Powiat Gniezno
tu powstała Polska

ŚWiAT
Powiatowe Centrum Stacji Meteorologicznych i Wiedzy Przyrodniczej

WEATHER INSTRUMENTS

European Funds
Regional Programme

Republic of Poland

WIELKOPOLSKA REGION

European Union
European Regional Development Fund

I. Stevenson screen

The Stevenson screen is an enclosure to meteorological instruments against precipitation and direct heat radiation. It is constructed of wood protected against the harsh weather conditions, fungi and insects. Moreover, the screen has double-louvered walls ensuring ventilation and is painted white to reflect sunlight. The Stevenson screen holds inside the following instruments:

1. August psychrometer,
2. extreme thermometers,
3. mechanical barometer,
4. thermo-hygrograph,
5. barograph.

1. August psychrometer

This instrument is used to measure air humidity. The principle of its operation is to determine the difference between dry bulb and wet bulb readings. Based on the difference in thermometer readings, the intensity of the evaporation process can be estimated. For the aforementioned purpose, the psychrometric tables are used. With their help, knowing the difference between dry bulb and wet bulb readings, as well as the absolute temperature value, a number of indicators related to air humidity can be determined. The instrument consists of two mercury-free liquid thermometers: dry and wet, and psychometric tables. The measuring range is from 0°C to 40°C.

2. Extreme thermometers

Extreme thermometers are used to measure the minimum and maximum air temperature, i.e. the lowest and highest temperature recorded in a given period of time. Owing to their

construction, thermometers can store the extreme temperature values until reset. Measuring ranges: Minimum thermometer: -50°C to +35°C; Maximum thermometer: -35°C to +50°C;

3. Mechanical barometer

This instrument is used to measure atmospheric pressure. The essential part of the instrument is a vacuum chamber, the deformations of which - caused by changes in atmospheric pressure - are transferred to the pointer. The pointer then shows the pressure value. The unit of pressure is the pascal (named after the French scientist Blaise Pascal). Most often, however, the value of atmospheric pressure is given in hectopascals (hPa).

4. Thermo-hygrograph (or hygrothermograph)

It is a chart recorder that measures and records both temperature and humidity. The pens draw the record on a paper strip (thermohygrogram) placed on a revolving drum. The strips are made of special paper that maintains its size regardless of environmental conditions. The instrument measures:

- air temperature in the range from -35ºC to +45ºC; ±0.5ºC
- air humidity in the range from 0% to 100% RH; ±3% RH

5. Barograph

This instrument records the atmospheric pressure over time in graphical form. The deformation of vacuum capsule is transferred into a vertical movement of a pen and the changes in the atmospheric pressure are recorded on a paper chart (barogram) placed on a revolving drum. The instrument

measures the atmospheric pressure changes in the range from 955-960 hPa to 1055-1060 hPa; ±0.7 hPa.

II. Soil thermometers

Thermometers with a right-angle bend in the stem are used to measure soil temperature at depths not exceeding 50 cm. The bulb is inserted into a hole in the ground while the stem is lying along the surface. The thermometers are permanently mounted and should not be disassembled.

III. Hellmann rain gauge

The Hellmann rain gauge is a traditional, hand-held instrument used to measure the amount (total) of precipitation - mainly rain. This model, with an inlet area of 200 sq cm, works best in lowland areas located below 500 m above sea level. This instrument is used to measure the sum of precipitation in a given period of time (between readings), but at the same time it does not allow to effectively determine when exactly the precipitation occurred, how long it lasted, or how its intensity changed.

IV. Wild anemometer

The Wild anemometer is one of the simplest instrument used to determine the wind speed and direction. Wind direction is determined by a large pointer rotating in relation to the arrows pointing to the cardinal directions. Wind speed can be estimated thanks to the metal plate, which tilts more from the vertical the stronger the wind blows.

V. Windsock (or wind cone, wind sleeve)

It is a conical textile tube, usually with white and red stripes. It can be used as a basic indicator of wind speed and direction. They are typically used at airports, ship masts, highways at exits to exposed areas, at industrial facilities or during sports competitions.

VI. Snow board with snow stick

The snow stick is used to measure the total height (depth) of the snow cover on the ground surface. The measurement value may refer to a single precipitation, as well as the accumulation of snow cover over many days, weeks or months. The obtained results are usually compared with the readings made using a snow board.

VII. Campbell-Stokes sunshine recorder

The basic part is a crystal ball of 10 cm in diameter, set on a stand. It is designed to focus the rays from the sun onto a card mounted at the back. The card is held in place by grooves. The rays burn a trace on the card, from which the time of sunshine is determined with an accuracy of 6 minutes (one tenth of an hour). There are three types of grooves for three types of cards:

- summer card (the bottom groove) - for use from 12th of April to 2nd of September in the northern hemisphere. Its ends are cut (along the marked line at the back of the card) for latitudes ≤25°,
- spring-autumn card (central groove) - for use from 1st of March to 11th of April and from 3rd of September to 14th of October,

- winter card (the top groove) - for use from 15th of October to 28th - 29th of February in the northern hemisphere. Its ends are cut (along the marked line at the back of the card) for latitudes ≥40°

VIII. Educational wind and solar power station

Educational wind and solar power station is used to demonstrate the operation of PV cells and a wind turbine. The light falls on the photovoltaic cell, where the solar energy is converted into electricity. As wind moves past the blades of a wind turbine, it rotates the blades. The kinetic energy of the wind is converted into mechanical energy, and then the generator converts it to electrical energy. This station is used to familiarise children with renewable energy sources, helps in shaping the responsibility for the environment and shows the possibility of using solar and wind energy to produce electricity and heat.

IX. Water well with hand pump

A well with a concrete ring diameter of 1000 mm, a depth of at least 5 m from the ground surface, the upper ring protruding above the ground surface to a height of 0.5 - 0.7 m covered with a round concrete slab with a hatch closed with a padlock. The size of the inspection hatch is to allow observation and control of the water level. The well is used to observe the fluctuations of the first-level water table, resulting from weather conditions, during drought and precipitation. On the inner wall of the well there is a scale – staff gauge (which allows for checking/reading the changes in the water level throughout the depth of the well; the ground surface is a reference point. For qualitative examination of the water level, the well is equipped with a cast-iron hand pump with a suction

strainer installed at a depth allowing for the suction of water from the full depth of the well.

X. Automatic weather station with on-line message

A professional, automatic weather station is perfect for monitoring environmental conditions (meteorological parameters) and soil conditions. Station sensors measure:

- air, soil and ground temperature,
- air and soil humidity,
- wind speed and direction,
- precipitation,
- atmospheric pressure,
- intensity of solar and UV radiation,
- leaf wettability,
- air quality (PM2.5 and PM10).

The measurement modules wirelessly send measurement data in real time in various data transmission standards to the sever.

Owing to power supply via a PV panel and the transmission of measurement data via the mobile network (without an access to WiFi/LAN), the automatic weather station is an autonomous measuring station that does not require constant human supervision.