

# Weather Stations for Meteorological Applications

/RELIABLE PERFORMANCE IN ALL ENVIRONMENTS



**VAISALA**

# Vaisala Automatic Weather Stations

*Weather has a constant impact on the world and our everyday lives. Extreme conditions affect health and safety, investments, agriculture, commerce, shipping, traffic, and quality of life.*

## Need for Better Measurements

Weather information and prediction are becoming ever more important. Recurrent and increasingly violent storms, severe floods, and droughts, as well as other adverse weather phenomena, demand better equipment for atmospheric information gathering. In addition to short-term weather phenomena, gradual climatological change is affecting the whole ecosystem of our planet.

## Global Leader

Experience, innovation, and commitment to quality has made Vaisala the leading global technology, solution, and service provider for weather-related information needs.

Vaisala Automatic Weather Stations (AWSs) are field proven, with over

15,000 installations in more than 70 countries. Our weather stations and instruments are fully compliant with World Meteorological Organization guidelines.

We have over 75 years' experience in providing solutions for almost every meteorological organization in the world, from Antarctica to the Arctic and everywhere in between.

To serve the increasing need for better measurements, driven by the changes in our planet's atmosphere, Vaisala has developed equipment to suit a wide range of specialist applications.

## High Data Quality and Availability

Data quality, consistency, and availability over long periods are crucial to producing reliable and scientifically valid results. Vaisala technologies are designed to minimize the need for post-installation maintenance and service. The following issues are emphasized in Vaisala products:

- Material and manufacturing quality standards
- Environmental testing of each component before certification
- Extended calibration intervals due to high long-term stability
- Self-diagnosing intelligent sensors providing service alerts
- Easy remote setting changes and configuration via intelligent logger



## “Install and Forget”

The Mean-Time-Between-Failure (MTBF) values of Vaisala Automatic Weather Stations are high – more than 20,000 hours. When weather-station field checking is necessary, Vaisala's hand-held instruments make it quick and easy.

The meteorological data from weather stations can be integrated with data from weather radars, thunder detection systems, and soundings to form a complete weather monitoring system.

Vaisala design quality is proven through extensive tests. Below is a PWD series sensor undergoing a 'freezing rain and rain with strong wind' test.



Vaisala HUMICAP® Hand-Held Humidity and Temperature Meter HM70 for relative field checks.



The Vaisala Measurement Standards Laboratory has ISO 17025 accreditation for pressure, temperature, and relative humidity calibrations.

# Climatologic/Synoptic Meteorology

Climatologic and synoptic meteorological surface data is used to create weather prediction models that describe the atmosphere and its changes over time. Meteorological data needs to be collected over many years, even decades, in order to produce reliable statistics. Building a functional and exhaustive meteorological database for accurate models requires high quality observations of a variety of relevant measurements. Modeling can be then used to understand the past, present, and potential future climate conditions.

Vaisala AWSs provide two options for synoptic measurement systems:

- Preconfigured weather stations with defined sensors that comply with WMO recommendation for accuracy
- Customized weather stations that are designed and built according to specific customer needs in co-operation with Vaisala professionals

The main variables of the meteorological measurements are:

- Air temperature
- Soil temperature
- Relative humidity
- Atmospheric pressure at station level
- Wind speed and wind direction
- Precipitation
- Snow depth
- Visibility
- Sky cover, state of the sky, height of cloud base, and type of cloud
- Solar radiation/sun duration

Data is collected by the desired intervals and transmitted to a central server via GPRS, satellite, or Ethernet.

Vaisala has successfully delivered thousands of synoptic stations around the world. Vaisala's automatic stations are designed to meet the key requirements of synoptic meteorology.



Vaisala BAROCAP® Digital Barometer PTB330 enables accurate climatological measurements with added reliability through redundancy.

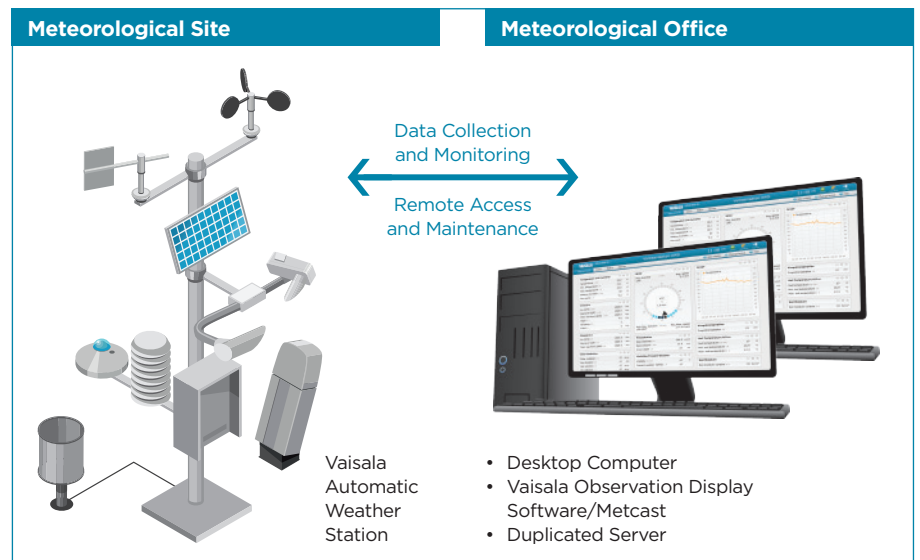


Vaisala PWD-series sensor gives prompt precipitation detection and traceable visibility measurement.

Vaisala HUMICAP® Humidity and Temperature Probe HMP155 with the new HUMICAP®180R sensor improves long-term stability and decreases the need for calibration. The optional warmed humidity probe is designed for high humidity environments (e.g. coastal and tropical areas).



## Example of a Vaisala Synoptic AWS System



# Hydrology

Hydrological measurement data is essential in the prediction and solution of flood, drought, erosion, and water pollution problems. Some areas have plenty of water while other areas, afflicted by drought, go wanting.

Vaisala hydrological AWSs focus on high data quality and reliable operation with no downtime. As hydrological sites are usually in remote locations and real-time data collection is important, Vaisala AWSs provide wireless telemetry – sometimes multi-telemetry for strategic sites.

The main variables of hydrological measurements are:

- Precipitation
- Water level (rivers, lakes, reservoirs, wells)
- Water temperature
- Snow depth
- Waterflow
- Evaporation
- Soil moisture
- Ambient water quality

The sensors used in Vaisala AWSs fulfill WMO recommendation for accuracy.

Reliable real-time data is necessary in hydrological forecasting and modeling. Hydrological forecasts are essential to preparing for natural disasters such as floods and droughts. With high quality observations and a suitable selection of measurements, an exhaustive hydrological information database can be built.

In hydrological AWS network operation the majority of the operating cost is generated by maintenance, calibration and telecommunication costs. Significant savings can be realized by using easily interchangeable sensors and sensors with extended calibration intervals. Maintenance and troubleshooting is easier when working with AWSs with self-diagnostics properties and remote maintenance possibilities.

Data from Vaisala hydrological station can complement Vaisala Weather Radar, which measures the location and movement of areas of precipitation. Combining the radar and the AWS station network gives the best rainfall estimate over the large areas like hydrological catchments.



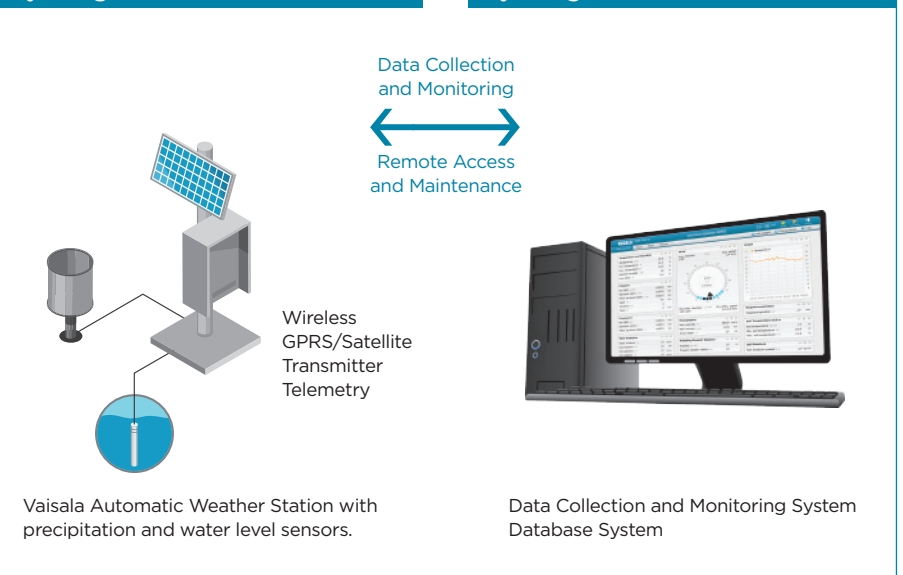
Vaisala MAWS Water Level Weather Station in Estonia. Vaisala Weather Radar is part of a complete hydrological system in Estonia.



## Example of a Vaisala Hydrological AWS System

### Hydrological Site

### Hydrological Office



Vaisala Automatic Weather Station with precipitation and water level sensors.

Data Collection and Monitoring System Database System

# Maritime and Coastal Meteorology

Coastal weather stations produce meteorological data for sea weather forecasts and to warn ships and off-shore operators about severe weather conditions. The same data is also used in regional and global computer models to help predict atmospheric changes and monitor ocean climate and the state of the oceans.

The maritime environment demands robust mechanical properties. The structure of Vaisala AWSs ensures long-term performance in harsh maritime environments. The equipment is anti-corrosive, freeze/thaw tolerant, and can endure vibration and shock.

As marine meteorological data is used both as the basis for warnings and as a climatological database, data reliability is essential. The data can be reported in various formats.

The main variables in maritime meteorology are:

- True wind speed and wind direction
- Atmospheric pressure
- Air temperature, relative humidity, and dew point
- Water temperature
- Water level

Additionally, the following measurements can be provided:

- Wave height
- Water salinity
- Visibility and current weather
- Cloud height
- Solar radiation/sun duration
- Precipitation
- GPS position and speed
- Compass heading
- Current speed and direction

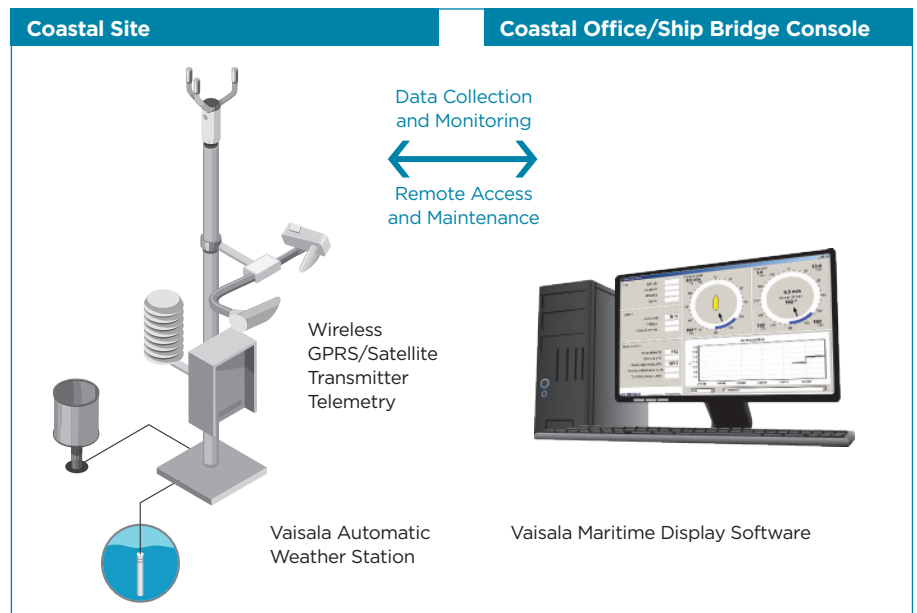


Vaisala WINDCAP® Ultrasonic Wind Sensor WMT700 is maintenance-free, with no moving parts, and the patented three-transducer layout provides accurate data in all wind directions.

Vaisala Marine AWS with wave height measurement. Complies with IEC 60945 and Lloyd's maritime standards.



## Example of a Vaisala Marine AWS System



# Agricultural Meteorology

Agrometeorological AWS systems measure in-situ weather conditions in parallel with local forecasts. The objective is to produce weather data that enables optimal timing and control of all field operations. The data is gathered, stored, viewed, and analyzed to enable more profitable decisions with less risk in farm management.

Weather-dependent field operations include sowing, water management, crop protection, soil management, and harvesting. Reliable weather data helps optimize planting schedules, growing days, irrigation needs, and harvest time. Reduced chemical, pesticide, and fertilizer spraying volumes are also an important outcome.

Solar-powered weather stations incorporate evapotranspiration calculation and versatile reporting features that can easily be connected to customer data collection systems.

Agrometeorological AWS systems provide reliable meteorological data for the whole growing season.

The main variables of agricultural measurements are:

- Solar radiation
- Evapotranspiration
- Rain/precipitation
- Soil temperature
- Soil moisture
- Leaf wetness
- Wind speed and direction
- Relative humidity
- Air temperature

Agrometeorological AWS systems produce data and calculation that helps the farmer to improve irrigation efficiency by optimizing the use of water.

A simple agrometeorological AWS system typically includes a Vaisala WXT520 Weather Transmitter and a solar radiation sensor. This AWS provides the basic agrometeorological parameters: wind, relative humidity, air temperature, air pressure, precipitation, solar radiation, and calculated evapotranspiration. The included sensors require minimal post-installation maintenance and service.

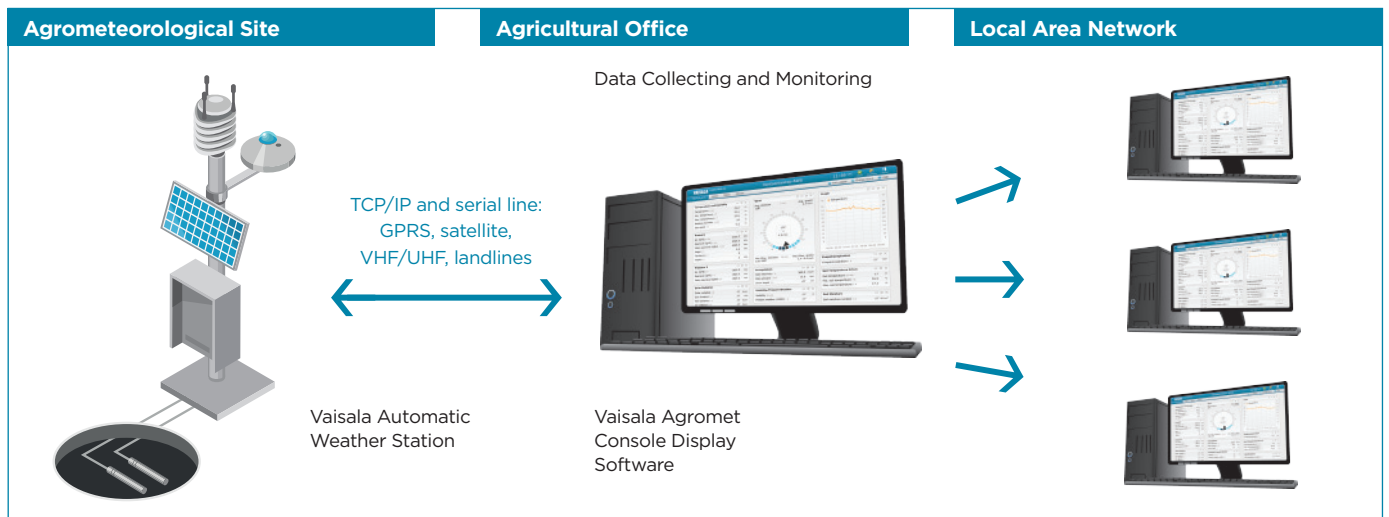
Vaisala MAW301 agrometeorological site in Northern Cyprus.



Vaisala WXT520 Weather Transmitter - 6 different meteorological measurements in one instrument.



## Example of a Vaisala Agriculture AWS System



# Urban Meteorology

Weather can create significant disruptions in urban areas. Heavy rains can cause severe flooding, snow and freezing rain can disrupt transportation systems, and major storms with accompanying lightning, hail, and high winds can cause power failures.

Industrialization and congested traffic increase air pollution. Day-to-day weather has a significant impact on air quality, as weather determines the speed of pollutant dispersal. It also determines the height of the boundary layer (the bottom layer of the troposphere), where emissions are diluted vertically upwards.

A dense network consists of several automatic weather stations within a small geographical area. In addition to providing meteorological and air quality data, the dense network fulfills a multipurpose role that can be utilized by different authorities:

- Fire and safety departments
- Water treatment plants
- Industrial areas and harbors
- Health authorities
- Energy authorities
- Road traffic and transportation authorities

- Insurance companies
- Individual inhabitants

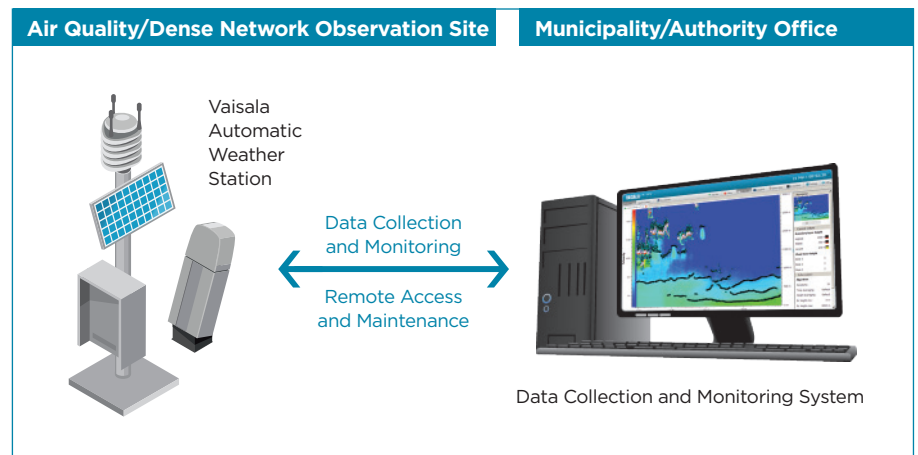
Vaisala AWS systems can be customized for specific air quality and dense network observations, with data utilization for additional analyses.

A sophisticated air quality analysis system would include Vaisala Ceilometer CL31/CL51 with BL-VIEW software. The AWS would be able to provide analyses of aerosol concentration and thus vertical structure of the boundary layer.



Vaisala CL51 Ceilometer provides highly accurate cloud height and boundary layer observations.

## Example of a Vaisala Urban AWS System



# Vaisala AWS Services

Vaisala AWS products have one-year factory warranty.

Standard technical support is available via [helpdesk@vaisala.com](mailto:helpdesk@vaisala.com)

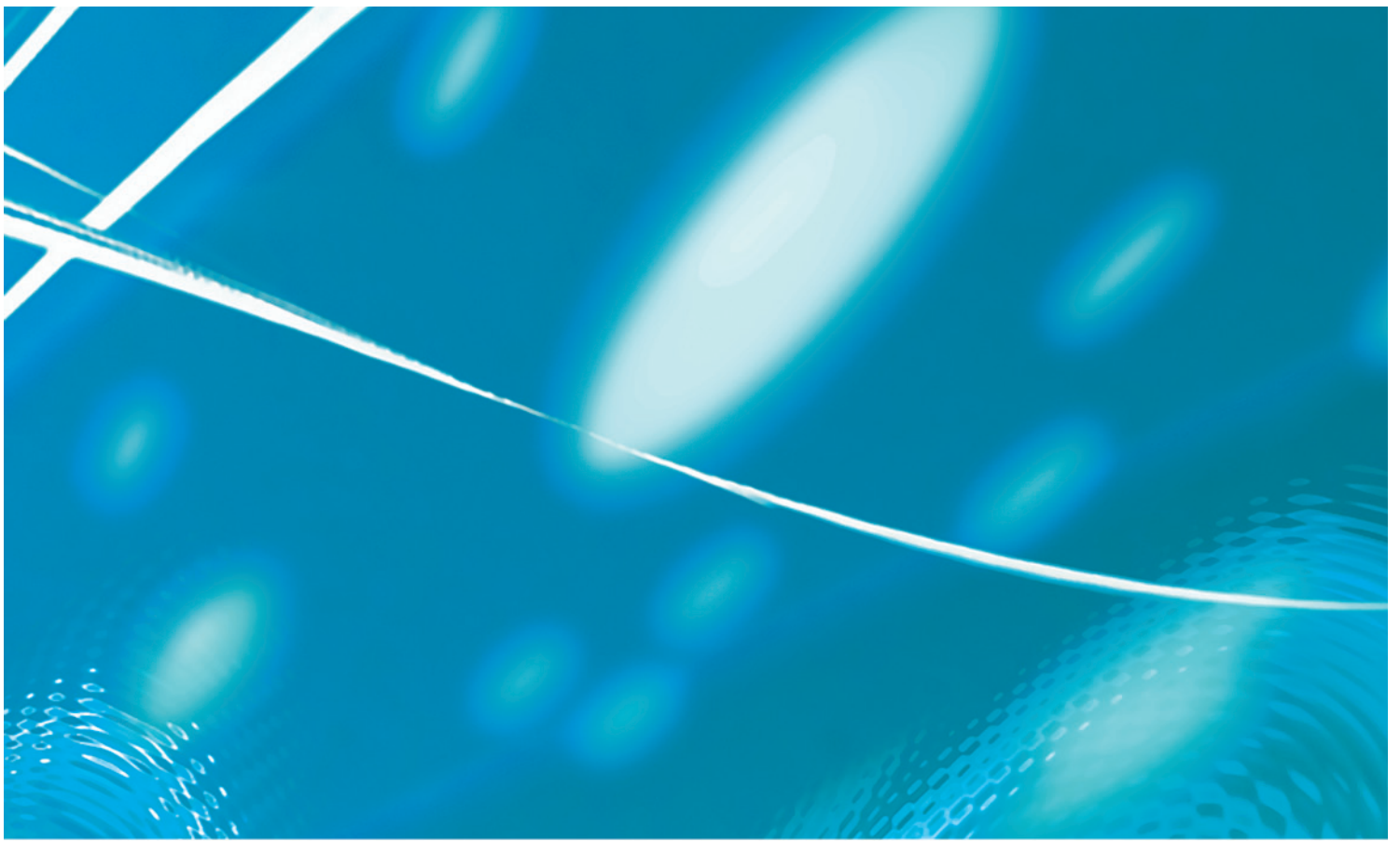
Regular maintenance and calibration of AWS components ensure measurement accuracy and instrument functionality. Tailor-made Vaisala service contracts make investment protection easy and deliver measurable results.

A service contract maximizes equipment lifetime by performing and keeping track of scheduled maintenance, calibration, spare part delivery and software upgrades.

Standard calibrations are traceable and ISO 9001 compliant. All accredited calibrations comply with ISO 17025 and are traceable to international standards.

Services available on request:

- On-site repairs, factory repairs
- Sensor calibrations
- Spare parts
- Modernization
- Product training
- Service contracts



# VAISALA

[www.vaisala.com](http://www.vaisala.com)

For more information, visit  
[www.vaisala.com](http://www.vaisala.com) or contact  
us at [sales@vaisala.com](mailto:sales@vaisala.com)

Ref. B211184EN-A ©Vaisala 2012  
This material is subject to copyright protection, with all copyrights retained by Vaisala and its individual partners. All rights reserved. Any logos and/or product names are trademarks of Vaisala or its individual partners. The reproduction, transfer, distribution or storage of information contained in this brochure in any form without the prior written consent of Vaisala is strictly prohibited. All specifications — technical included — are subject to change without notice.