

Hukseflux heat flux sensors for industrial use

Sensors for process control, emergency response, studies of insulation

Hukseflux is specialised in measurement of heat transfer and thermal quantities. We have designed and supplied sensors for many industrial projects. Our experience includes a variety of environments such as coal fired boilers, fluidised beds, solar concentrators, offshore flare systems and blast furnaces. Relative to conventional monitoring based on temperature, use of heat flux sensors improves insight in processes, behaviour of materials, and often leads to faster response times for process control and emergency response.

Introduction

Hukseflux Thermal Sensors, market leader in heat flux sensors, offers a range of dedicated **sensors and systems** for use in industrial environments. Our measuring instruments for industrial use are often designed in close cooperation with customers. This brochure briefly looks at the benefits of heat flux measurement for industrial applications, and the sensors, standard or custom-made, recommended for such jobs. Please **contact us** to discuss your specific application.

Process control and emergency response

Many industrial systems rely on temperature measurements. Heat flux measurements offer additional information. A change of temperature usually goes together with a heat flux. Measuring both quantities offers a better picture of what is happening. Heat flux can often be detected earlier than a temperature change. This offers advantages, for example better process control and faster response to emergency situations.

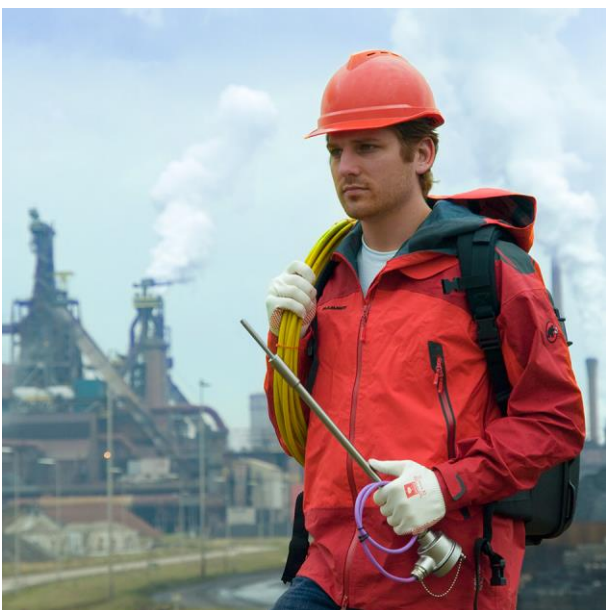


Figure 1 NF01 needle type heat flux sensor: improved process control and faster emergency response

Example applications

- Coal fired boilers: sensors measure heat flux and surface temperature on the furnace wall. The heat flux sensors serve as boiler fouling sensors. Surface temperature is used for assessment of expected tube lifetime.
- Study of industrial insulation: measure the heat flux and temperature difference of insulation packages to verify its performance.
- Solar concentrators: sensors measure the concentrated solar radiation on the boiler surface. The measurement offers an indication of the quality of mirror performance and sets off an alarm in case the heat flux level is out of range.
- Blast furnaces: needle type heat flux and temperature sensors offer high accuracy process monitoring of blast furnaces used in iron production. In addition, they offer a faster response than conventional thermocouples to emergency situations.
- Flare systems: flare radiation sensors are one of the elements in the safety system, offering a measurement of the level of heat load on people and equipment.
- Fluidised beds, cokers, distillation columns: heat flux sensors mounted on the shells monitor the process and detect the formation of deposits. Using this information, maintenance of systems is scheduled.



Figure 2 example: ultra sensitive heat flux sensor IHF02 for verification of thermal behaviour of industrial equipment

Studies of insulation

Using **heat flux sensors**, users can analyse the actual performance of insulation materials. You then have to measure two temperatures and a heat flux. Averaging over time, for example during several days, will give an idea of the performance of insulation materials.

Table 1 Hukseflux capabilities for industrial applications

HUKSEFLUX HEAT FLUX SENSORS FOR INDUSTRY		
Field of application	Purpose	Comment
Industrial equipment like furnaces, boilers, fluidised beds, distillation columns and ovens	Verification of thermal behaviour Trend-monitoring and comparative measurement of heat flux and surface temperature in industrial installations, such as the shell of aluminium reduction cells	Sensor model IHF01 and IHF02 Measures heat flux and surface temperature. Up to 900 °C. IHF02 is 25 x more sensitive than IHF01. ATEX certificate optional
Flame research	High heat flux measurement and high-intensity flames	Sensor model HFS01 very robust all-metal / ceramics instrument body and sensor
Coal fired boilers	Steam pipe heat flux measurement Fouling detection Sootblower control Tube lifetime assessment Flame position monitoring	Sensor model CBW01 Sensor on steam pipe Certification according to ASTM, CE, EN, PED, IBR
LNG tankers	Insulation studies Study and improvement of industrial insulation	Sensor model HFP03 Sensor on insulation material combined with an accurate temperature difference measurement. See our system TRSYS
Solar concentrators	Steam pipe heat flux measurement Studies of concentrated solar irradiance (800 x concentrated direct solar radiation) Mirror performance monitoring System safety: heat flux overrange	Sensor model CBW01 Certification according to ASTM Heat fluxes up to $700 \times 10^3 \text{ W/m}^2$
Blast furnaces	Shell heat flux measurement Accurate process monitoring System safety: cooling failure System safety: wear of graphite System safety: wear of mortar / brick System safety: temperature overrange	Sensor model NF01 Inconel probe for high temperature range Temperatures up to 1000 °C
Flare systems	Flare heat flux measurement Personnel safety Equipment safety	Sensor model HF02 EN (EExi) certification provided with the sensor Always in combination with other decision support systems
Fluidised beds Cokers Distillation columns	Shell heat flux measurement Accurate process monitoring Monitoring of the formation of deposits Scheduling of maintenance	Sensor model HF05 Typical mounting outside on the vessel wall / shell. Combination of long-term heat flux, temperature and meteorological parameters

Some of our references





Figure 3 verification of thermal behaviour of industrial equipment with the very robust IHF02 sensor



Figure 5 mobile heat flux measurements at an industrial flare system site

Standards

Products are manufactured under ISO 9001 quality management system. If applicable, the sensors comply with industrial standards such as ITS90, ANSI, DIN, and BS. Sensors for hazardous areas can be manufactured according to safety standards like EExi, ATEX / Cenelec and NAMUR.

Local support

Hukseflux has support available around the globe, with local representatives in:

- EU (Amsterdam region)
- USA (New York region)
- India (Roorkee region)
- China (Shanghai region)
- Japan (Tokyo region)



Figure 4 HF02 flare radiation monitor / heat flux sensor as used in permanent installation; EN (EExi) certified

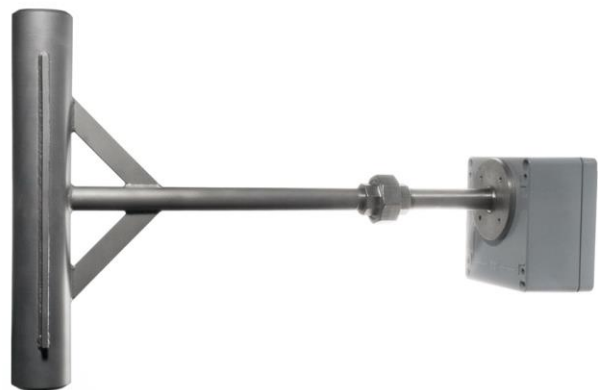


Figure 6 CBW01 heat flux sensor on a steam pipe. The sensor is located in the weld material at the crown of the tube. Typical use is in coal fired boilers and solar concentrators. Wiring is led away in the vertical tube to a connection box through the boiler insulation material. CBW01 is ASME certified.

About Hukseflux

Hukseflux Thermal Sensors offers measurement solutions for the most challenging applications. Our main area of expertise is measurement of heat transfer and thermal quantities such as solar radiation, heat flux and thermal conductivity. Hukseflux sensors, systems and services are offered worldwide via our office in Delft, the Netherlands and local distributors.

Would you like more information?
E-mail us at: info@hukseflux.com