

## Vaisala wind and weather sensor technologies for measurements in industrial applications



Vaisala's long history in wind and weather measurements started already in the 1930s from the development of a radiosonde to measure the conditions in the upper atmosphere. Today, Vaisala wind and weather instruments are used in dozens of applications and industries all over the world.

### Industrial applications for wind and weather measurements

Wind and weather data are required in many activities across industries. For example, in power industry, the efficiency of power lines is a function of wind speed and direction.

Nuclear power plants require wind data for safety reasons to be able to model the dispersion of potentially radioactive leakages. In addition to nuclear power plants, also chemical factories need to gather wind data for dispersion monitoring.

Accurate outdoor measurements are essential in operating modern buildings. Processes such as free cooling, natural ventilation, and automated shading are dependent on real-time weather data. Ventilation control in greenhouses also relies on localized weather data to ensure an optimized environment for plant growth.

### Vaisala wind and weather instruments

Vaisala manufactures wind and weather instruments for different applications, requirements and budgets. The wind sensor portfolio for industrial applications includes both mechanical and ultrasonic sensors. View the complete range of wind products at [www.vaisala.com/wind](http://www.vaisala.com/wind). Have a look at the multiparameter Vaisala Weather Transmitter WXT530 at [www.vaisala.com/wxt530](http://www.vaisala.com/wxt530).

#### Vaisala ultrasonic wind sensors in brief

- Wind sensor with no moving parts
- Unique triangular design for accurate measurements from all directions
- Optional sensor heating available
- Maintenance free, no field calibration required
- Measurement range up to 90 m/s

#### Vaisala mechanical wind sensors in brief

- Accurate wind speed and direction sensors
- Fast and linear response
- Low measurement starting threshold
- Sensors with heating elements available for cold climates

#### Vaisala weather sensor in brief

- Measurement of the six essential weather parameters: wind speed and direction, liquid precipitation, barometric pressure, temperature, and relative humidity
- Feature proprietary Vaisala sensor technologies: WINDCAP®, RAINCAP®, HUMICAP®, and BAROCAP®

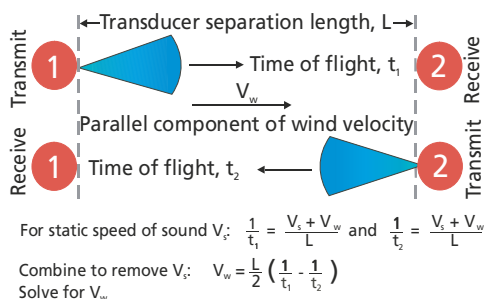
# Vaisala sensor technologies for wind and rain measurements

## Vaisala WINDCAP® sensor

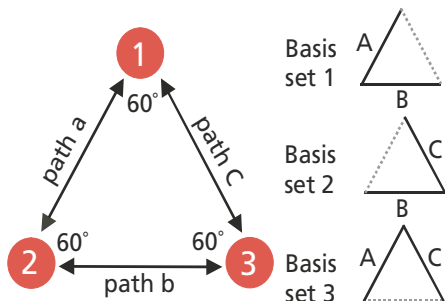
Vaisala WINDCAP® Ultrasonic Wind Sensor uses ultrasound to determine wind speed and direction. The sensor has no moving parts, which makes it independent of the limitations of mechanical wind sensors such as friction, inertia, time constant, over-speeding, and starting threshold.

### How it works

WINDCAP® sensor features an array of three ultrasonic transducers oriented to form an equilateral triangle. Wind measurement is based on time of flight (TOF) of the sonic impulse - the time it takes for the signal to travel from one transducer to another. TOF is measured in both directions for each pair of transducer heads. Simple algebra allows solving for the parallel component of wind velocity independently of the static speed of sound.



The equilateral triangle configuration of the three transducers provides three possible sets of basis vectors. The combinations yield bi-directional measurements on the paths labeled A, B and C. These measurements are used to determine the wind velocity components parallel to each of the three paths.



## Vaisala RAINCAP® sensor

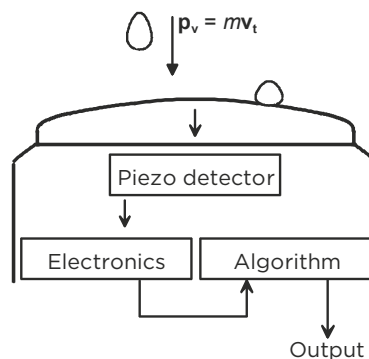
Vaisala RAINCAP® Sensor is an acoustic sensor that measures the impact of individual raindrops on a smooth stainless steel surface using a piezoelectric detector. The sensor provides real time information on rain intensity, duration, and accumulated rainfall.

### How it works

The RAINCAP® sensor consists of a round stainless steel cover, approximately 90 mm in diameter mounted to a rigid frame. A piezoelectric detector is located beneath the cover.

Raindrops hit the RAINCAP® sensor surface at terminal velocity, which is a function of the raindrop diameter. Rain measurement is based on acoustic detection of each individual rain drop as it impacts the sensor cover. Larger drops create a larger acoustic signal than smaller drops.

The piezoelectric detector converts the acoustic signals into voltages. Total rain is calculated from the sum of the individual voltage signals per unit time and the known surface area of the RAINCAP® sensor. In addition, the intensity and duration of rain can be calculated.



- $P_v$  = vertical momentum
- $m$  = mass of drop
- $v_t$  = terminal velocity of drop



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