



## All-in-one Weather Sensor with IEC 61724-1 Compliance

Purpose built to perform and survive the extreme conditions of PV Sites

### Overview

The ClimaVue™40 is an all-in-one meteorological sensor designed for solar plant operational monitoring and solar resource assessment with IEC 61724-1 compliance. Campbell Scientific is well known for creating accurate and reliable instruments. We recognize that ease of operation and overall cost of operation are critical. With the ClimaVue 40, you will

get this and more. In adherence to IEC 61724-1 (2021), the ClimaVue 40 provides ambient air temperature, barometric pressure, precipitation, relative humidity, wind direction, and wind speed measurements. The sensor also offers vapor pressure, tilt, lightning strike, and lightning average distance measurements.

### Benefits and Features

- › Sold as a stand-alone sensor for integration into systems from other companies and works seamlessly with Campbell Scientific SunScout and SunSentry stations.
- › Easy to install with quick-connect cables and integrated leveling
- › High-accuracy air temperature measurements without a louvered radiation shield
- › Double precipitation counting method extending the measurement range to capture extreme events
- › No configuration, special software, or special cables needed
- › No confusing sensor options to choose from
- › Compact design for quick and easy installation
- › Reduced per-parameter cost with a multi-parameter sensor
- › Integrated tilt sensor to help assure the sensor stays level over time
- › Detachable cable for easy field-swapping and -servicing
- › Designed and manufactured in the US
- › Compatible existing Supervisory Control and Data Acquisition (SCADA) systems via RS-485 Modbus

### Technical Description

#### Sensors

All sensors are integrated into a single, small form-factor unit, requiring minimal installation effort. With a robust, limited-moving-parts design that prevents errors because of wear or fouling, the ClimaVue 40 is ideal for long-term installations.

#### Anemometer

The space underneath the rain gage is where the ClimaVue 40 measures wind speed. Ultrasonic signals emitted from transducers at right angles to each other bounce off the porous, sintered glass plate and back up to the opposite sensor. The speed of sound is affected by the wind, and the wind speed is calculated by measuring differences in the



time it takes for sound to travel from the transmitters to the receivers.

### Temperature Sensor

Like the ClimaVue 50, the ClimaVue 40 temperature measurement is made in the center of the anemometer area where a small, stainless-steel needle containing a miniscule temperature sensor extends from the middle of the four sonic transducers.

The temperature sensor is protected from direct sunlight by the sensor body and allows air to freely flow through the region. Any temperature sensor thus mounted (including those in non-aspirated radiation shields) exhibits a bias in temperature measurement due to solar loading of the mounting structure. An energy balance equation can be used to calculate a correction for this bias based on wind speed and solar radiation. This correction can be applied when a ClimaVue 40 is used with a Campbell Scientific data logger or when this sensor is included in one of our standard system offerings, such as the SunScout.

### Relative Humidity Sensor

The relative humidity sensor on the ClimaVue 40 is located behind the circular Teflon screen close to the sonic transducers. The Teflon screen protects the sensor from liquid water and dust while allowing water vapor to freely

pass to the sensor. The ClimaVue 40 measures relative humidity and temperature and computes vapor pressure.

### Drip/Tipping Counter Precipitation Gage

The ClimaVue 40 contains a 9.31 cm (3.67 in.) diameter rain-collection funnel. A spring in the funnel acts as a filter to keep out large particles while allowing enough flow so water does not back up. Rain collected by the funnel exits the funnel through a precision-flared hole that forms the rain into drops of a known size. The falling drops hit and momentarily bridge the gap between two gold pins, creating an electrical pulse.

After passing the drop counter, the drops land in a tipping spoon reservoir for a secondary precipitation measurement. This secondary measurement method extends the measurement range to capture extreme rainfall events of up to 1,500 mm/hr.

### Tilt Sensor

The ClimaVue 40 is also equipped with a tilt sensor. The primary use of the tilt sensor data is to ensure the ClimaVue 40 remains level at all times. Campbell Scientific recommends regularly checking X and Y tilt data to ensure the ClimaVue 40 is level. If it has tilted, return to the site and level it again. Three degrees off level can cause errors in the rain and solar radiation measurements. Although this sensor's readings may be used to level the instrument during installation, it is much easier to use the small bubble level on the bottom of the anemometer plate.

## Specifications

Measurements Made	Air temperature, precipitation, relative humidity, and wind speed.
Measurement Scan Rate	1 s
Input Supply Voltage	3.6 to 15.0 Vdc
Operating Temperature Range	-50° to +60°C
Typical Current Drain @ 12 Vdc	1 mA
Communications	RS-485 Modbus
Connector	M12 five pin
Compliance	<ul style="list-style-type: none"> <li>› 2014/30/EU Electromagnetic Compatibility Directive (EMC)</li> <li>› 2011/65/EU Restrictions of Substances Directive (RoHS2)</li> </ul>
Conformity Standard	› EN 61326-1:2013: Electrical equipment for measurement, control, and laboratory use—EMC requirements—for use in industrial locations

› EN 50581:2012: Technical documentation for the assessment of electrical and electronic product with respect to the restriction of hazardous substances

Precipitation	
Range	0 to 1,500 mm/h
Resolution	0.017 mm
Accuracy	±5% of measurement (from 0 to 1,000 mm/h)
Vapor Pressure	
Range	0 to 47 kPa
Resolution	0.01 kPa
Accuracy	Varies with temperature and humidity
Air Temperature	
Range	-50° to +60°C
Resolution	0.1°C
Sensor Accuracy	±0.2°C at 25°C

Measurement Accuracy  $\pm 1^{\circ}\text{C}$  from  $-20^{\circ}$  to  $+50^{\circ}\text{C}$

### Humidity Sensor Temperature

Range	$-40^{\circ}$ to $+50^{\circ}\text{C}$
Resolution	$0.1^{\circ}\text{C}$
Accuracy	$\pm 1^{\circ}\text{C}$

### Barometric Pressure

Range	1 to 120 kPa
Resolution	0.01 kPa
Accuracy	$\pm 0.05$ kPa at $25^{\circ}\text{C}$
Equilibration	$< 10$ ms
Long-Term Drift	$< 0.1$ kPa/year, typical

### Horizontal Wind Speed

Range	0 to 60 m/s
Resolution	0.01 m/s
Accuracy	0.3 m/s or 3% of measurement, whichever is greater

### Wind Gust

Range	0 to 60 m/s
Resolution	0.01 m/s

Accuracy 0.3 m/s or 3% of measurement, whichever is greater

### Wind Direction

Range	$0^{\circ}$ to $359^{\circ}$
Resolution	$1^{\circ}$
Accuracy	$\pm 5^{\circ}$

### Tilt

Range	$0^{\circ}$ to $180^{\circ}$
Resolution	$0.1^{\circ}$
Accuracy	$\pm 1^{\circ}$

### Lightning Strike Count

Range	0 to 65,535 strikes
Resolution	1 strike
Accuracy	$> 25\%$ detection at $< 10$ km typical (variable with distance)

### Lightning Average Distance

Range	0 to 40 km
Resolution	3 km
Accuracy	Variable

For comprehensive details, visit: [www.campbellsci.eu/climavue40](http://www.campbellsci.eu/climavue40) 



80 Hathern Road, Shepshed, LE12 9GX UK | +(0)1509 828888 | [sales@campbellsci.co.uk](mailto:sales@campbellsci.co.uk) | [www.campbellsci.eu](http://www.campbellsci.eu)  
AUSTRALIA | BRAZIL | CANADA | CHINA | COSTA RICA | FRANCE | GERMANY | INDIA | SOUTH AFRICA | SPAIN | THAILAND | UK | USA

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