 sensor can also be ordered without black coating, so that HFS01's absorption of radiation is reduced, while it remains sensitive to convective radiation. Users may also coat HFS01 with their own coating, to create a different response to radiation.

Suggested use

- solar concentrators
- flame research
- fluidised beds

Next level technology

HFS01 has several advantages:

- very robust all-metal / ceramics instrument body and sensor
- high-temperature signal cable
- signal wires electrically insulated from the sensor body and from cooling water

HFS01 high heat flux sensor design

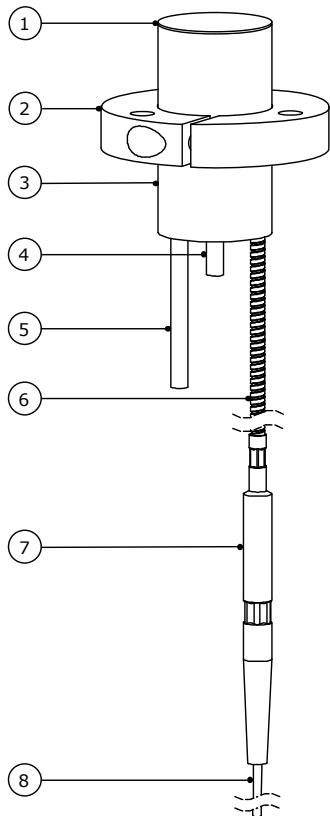


Figure 3 HFS01: (1) black coated sensor surface, (2) removable flange, (3) sensor body, (4) cooling water IN (5) cooling water OUT, (6) high-temperature cable, (7) transition piece, (8) low-temperature extension cable

Calibration

HFS01 calibration is traceable to international standards. The factory calibration method follows the recommended practice of ASTM C1130-07 (2012).

Operation

Using HFS01 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 HFS01 output, a small voltage, by the sensitivity. The sensitivity is provided with HFS01 on its product certificate. Equipped with heavy-duty cabling and a fully stainless steel casing which prevents moisture from penetrating the sensor, HFS01 has proven to be very reliable.



Figure 4 HFS01, pictured without flange, with cabling

HFS01 specifications

Measurand	heat flux
Measurand in SI units	heat flux density / irradiance in W/m^2
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
Measurement range	$(0 \text{ to } 800) \times 10^3 W/m^2$
Rated operating temperature ranges:	
sensor and black coating	-30 to +650 °C
high-temperature cable	-30 to +900 °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)
Rated cooling water temperature range	10 to 30 °C
Rated cooling water flow	> 30 l/h (0.01 l/s), preferably 100 l/h (0.03 l/s)
Output signal	DC voltage
Output signal range	$10 \times 10^{-3} V$ at rated measurement range
Spectral range	0 to $50 \times 10^{-6} m$
Full field of view angle	180 °
Black coating emissivity	0.92 (estimate)
Order code	HFS01 -
	high-temperature cable length in m -
	low-temperature extension cable length in m

Options

- longer cable (specify total cable length for both cable types in m)
- connector at HFS01 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)
- blank metal sensor surface, no coating

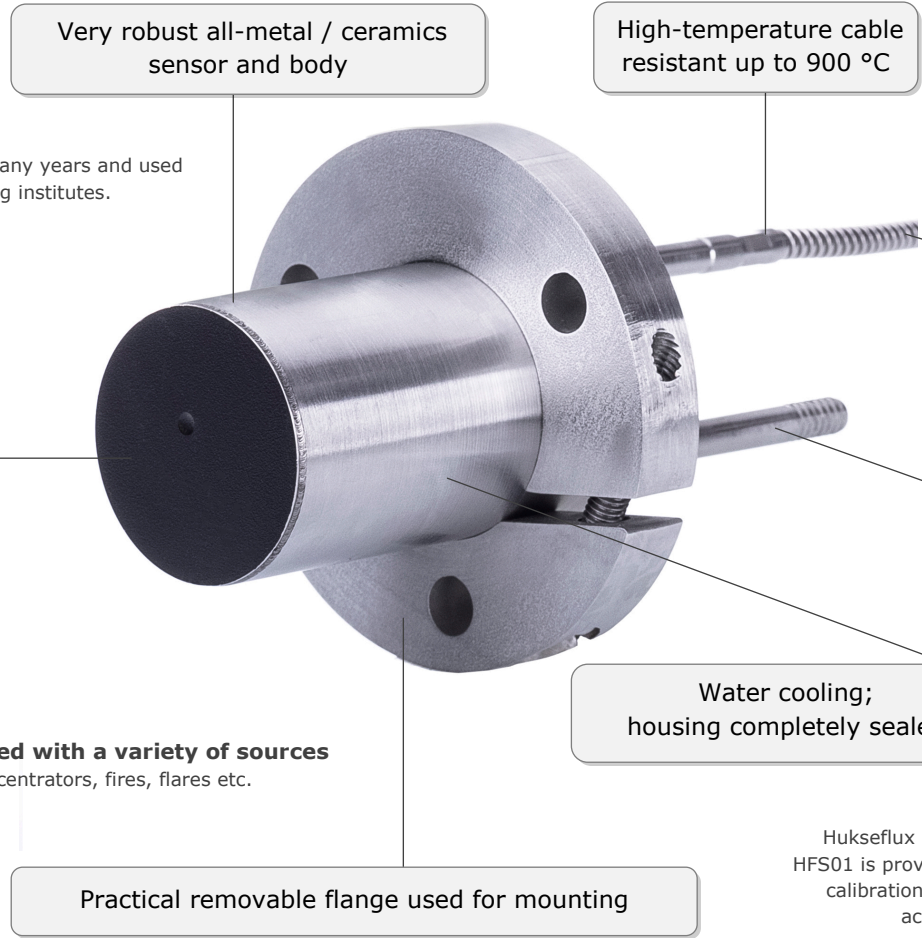
About Hukseflux

Hukseflux Thermal Sensors offers measurement solutions for the most challenging applications. 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

HFS01 outperforms competing models: how?

HFS01 is the sensor of choice for heat flux measurements of fire and flames in unfriendly environments and at high temperatures. This is why.



World market leader

Hukseflux is on the market for many years and used by the vast majority of fire testing institutes.

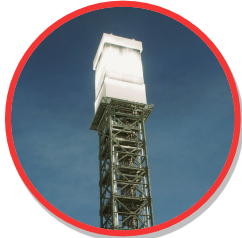
Black absorbing paint, extremely stable: fluxes up to $800 \times 10^3 \text{ W/m}^2$ and $650 \text{ }^\circ\text{C}$ surface temperature

Very robust all-metal / ceramics sensor and body

High-temperature cable resistant up to $900 \text{ }^\circ\text{C}$

Solar concentrator

Suited for solar concentrator heat flux



Durable cable with strain relief, pressure- and waterproof

Robust water supply connections



Employed with a variety of sources

Solar concentrators, fires, flares etc.

Water cooling; housing completely sealed

Practical removable flange used for mounting

Best paperwork
Hukseflux has the paperwork covered; HFS01 is provided with formally traceable calibration certificates. We calibrate in accordance with ASTM C1130.

