MicroStep-MIS

IMS4 Agro

Automatic Agrometeorological Station

IMS4 Agro system is designed for agrometeorological purposes and provides reliable weather monitoring for agrometeorologists, biologists, and farmers.

EFFICIENT AND SUSTAINABLE FARMING

Disease control and prevention

The prognosis of various diseases and their signalization is calculated from several meteorological parameters. The information gets displayed on the data logger, IMS4 screen, tablet, or phone.

Freeze protection

Various methods have been developed to model radiation cooling. The IMS4 Agro integrates them to predict the minimum temperature and to protect the crops from frost.

Effective irrigation

Using the FAO Penman-Monteith method to calculate evapotranspiration, the system quantifies the amount of water needed for optimal irrigation.

Estimating phenological phases

Formulas estimating phenological phases based on previous experience and long-term analysis of weather data for different plant species are integrated into the Agro Station.

FEATURES

Modular and scalable platform

Multimode data communication

Statistics, alerts, and notifications

Customizable web interface

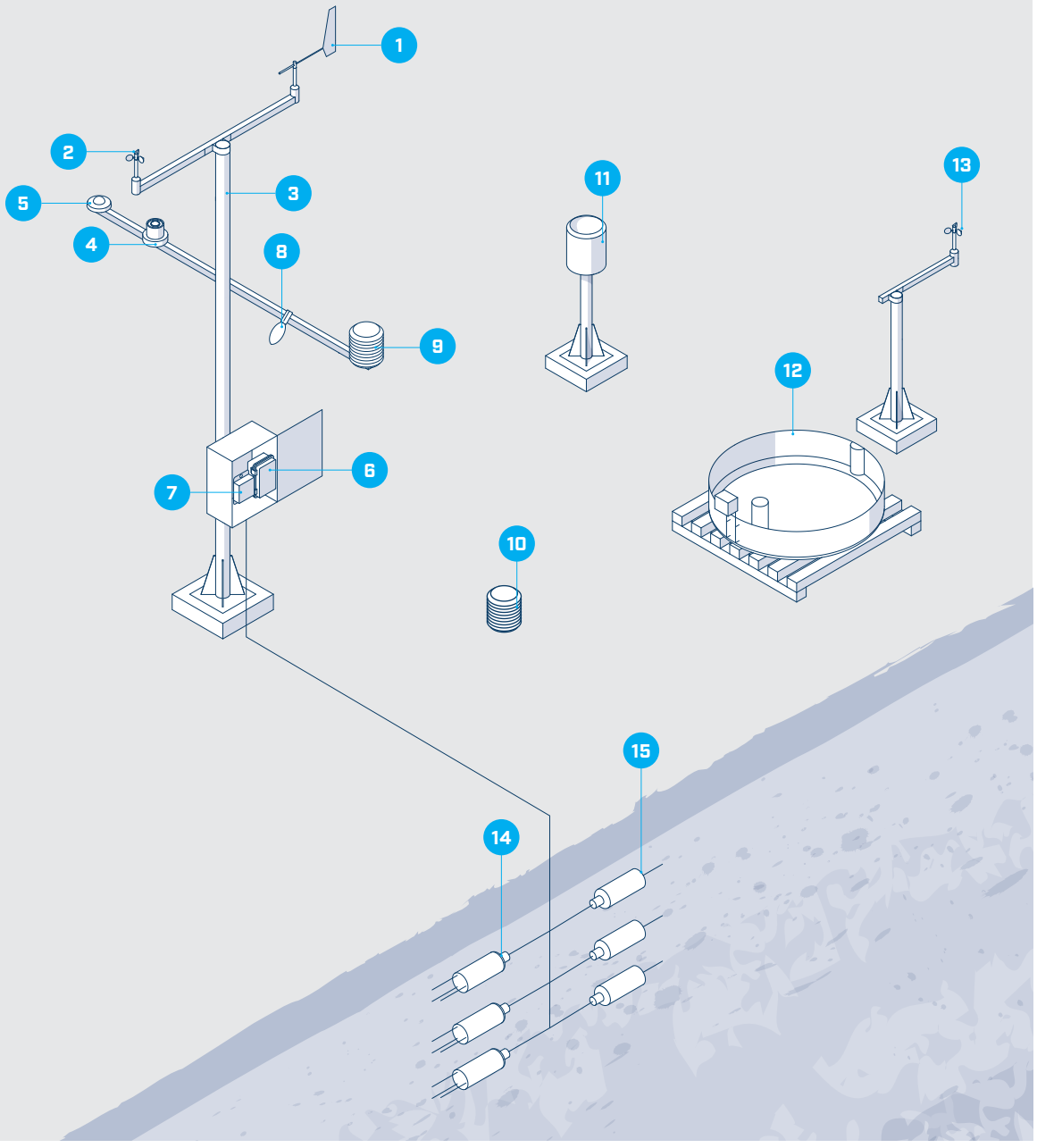
Automatic measurement 24 h/day

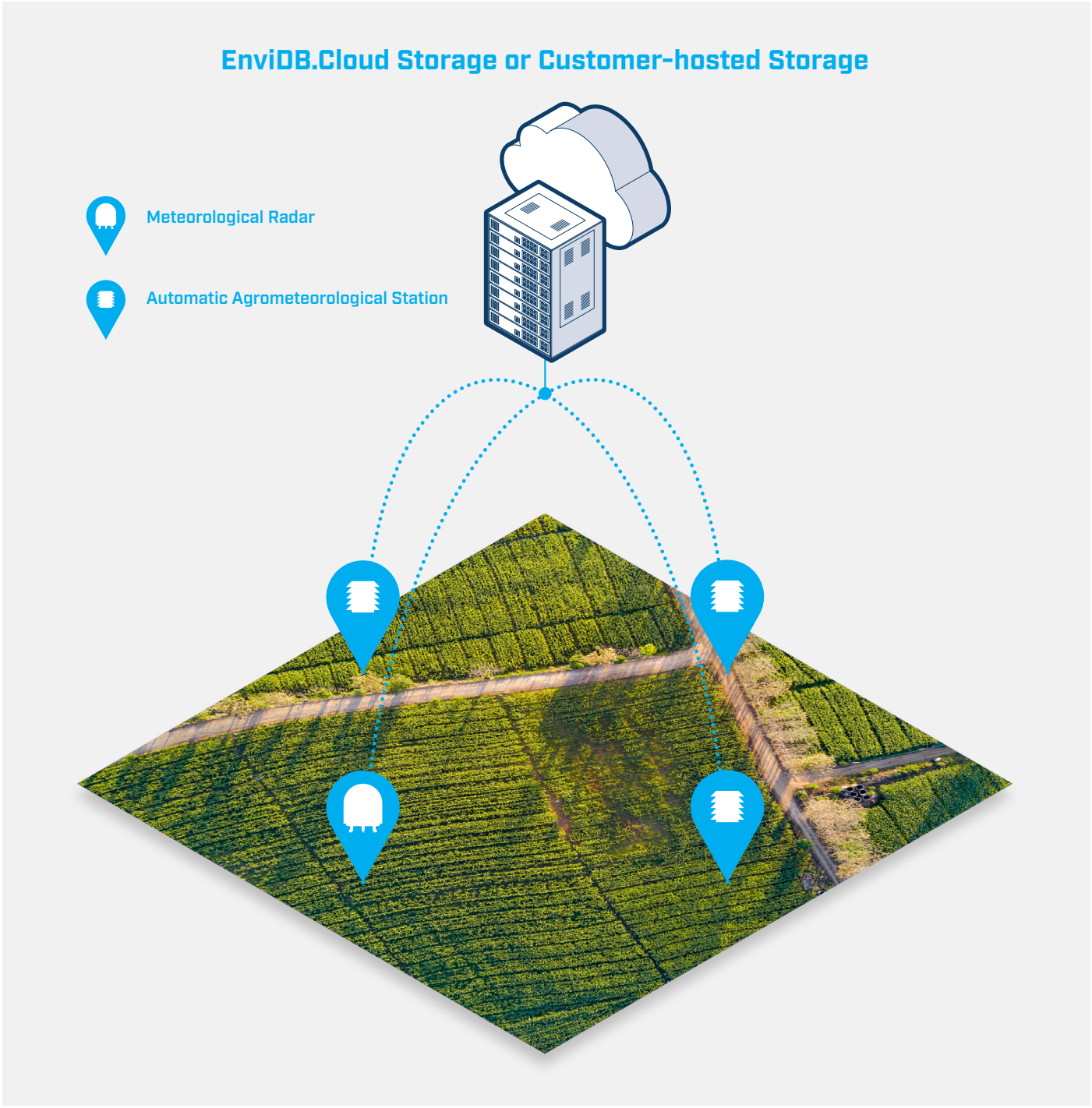
National language support

Optional camera for visual presentation

Station configuration according to clients' requirements

1. **Wind direction sensor**
2. **Wind speed sensor**
3. **Meteorological mast**
4. **PAR sensor**
5. **Solar radiation sensor**
6. **Data logger**
7. **Atmospheric pressure sensor**
8. **Leaf wetness sensor**
9. **Temperature and relative humidity sensor**
10. **Ground temperature sensor**
11. **Precipitation sensor**
12. **Evaporimeter**
13. **Wind speed sensor** (for calculation of evapotranspiration)
14. **Soil temperature sensor**
15. **Soil moisture sensor**





EnviDB.Cloud - Plug your station

1. Obtain your EnviDB.Cloud ID.
2. Install your MicroStep-MIS AWS, connect it to the mobile network and plug it to EnviDB.Cloud for data collection and analysis.
3. Manage your stations and notification.
4. View your data on the web or on mobile application.
5. Subscribe to additional derived datasets: weather, agro, etc.
6. Explore the models and forecasts.

Application programming interface for the 3rd party applications

- REST API
- Web service SOAP API
- Client side: Python, Java, etc.

Measurement

The IMS4 system can interface numerous types of data loggers and sensors. It is designed to measure, calculate and process various meteorological variables such as temperature and relative humidity, wind speed and direction, atmospheric pressure, precipitation, solar radiation, evaporation, etc.

If necessary, the station can be adapted to measure other special agrometeorological variables, such as leaf wetness or soil moisture. It can also collect data from multiple measuring sites located in the field (crop).

Disease/Pest Control & Prevention

Disease prognosis or signalization of occurrence of plant diseases and pests are based on knowledge of their biology and of connections between the disease, the plant and the environment.

The most important environmental variables are usually air circulation, solar radiation intensity, leaf wetness duration, soil moisture, air and soil temperature, precipitation, sun duration. Suitable schedule for the agrotechnical actions (spraying, dusting…) can be thus effectively planned.

Disease danger indices are calculated from station data such as:

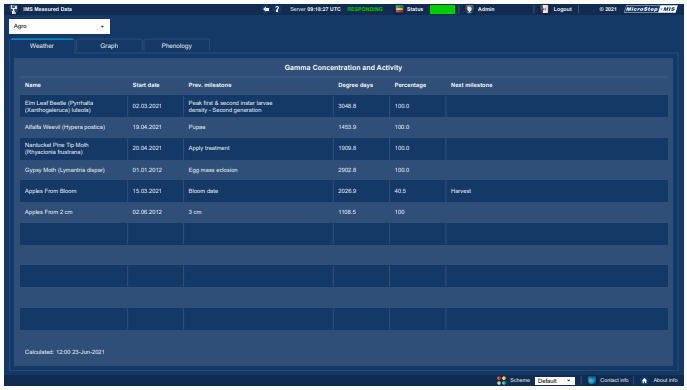
- sum of daily average temperatures
- sum of effective temperatures*
- sum of days with temperatures above specific threshold (cumulative growing degree days)
- daily, weekly, decadal, monthly precipitation sums
- floating precipitation sums
- precipitation deficit
- daily plasmopara index (function of average temperature, relative humidity, precipitation)

**Effective temperature is the air temperature reduced by biological zero (minimum). Biological zero is around +5 °C, and is defined for each plant or tree.*

To signalize possible occurrence season of diseases and pests, the software compares among other:

- sums of average or effective temperatures against thresholds (cereals - erysiphe graminis, potatoes -
- leptinotarsa decemlineata, apple - cydia pomonella),
- maximum daily temperatures or effective soil temperatures against thresholds (cherry - rhagoletis cerasi),
- precipitation sums against long-term normals (cereals - pseudocercosporella herpotrichoides, potatoes -phytophtora infestans),
- cumulative precipitation against seasonally-dependent threshold (vine - plasmopara viticola),
- floating sum of plasmopara index against threshold,
- leaf wetness at given temperature against threshold (apple - ascospore, conidia infections)

The set of the disease and pest models and calculations are subject to continuous improvement. Contact MicroStep-MIS for implementation of new models.



Effective irrigation

The soil water deficit can be easily determined from soil moisture measurements, precipitation and evapotranspiration. Using FAO Penman-Monteith method for calculating evapotranspiration it is possible to enumerate the amount of water necessary for optimal irrigation. Calculation of evapotranspiration according to this method requires wind speed and sun duration sensor. Calculated actual hydrothermic coefficient may also help with effective irrigation.

Freeze protection

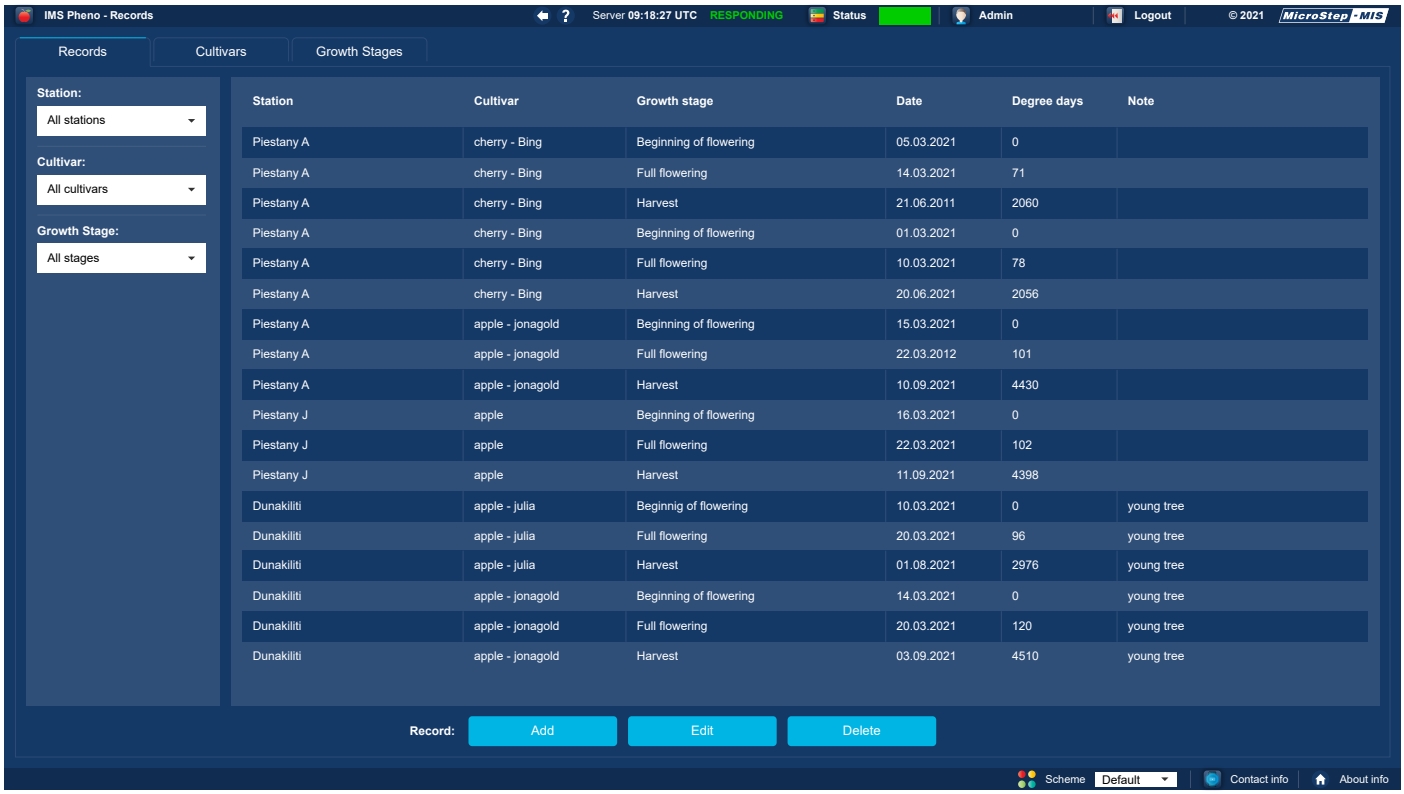
Various methods modeling the radiation cooling, especially for freeze protection and the minimum temperature prediction are implemented.

Estimating phenological phases

The principle of estimating phenological phases is based on real meteorological measurements. For example, the occurrence of flowering phase (in the vineyard) correlates significantly correlates with the 2-month average air temperature (March - April). Some formulas estimating phenological phases have been developed based on experience and long-term analysis of weather data for different plant species and are integrated in the IMS4 Agro Station. Phenological data and climatological normals are also useful, for example, for estimating the sugar content of wine (from temperature and sunshine duration).

Forecasts and Virtual Stations

No station at your farm? Setup the virtual station and plug to the MicroStep-MIS numeric weather analysis and prediction data.



Data presentation

The data measured by the sensors are processed and various characteristics are calculated. IMS4 presents the data on displays and graphs.

Reporting and exporting

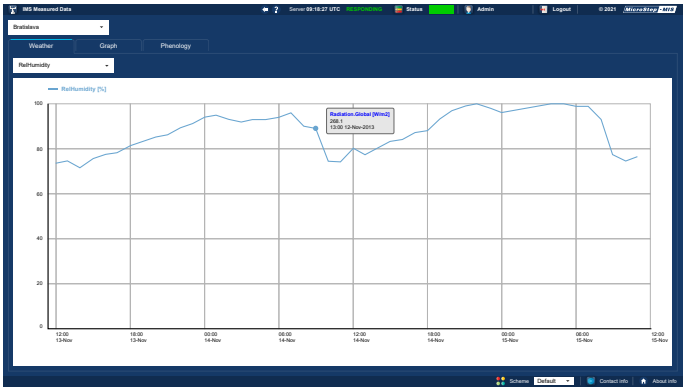
The IMS4 Agro Station can send and receive data in the form of meteorological messages via the GTS network. This feature is useful when the station is not used solely for agricultural purposes, but is also integrated in other meteorological networks.

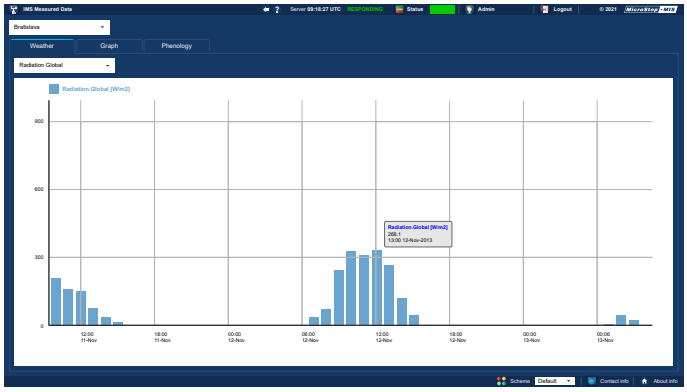
The system works also with other messages, and it is open for new ones. In addition, data files can be exported as standard .csv files for advanced processing in any third-party statistical software.

Alerts and Notifications

Setup your set of alarms and notifications:

- Diagnostics of data-logger and sensor errors
- Quality control and verification of measured data (limits, internal consistency)
- Operational alarms (user-defined thresholds and limits)
- Communication errors
- Freezing conditions detection or warning
- Disease warnings



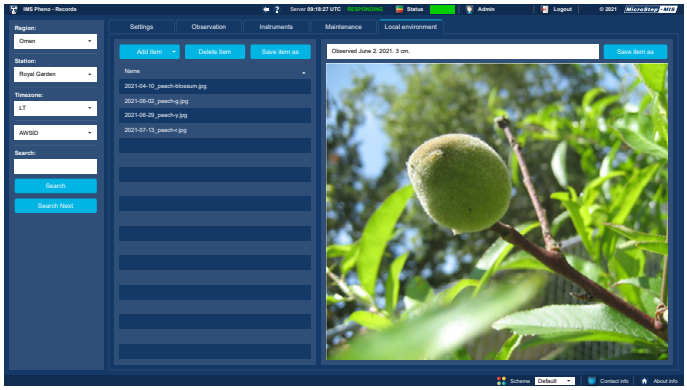


Configuration

The user-friendly interface allows the IMS4 software to be configured to meet the requirements of many different applications, ranging from simple synoptic stations to research types of dozens of sensors and communication lines.

Customization based on XML configuration files includes:

- Station metadata
- Data logger and sensor parameters
- Communication line setup
- Alarms



Remote Maintenance

All IMS4 systems have full remote maintenance capabilities, including download of measured data, sensor maintenance along with data loggers and software upgrades.