

WS01
SENSOR FOR ULTRA LOW WIND SPEEDS
AND BOUNDARY LAYER CONDUCTANCE

WS01 is a sensor that is used to investigate the heat transfer coefficient, C_{tr} , from its surface to the air. The obtained data can be used to determine other transfer coefficients (for instance for water vapour transport) or local wind speed (specifically in the low wind speed range). Both measurements are qualitative rather than absolute. WS01 is suitable for outdoor use. It has to be used combination with a proper data acquisition and control system.

WS01 consists of a heater and a sensor incorporated in a very thin plastic foil. The sensor in WS01, consisting of two thermopiles, performs a differential temperature measurement around the heating wire with record breaking sensitivity. When placing the sensor in air and switching on the heater, the sensor output will be inversely proportional to the heat transfer to the air. The main application of WS01 is as an "artificial leaf" to study mass transport in the leaf boundary layer. In this application it is a benefit that WS01 has a leaf-like geometry (flat and thin). Also WS01 can be used to study local wind speed in the 0.1 to 2 m/s region, for instance in greenhouses and buildings. This can only be done if there is one predominant wind direction. Measurement errors induced by solar radiation are strongly reduced by the fact that the sensor is symmetrically placed around the wire, and by using the technique of pulsed heating. The low thermal mass makes WS01 very fast, reaching thermal equilibrium in 30 s in still air. When considering to apply WS01 it is recommended to consult the manual which is available at Hukseflux. A program for interfacing with the Campbell Scientific CR10X and CR1000 are available.

WS01 SENSOR SPECIFICATIONS

Thermocouples:	40 Cu-CuNi
Temperature range:	-30 to +80 °C
Sensor thickness (nominal):	0.15 mm
Required readout:	2 diff voltage channels
	3 V and 5 mV range
Voltage input:	1-2 VDC (nominal)
Interfacing:	to most common datalogging systems

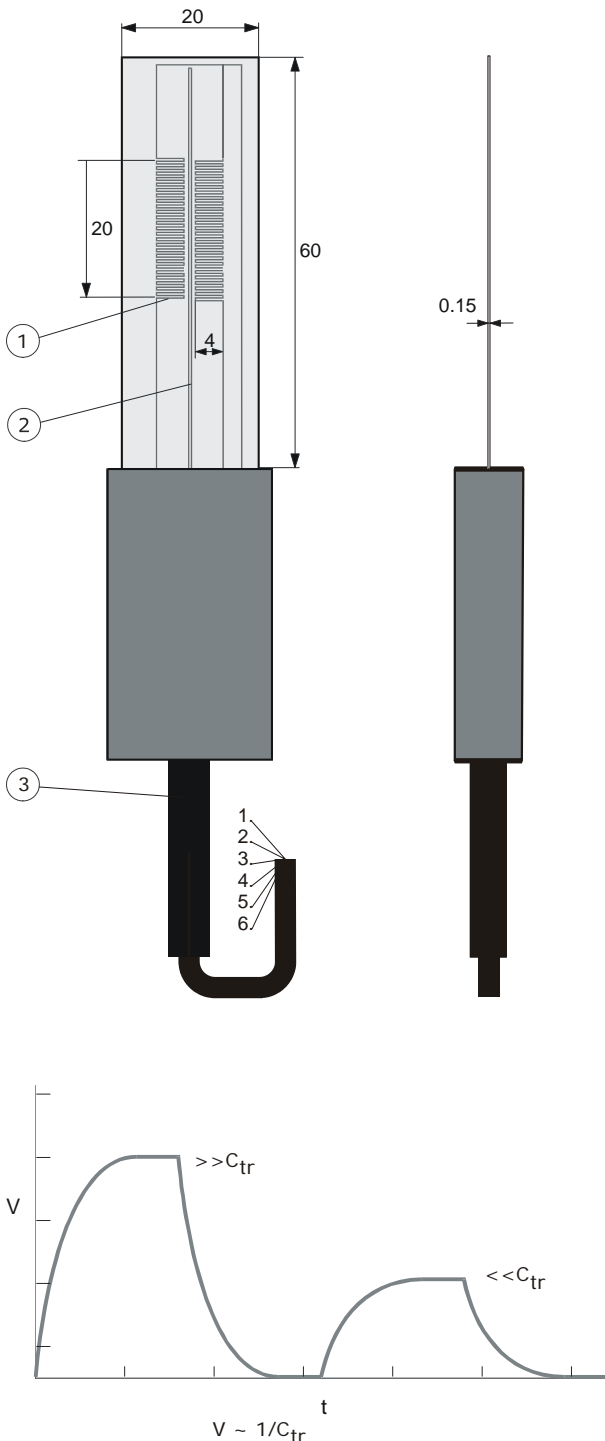


Figure 1 above: WS01 sensor: thermopiles (1), heating wire (2), cable (3).
below: graphs at different wind speeds: signal amplitude varies with 1/ wind speed or $1/C_{tr}$.
All dimensions are in mm.