

# HFP01SC

## SELF-CALIBRATING HEAT FLUX SENSOR

The HFP01SC Self-Calibrating Heat Flux Sensor is intended for soil heat flux measurement applications requiring the highest possible degree of measurement accuracy. Employing an innovative pulsed heat self-calibration technology (via the Van den Bos-Hoeksema method), the HFP01SC minimizes the possibility of sensitivity and temperature dependence induced error effects inherent in conventional soil heat flux sensor models resulting from varied soil moisture content and temperature.

The HFP01SC Self-Calibrating Heat Flux Sensor is primarily intended for high accuracy heat flux measurement studies within the soil medium it is buried. The sensor incorporates a passive thermopile detector embedded within a thin ceramic plastic composite body, with an integrated thin film heating element mounted atop the sensors composite body. The HFP01SC outputs a linear millivolt signal generated by the differential temperature across the sensors body and proportionate to the local soil heat flux. The heating element can be cycled on/off at user defined timing intervals to perform an in-soil calibration check (see figure 1), thus allowing the user to derive sensor calibration factors ideally matched to the soil conditions at the time of measurement; implicitly cable connection, data acquisition and data processing are also tested. For certain application environments, the user may wish to consider the installation of two HFP01SC sensors; sensor redundancy offers the possibility of improved spatial averaging and QA of the processed measurement result. A copy of the HFP01SC operations manual is available in PDF format upon request. Hukseflux offers program code for Campbell Scientific CR10X and CR1000 data logger models free of charge, for ease of intergration.

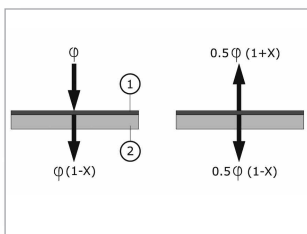


Figure 1

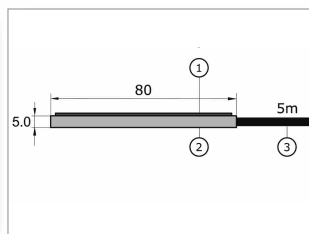


Figure 2



### APPLICATIONS

- Agrometeorology (evapo-transpiration)

Note: Above applications are inclusive of, but not limited to the entire HFP01SC application range.

### HEAT FLUX SENSOR SPECIFICATIONS

Sensitivity (nominal):	50 $\mu\text{V}/\text{Wm}^2$
Resistance (nominal):	2 $\Omega$
Temperature range:	-30 to +70° C
Measurement accuracy:	+/- 3%

### FILM HEATER SPECIFICATIONS

Sensitivity (nominal):	50 $\mu\text{V}/\text{Wm}^2$
Resistance (nominal):	100 $\Omega$
Voltage input/output:	9 - 15 VDC / 0 - 2 VDC
Duration of calibration:	$\pm$ 3 min. @ 1.5 Watts, typically every 3 - 6 hours
Average power consumption:	0.02 or 0.04 Watts

### OPTIONS

Additional cable length by the meter (5 m supplied standard)

- ◀ Figure 1 (Left): Explanation of the self-calibrating principle: See typical heat flux situation  $\phi$  left. On the right, the HFP01SC integrating heating element (1) is activated, generating a known heat flux pulse  $\phi$ . The response of the heat flux sensor is measured. Ideally 50% of the generated flux  $\phi$  passes through the sensor (150  $\text{W}/\text{m}^2$  nominal). In the case of non matching thermal conductivities, a deviation (X) will occur. The essence of the approach is that the flow is divided in an upward flow through undisturbed medium (1+X) and a downward flow through the heat flux sensor (a disturbance) plus underlying medium. The (1-X) signal level however still represents a 0.5  $\phi$  heat flux level of the normal situation of the illustration depicted left.

- ◀ Figure 2 (Right): HFP01SC dimensions in mm, heater (1) heat flux sensor body (2), cable (3)