

Heat Flux Overview



Federal Aviation
Administration

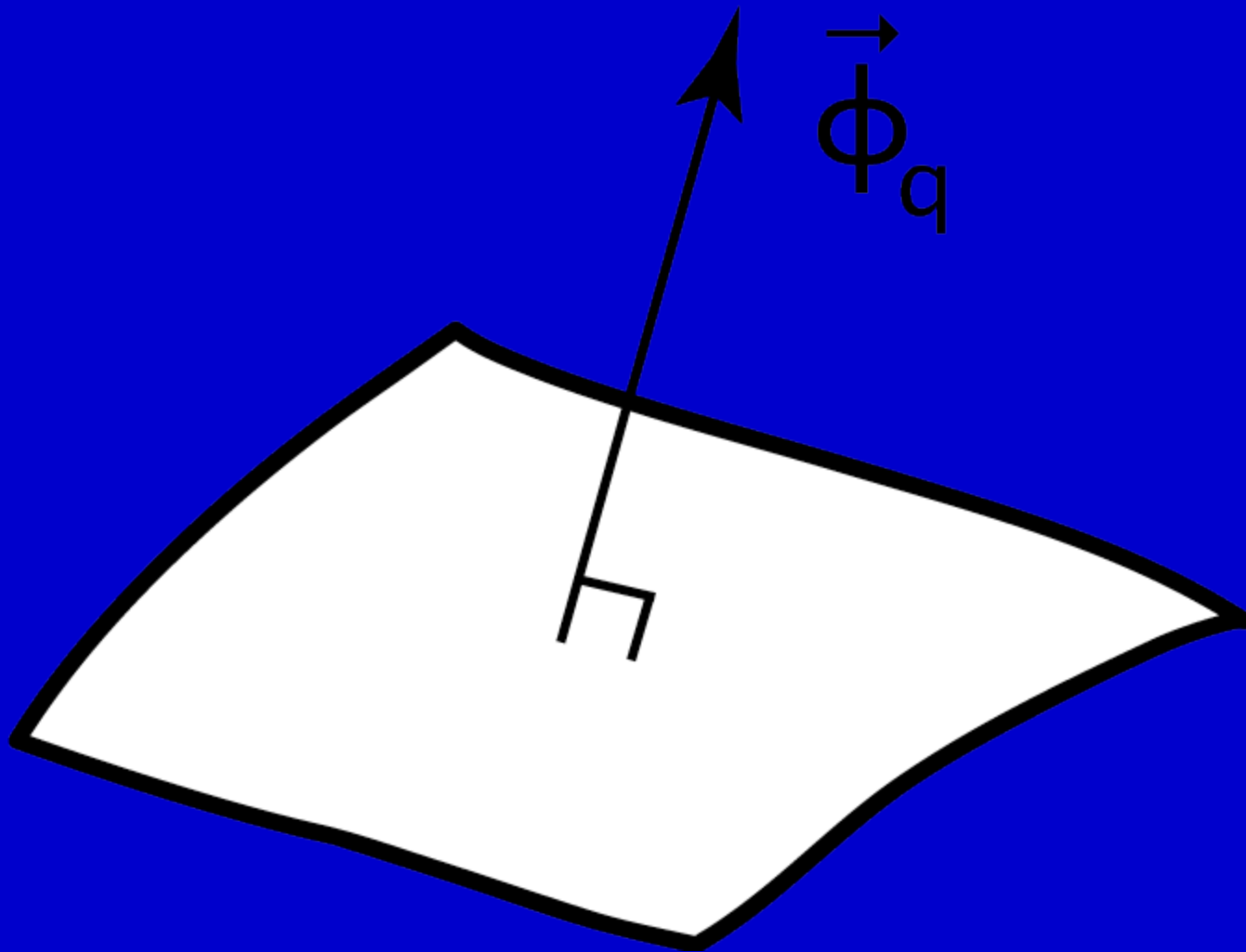
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What is Heat Flux? How is it Measured?



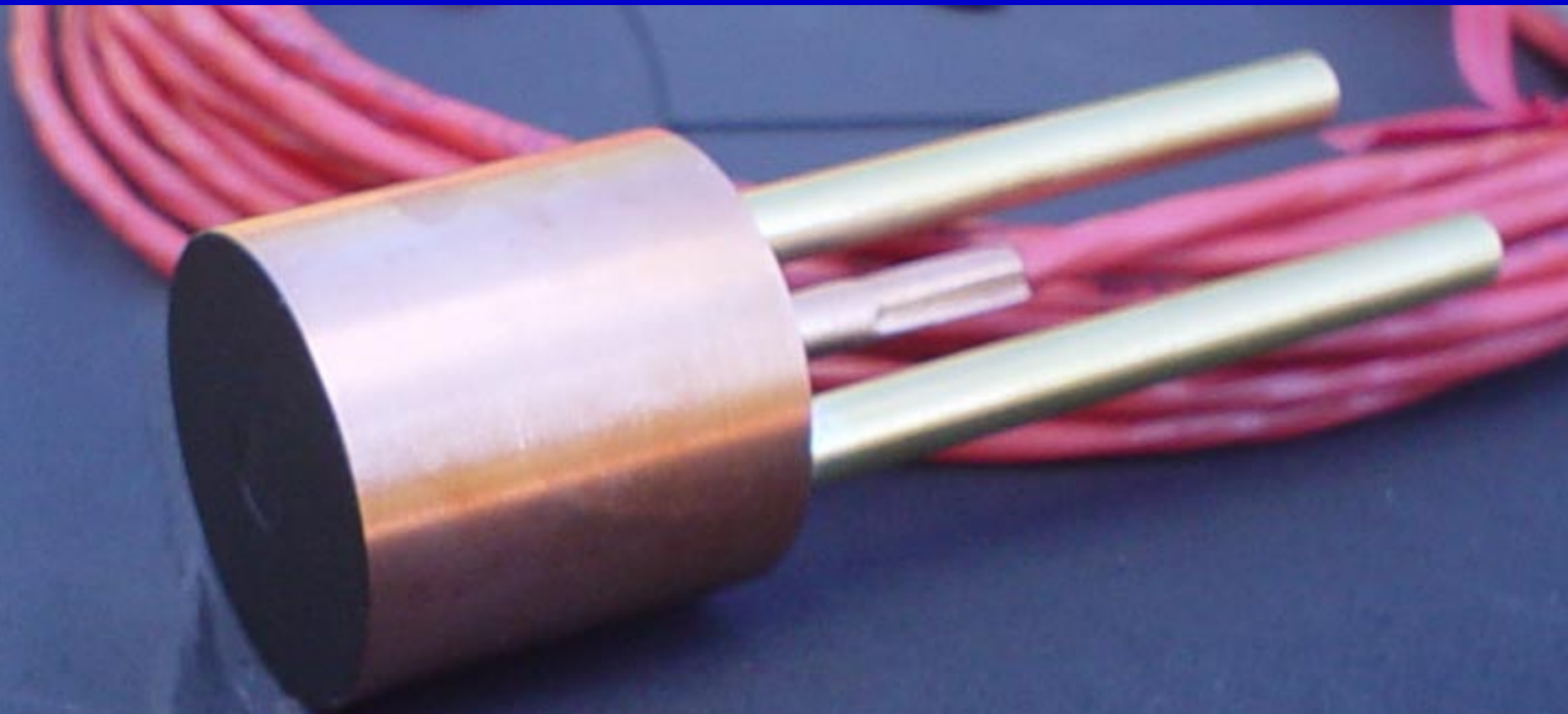
Heat Flux Density

- The intensity of the thermal environment, the specimen is exposed to, when burned.

Operating Principles:

- Thermocouple that measures temperature difference between center and circumference of a thin circular foil disk.
- Disk is bonded to a circular opening in a cylindrical heat sink.
- Foil is made of Constantan and the heat sink is copper.
- Produces an output directly proportional to heat flux.

Heat Flux Gage



Heat Flux Basics

Installation:

- Water removes absorbed heat continuously which provides a good heat sink
- Heat Flux gage has a view of 180°.

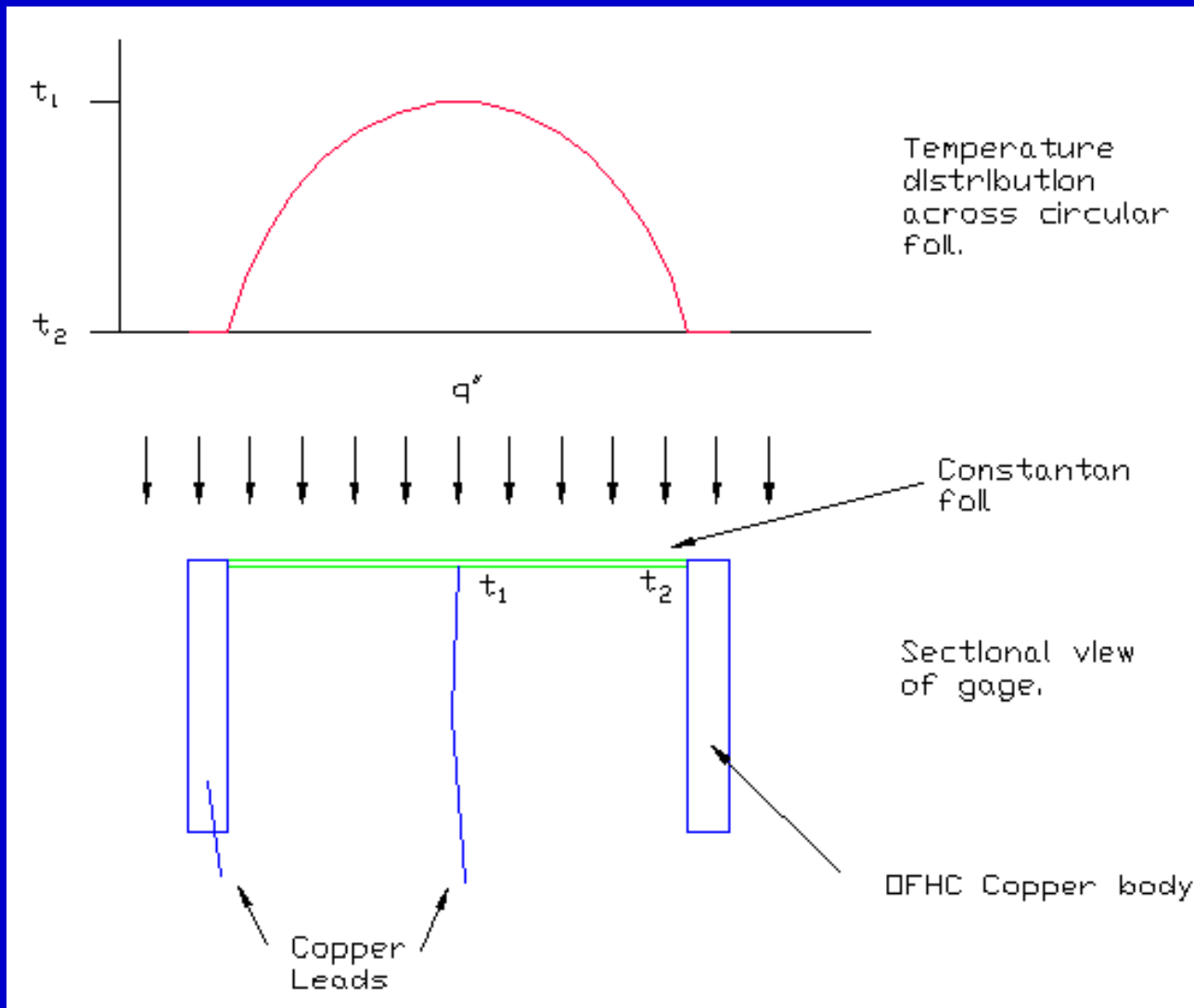
Emissivity:

- Ratio of radiant energy emitted by a surface to that emitted by a blackbody at the same temperature

Blackbody:

- An ideal body or surface that completely absorbs all radiant energy falling upon it with no reflection

Heat Flux Distribution



Capturing Heat Flux Data

Taking Measurements:

- Voltage output proportional to heat flux.
- Converted to respective heat flux using calibration information (Watts/cm² or BTU/ft² * sec)
- Calibration performed with radiative heat sources
 - Consistently repeatable.
 - Calibrated for incident heat flux.
- Incident heat flux is output voltage divided by sensitivity of unit.
 - This assumes radiative heat transfer.
 - For convection you must factor in the emissivity.

Some Things To Know

- 3 wires associated with standard gages.
 - Red wire = (+) heat flux
 - Black wire = (-) heat flux
 - Silver wire = floating ground
- Top of range is set for 10 mV full scale output.
- Units may be over driven to 15 mV without damage or loss of calibration.
- Overdriving the units to 20 mV will damage the gage.

EXTREMELY Important Things To Know!

Face Coating:

- Sensitivity of transducer is dependent on emissivity of face of sensor.
- Depositing material or removing coating can change the emissivity of the face of your sensor, changing the calibrated sensitivity.
- It is important to try to maintain the original coating on the face of the sensor as much as possible.
 - Regularly inspect face of sensor for physical damage or build up of material.

Heat Flux Gage Recommendations

Recalibration:

- Manufacturer recommends recalibrating sensor at least once a year.
- More frequent when:
 - Sensor is placed directly in a flame
 - Deposits onto or material removed from face of sensor.

Troubleshooting:

- If problems with sensor:
 - Resistance should not be above 5 ohms.
 - Any changes to original coating that can be visually noted can effect the sensitivity.

“Cool” Tips for Heat Flux gages

Water-cooled 1000 Series

- When using the 1000 water-cooled series it is important to use clean water.

Note: Deionized water is not necessary.

- The water itself does not need to be chilled (Room temperature water is appropriate).
 - Chilled water may cause condensation on the face of the sensor which will change the sensitivity of the product and alter measurements.

Heat Flux Gage Calibration Method

