Heat Flux Sensor
FluxTeq PHFS-09e
Datasheet

General Description

The PHFS-09e is the first low-cost large area heat flux sensor on the market. It is particularly useful for monitoring the performance of thermal insulation and direct in-situ measurement of insulation thermal resistance R-values. The sensor has minimal thickness and excellent sensitivity perfect for measurements on building thermal insulation.

This datasheet covers performance and usage information for this sensor as well as an application note of its usage with the SMT precision instrumentation amplifier and SMT's data acquisition and monitoring system.

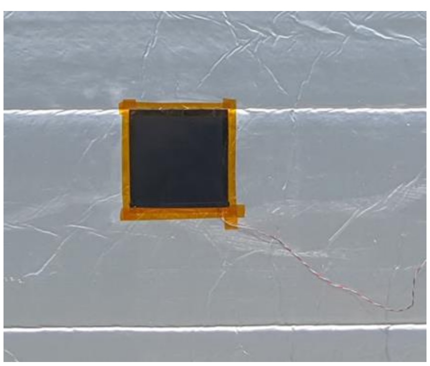
Applications

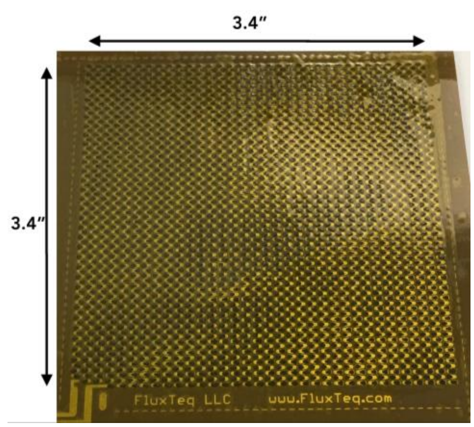
- Thermal monitoring of buildings
- In-situ R-value measurements
- R&D
- Thermal energy efficiency

Features

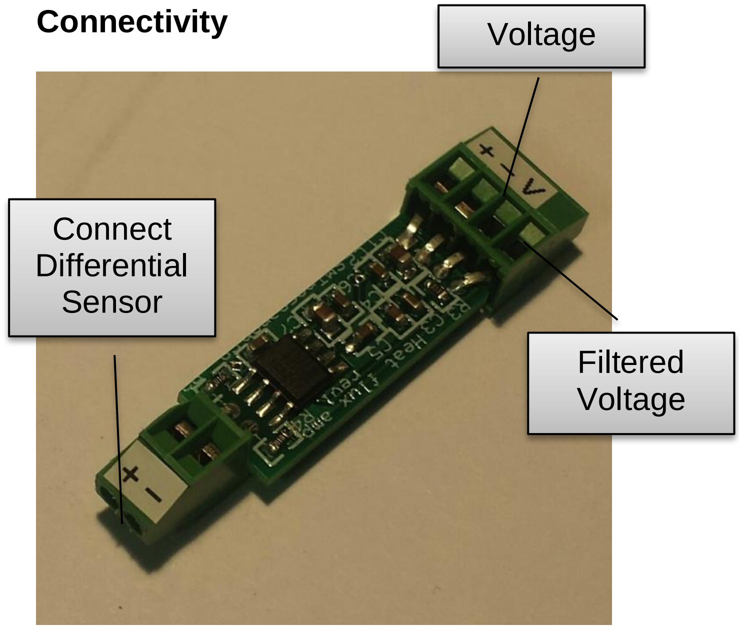
- Large surface area allows coverage of full assemblies.
- Compatible with SMT gain amplifier and A3 datalogger units.
- Sensitivity of 65mv/W/cm2

FluxTeq PHFS-09e





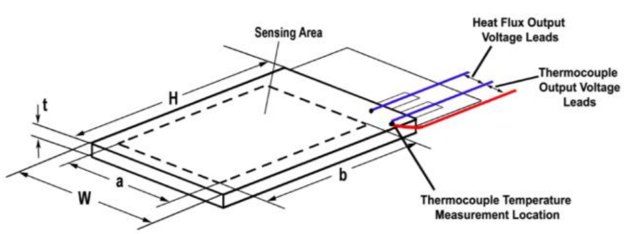
Connectivity



Heat Flux Sensor Specifications	
Sensor Type	Differential-Temperature Thermopile
Encapsulation Material	Kapton (polyimide)
Nominal Sensitivity	Approx. 50 – 65 $mV/(W/cm^2)$
Sensor Thickness (t)	Approx. 275 microns
Specific Thermal Resistivity	Approx. 0.9 $K/(mW/m^2)$
Heat Flux Range	+/- 150 kW/m^2
Temperature Range**	-50°C to 120°C
Response Time*	Approx. 0.6 seconds
Sensor Surface Thermocouple	Type-T
Sensing Area (cm^2)	84 cm^2

* Response time is time for one time constant or 63% of sensor output signal to a heat flux step input.

** Temperature range may be larger than specified. Further testing is being conducted.



Connect the datalogger to the positive, negative and voltage out terminals.

The voltage port is located to the right of power and ground. The right most output is a filtered voltage output. Use this output if your signal appears to have any jitter or noise. Response time from this port is slower due to the noise cancelling capacitors.

Connect the sensor to the +/- port.

Note: A 2.5V offset is applied. Before using determine the exact offset by shorting the +/- inputs and measure the voltage across Vout and Ground.

Output readings will then be:

2.500V– Reading = Amplified Reading

Application Note

Heat Flux Sensor with A3 Data-Logger

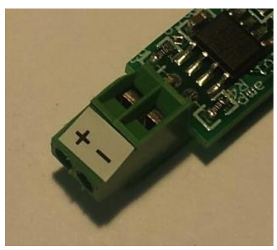
This guide covers the installation of a FluxTeq PHFS-09e sensor used with the SMT Precision Instrumentation Amplifier and SMT's data acquisition and monitoring system.

Step 1 – Calibrating the Amplifier

a) Note the amplifier gain, typical gain amplifier to be used with the PHFS is 1000 times.

b) Connect the gain amp to the datalogger (WiDAQ, A2 or A3)

c) Zero any error or drift in the datalogger circuit. Short the differential inputs with a wire.



d) Take a few readings and make sure they are showing up in the BiG software, all samples taken should be within 100uV.

e) Select calibrate in BiG by right-clicking the sensor you wish to calibrate and pan/zoom the time graph to contain only the readings where the inputs were shorted and are consistent. Select calibrate.

f) The datalogger is now ready to read differential voltages centred at 0uV.

Step 2 – Calibrating the Heat Flux Sensor

a) Connect the heat flux sensor to the input on the Gain Amp. The RED wire is positive, the WHITE wire is negative.

b) Locate the sensitivity number associated with the specific heat flux sensor.

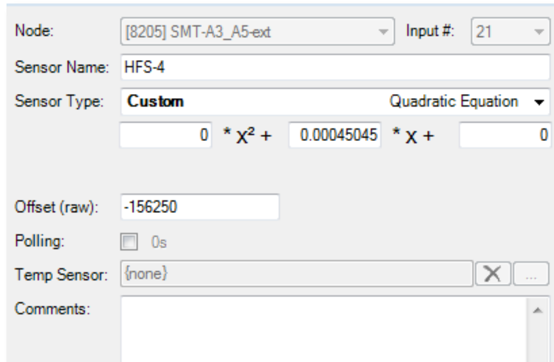
c) Right click the sensor in BiG and click configure. Choose *Custom – Quadratic Formula* as sensor type.

d) Calculate b multiplier:

   a. Multiply calibration value by 1000.
      Example: 1000 x 2.22 = 2220

   b. Calculate inverse value.
      Example: 1/2220 = 0.00045

e) Enter value as b in quadratic formula ax2 + bx + c



   a. Calculated value is in W/m^2

   b. Apply the Sensitivity Multiplication Factor (M.F.) to adjust sensor sensitivity when the sensor temperature is significantly different that 25ºC.

      The resulting sensitivity at that sensor temperature, $S_{T°C}$ can be found using the following equation.

      $S_{T°C} = [0.00334 \times T_{°C} + 0.917] \times S_{calib}$.

      Where $T_{°C}$ is the sensors temperature in degrees Celsius and S_{calib} is the calibrated sensor sensitivity provided.