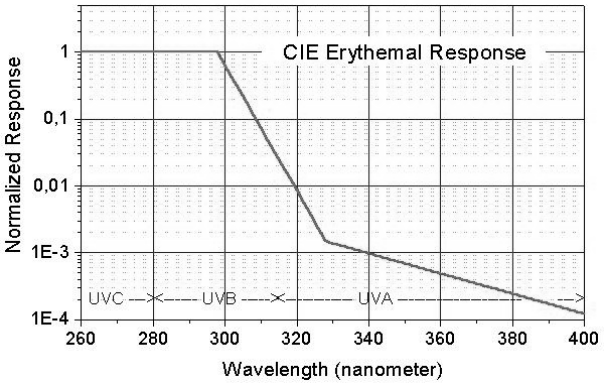
UVB-sensor

14.12.10 Ae 2872.61

Description:
This detector is sensitive to electromagnetic radiation in the wavelength range 280-315 nm referred to as the UVB region. The detector response follows the CIE 87 erythemal response curve for reddening of the skin which takes the varying sensitivity of the average person to these wavelengths into account. Because of the biological importance of these wavelengths the sensor is therefore calibrated in the unit MED/hour (minimum erythemal dosage units per hour).



The instantaneous solar irradiance in the UVB region can also be measured in mW/m^2. The typical noontime value on a clear day in the middle latitudes at sea level ranges from 125-240 mW/m^2. The irradiance value 25 mW/m^2 is defined as 1 UVI (1 UV intensity unit) so that 125-250 mW/m^2 corresponds to a range of 5-10 UVI.

Because the detector sensitivity takes the reddening response of human skin into account, the unit MED/hour will often be the preferred unit of measure. One MED is the minimum dose requried for a person with very sensitive skin to experience erythema. If the UVB irradiance is 1 MED/hour, then it will take an hour for a person exposed to this irradiance to receive the minimum erythemal dosage. People with different types of skin react differently, and this issue is addressed in greater detail in the appendix.

1 MED corresponds to a total dose of 210 J/m^2. Thus 1 MED/hour = (210 J/m^2)/3600 s = 58.3 mW/m^2 = 2.33 UVI.

Required accessories:
The sensor requires a bias voltage of 5 V to operate. The instrument can be conveniently used with a battery box (2515.60). This provides the needed bias voltage and at the same time access to read out of the signal on a voltmeter.

Another option is to connect the sensor directly to a data logger interface such as Pasco Science Workshop, Multilog or Texas Instruments CBL.

Mounting, operation and maintenance:
The sensor is connected to the appropriate data registration unit and exposed to the ultraviolet irradiance to be measured. If a battery box and voltmeter are used, the voltage readout must be multiplied by a calibration factor for conversion to UVI or MED/hour. If a computer interface is used, the data-logging program can convert the raw voltage measurement to the desired UVB units.

Technical data

Size:	
Height:	50 mm
Diameter:	60 mm
Aperture:	6 mm diameter
Bias voltage:	5 volt DC
Output signal:	0-5 V

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DIN connector pins:

1: Signal
2: 0 (ground)
3: NC
4: +5V (bias voltage)
5: 0 (ground)

Calibration:

Sensor serial number: _____

Calibration data:
Measured voltage: _____

MED/hour: _____

Note:

Calibration data for these instruments are available on the Frederiksen A/S home page (www.sflab.dk) should they be misplaced.

Accessories:

The sensor is supplied with a threaded hole in the bottom. A threaded mounting rod (item no. 97850120, length 105 mm, diameter 10 mm) fits this hole.

Battery box for readout on a multimeter: item no. 2515.60.

Appendix:

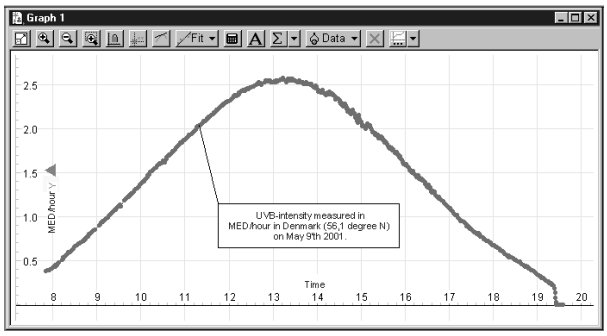
Various skin types:

1 MED is the minimum dose of UVB radiation which will cause sensitive skin to begin to redden. Because the sensitivity of various individuals to UVB radiation varies, a Skin Factor has been defined to take this into account. It is of course somewhat subjective to decide what skin type a particular individual has, but it is possible to get a good idea about this by observing the effects of UVB on the skin in conjunction with the use of the UVB sensor.

The tabulated skin factor values can be interpreted as follows: if the skin factor is twice as high, then the individual with this skin factor can remain exposed to the sun twice as long before acquiring a minimum erythemal dose. An individual with a high skin factor can tolerate higher exposures than a person with a low skin factor.

The MED unit is based upon an individual with skin factor 8.

The figure gives an impression of the UVB levels which can be encountered at middle latitudes in the spring. The unit of measure is MED/h. Reading the maximum value encounted this day in early May in Denmark, we find a reading of 2.5 MED/h on a horizontal surface. Thus the average person would receive a minimum erythemal dose in 60/2.5 = 24 minutes. A person with skin factor 16 could remain exposed for 48 minutes before reaching the minimum erythemal dose, while a person with skin factor 4 would receive the MED in just 12 minutes.



Skin Factor overview:

Skintype	Description of skin	Skin factor
Never tans, always burns.	Pale or milky white, alabaster.	4-10
Sometimes tans, usually burns.	Very little brown sometimes freckles.	10-12
Usually tans, sometimes burns.	Light tan, brown or live, distinctly pigmentet.	11-14
Always tans, rerely burns.	Brown, dark brown or black.	12-16

This table was developed by the US Environmental Protection Agency.