

Figure 1 the working principle of CHF sensors. In case of a thermal process that follows a temperature trajectory according to line (2), a small temperature change (1), for instance due to a chemical reaction or a phase change, is hardly visible in the temperature signal. The CHF signal "amplifies" such minor events and facilitates the detection and analysis.

CHF01, CHF02 CHANGE-OF-HEAT-FLUX SENSORS

CHF01 and CHF02 are sensors for studying small thermal effects that usually remain hidden. This is attained by the direct measurement of changes in heat flux. The application of the CHF sensors typically is in the detection of chemical reactions and phase changes in industrial processes. Common applications are in quality control of composite processing and in chemical process monitoring.

INTRODUCTION

In many chemical processes it is interesting to detect the occurrence of reaction steps. A typical process is equipped with temperature and pressure sensors; in general the information of these is sufficient. CHF sensors are designed to look in more detail; by detecting changes in heat flux one can detect otherwise invisibly small thermal effects.

CHF DESIGN

CHF sensors essentially employ two differential temperature sensors. These sensors are stacked, and electrically connected in anti-series, creating a single output.

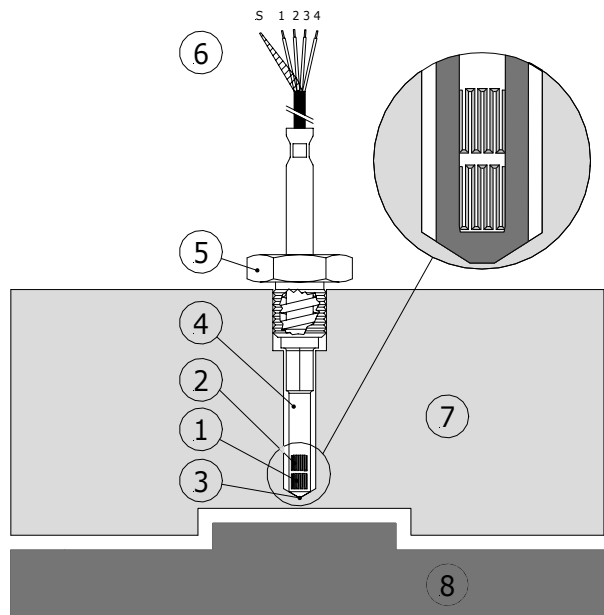


Figure 2 CHF sensor working principle. Differential temperature sensors (1) and (2) stacked and electrically in anti-series, CHF tip (3), CHF tube with temperature sensor (4), spring loaded bolt (5), wiring out with change-of-heat-flux and temperature wiring (6), metal vessel or mould (7), reacting substance (8).

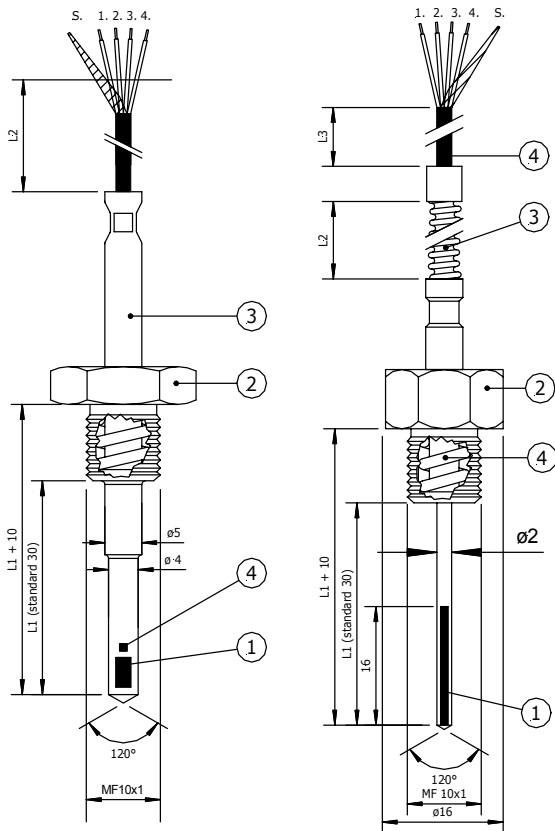


Figure 3 CHF01 (left) is used for applications up to 260 degrees C

- (1) sensor
- (2) spring loaded bolt
- (3) Teflon cable
- (4) thermocouple location

CHF02 (right) is used for high temperature applications up to 700 degrees C.

- (1) sensor & thermocouple location
- (3) Teflon cable
- (4) spring loaded bolt
- (5) metal sheathed cable

Dimensions in mm.

CHF DESIGN (CONTINUED)

Model CHF01 has been designed for low temperatures up to 260 degrees C, while CHF02 is specifically meant for higher temperature / high flux applications.

CHF installation should be done with care; in particular the CHF tip should be in good thermal contact with the phenomenon to be measured. Thermal pastes may be used to promote contact. Holes for mounting are typically drilled with a 0.2 mm higher diameter than the probe diameter.

SUGGESTED USE

- Quality assurance of critical chemical reactions
- Quality assurance of composite processing
- Monitoring of chemical processes
- General quality control of production

MORE INFORMATION / OPTIONS

Alternative designs: Hukseflux is specialised in CHF design. Alternative models, for instance more robust or temperature resistant have been manufactured on request.

Depending on the application, amplifiers AC100 or NAM01 are used.

CHF SPECIFICATIONS

Temperature sensor:	Thermocouple K, ANSI MC96.1-1982
Protection sensor tube:	IP 68
Protection metal sheathed cable	IP 68
Protection Teflon cable:	IP 67

CHF01

Temperature range (total sensor including cable):	-55 to +260 °C
ordering code:	CHF01/L1/L2 L1, L2 in mm
standard:	CHF01/30/2500
response time (1/e):	1 s (typical in steel)
probe diameter:	4 mm

CHF02

Temperature range (total sensor including metal sheathed cable):	-55 to +450 °C
Temperature range (Teflon cable):	-55 to +260 °C
ordering code:	CHF02 /L1/L2/L3 L1, L2,L3 in mm
standard:	CHF02/30/100/2500
response time (1/e):	4 s (typical in steel)
probe diameter:	2 mm
options:	extended temperature to 700 degrees C (no spring)