

**NF01**  
**NEEDLE TYPE HEAT FLUX AND**  
**TEMPERATURE SENSOR**

The NF01 needle type heat flux and temperature sensor is used to perform continuous measurement of temperature and heat fluxes in furnace walls. It is designed in particular as a tool for monitoring blast furnaces and smelters. The same technology can be used to manufacture heat flux sensors for different applications.

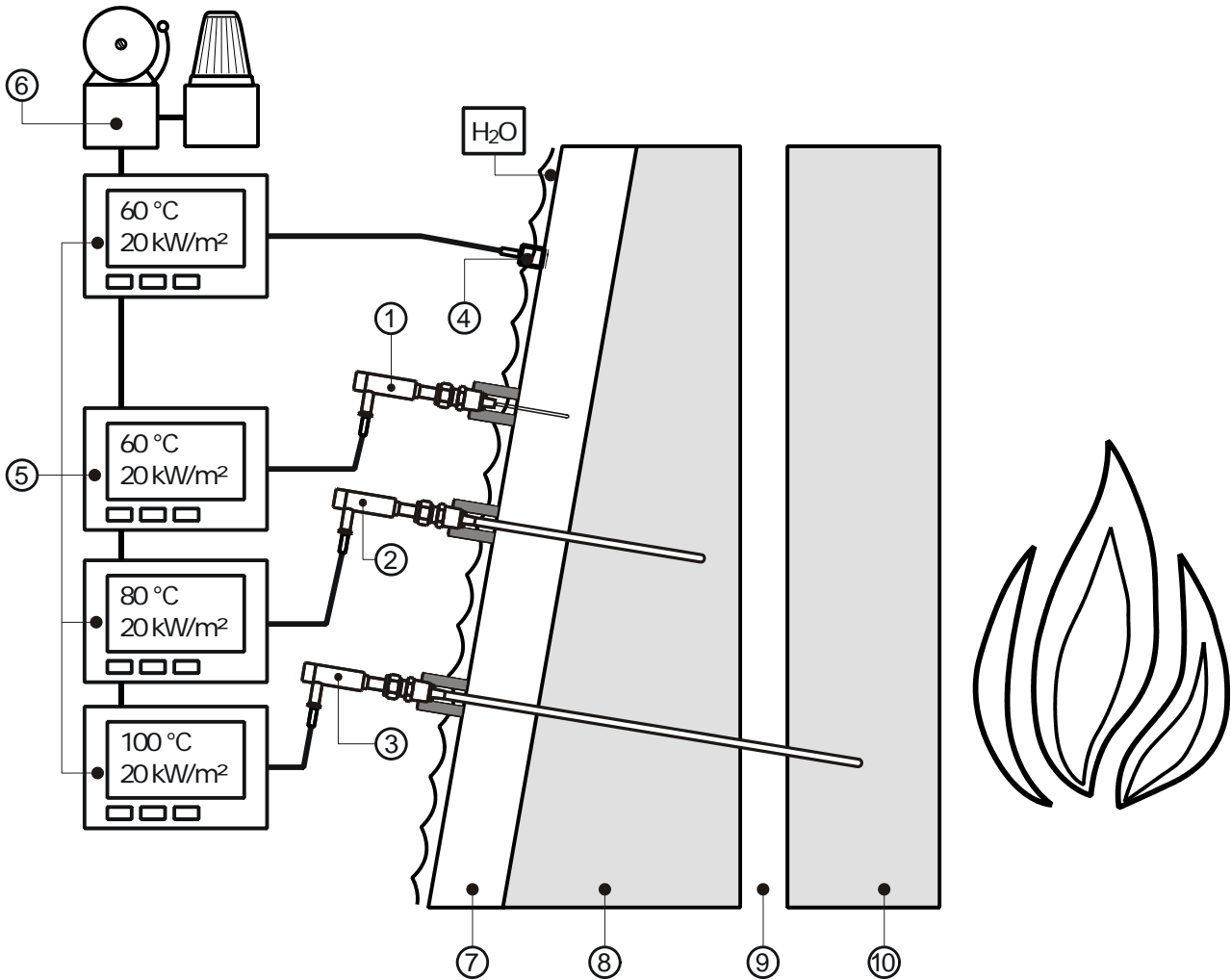


Figure 1 Needle type heat flux (and temperature) sensors applied as monitoring tool for blast furnace conditions (1), (2), and (3): Removable high temperature heat flux sensor type HF01 (4), measurement and control system (5), alarm / warning system (6), steel shell (water cooled) (7), graphite (also applicable in brick) (8), mortar (9), semi-graphite (10).

The sensors are part of furnace / smelter monitoring systems and can be used to study energy balances as well as on-line (continuous) detection of failures in water cooling failure or of process overheating.

**INTRODUCTION**

The NF01 has been designed for studies of the energy balance of industrial blast furnaces and smelters. It has been applied successfully in iron furnace safety systems as well as in a smelter for titania slag production

The main component, the actual sensor, is incorporated in a fully stainless steel needle. This sensor can withstand temperatures up to 700 degrees C, as well as the aggressive chemical environment of a furnace. Optionally the sensor temperature can be extended to 1000 degrees C.

The extension cable is made of PVC.

## NF01 INTRODUCTION (CONTINUED)

Sensor output consists of a heat flux signal (microvolt analog signal) and type K thermocouple.

NF sensors can be manufactured in such a way that they are fully exchangeable, which is easy for servicing. Also the exact depth of insertion is not critical, which saves installation time.

### SUGGESTED USE

- Studies of energy balance of furnaces
- Safety systems of blast furnaces
- Monitoring of smelters

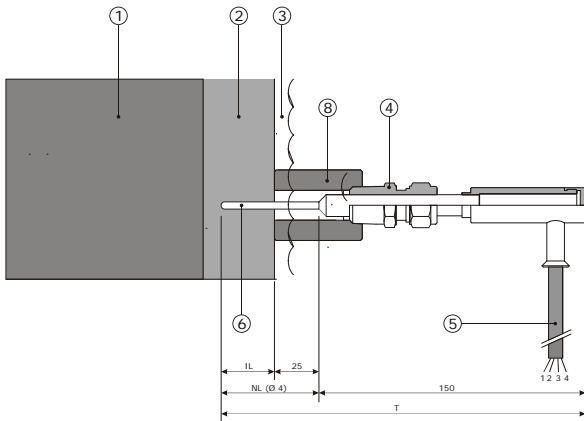


Figure 2 NF01-4mm version for operation in the water cooled part (shell) of the furnace wall. Steel shell(2), water cooling (3), graphite or brick (1), Coupling screwed part (4), PVC cable (5), heat flux and temperature sensor (6), coupling welded part (8)

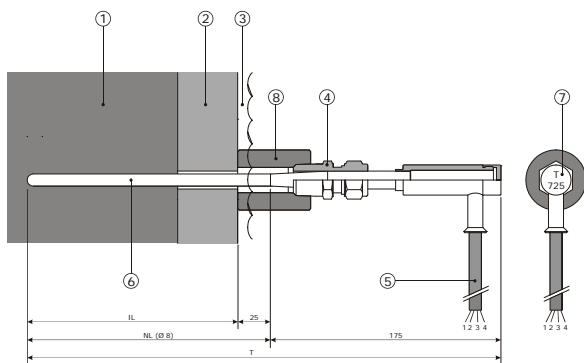


Figure 3 NF01-8mm version for operation in the graphite part of the furnace wall. Steel shell(2), water cooling (3), graphite or brick (1), Coupling screwed part (4), PVC cable (5), heat flux and temperature sensor (6), coupling welded part (8).

## MORE INFORMATION / OPTIONS

*Alternative designs:* Hukseflux is specialised in heat flux sensor design. For different applications special models can be constructed.

*Optional:* NF01 can be made in different diameters and lengths (see below).

Extended temperature to 1000 degrees C.

See model NF02 for miniaturised versions of NF01.

See NAM01 and AC100 amplifiers for amplification.

Added items:

NF01 coupling-W, Coupling welded part, specify length

NF01 coupling-S, Coupling screwed part

NF01-BIT, bits for drilling/centering, order dependent

NF01-DRILL, drills, order dependent

### NF01 SPECIFICATIONS

Sensitivity (nominal):	depends on exact design
Temperature dependence:	depends on exact design
Working range (typical):	0.05 to 50 kWm <sup>-2</sup>
Temperature range sensor:	-30 to +700 °C
Temperature range last 100 mm sensor and cable:	-30 to +85 °C
Heat flux output signal:	analog microvolts
Temperature output signal:	thermocouple type K
Power requirements:	no power required
Optional:	sensor length and diameter, extended cable, cables with alternative colour codes, extended temperature to 1000 °C
Protection sensor/coupling/cable:	IP 65 / 64 / 64
CE certification:	NF01 is CE certified