AMK-03 AUTOMATED METEOROLOGICAL COMPLEX

Description
AMK-03 Automated Meteorological Complex, as well as its modifications AMK-03/1, AMK-03P, AMK-03P/1, PMK-01, BMK-01 are intended for automatic measurements and recording values of the main meteorological parameters of the atmosphere:
- air temperature;
- horizontal wind velocity and direction;
- vertical wind velocity;
- relative air humidity;
- atmospheric pressure.

The AMK-03 device sends to a PC an information on instantaneous values of wind velocity (three orthogonal components) and air temperature with the resolution no worse than 0.01 m/s for wind velocity and no worse than 0.01 °C for air temperature with the sampling frequency, preset by the Producer from 10 to 160 Hz. Automatic calculation of up to 60 statistical and turbulent parameters of the atmosphere can be performed based on the measurement results.

The device can be completed with a PPU-25 control console that calculates mean values of the above indicated meteorological parameters (without PC) and displays them on a screen.

Metrological performance of AMK-03 is standardized for mean values of the measured parameters only (see Table below).

Technical specifications

<table>
<thead>
<tr>
<th>Measurable parameter (symbol)</th>
<th>Measurement range, limits</th>
<th>Measurement error, limits</th>
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</thead>
<tbody>
<tr>
<td>Air temperature (T)</td>
<td>From minus 50 to plus 50 °C</td>
<td>± 0.3 °C, at T &lt; +30 °C; ± 0.5 °C, at T ≥ +30 °C</td>
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<tr>
<td>Horizontal wind velocity (V)</td>
<td>From 0 to 40 m/s</td>
<td>± (0.2 + 0.02 V) m/s</td>
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<tr>
<td>Horizontal wind direction (D)</td>
<td>from 0 to 360°</td>
<td>± 4°</td>
</tr>
<tr>
<td>Vertical wind velocity (w)</td>
<td>From minus 15 to plus 15 m/s</td>
<td>± (0.2 + 0.02 w) m/s</td>
</tr>
<tr>
<td>Relative air humidity (r)</td>
<td>from 5 to 100 %</td>
<td>± 2.5 % at T &gt; 0 °C; ± 5 % at T ≤ 0 °C</td>
</tr>
<tr>
<td>Atmospheric pressure (P)</td>
<td>from 523 to 800 mm Hg</td>
<td>± 0.8 mm Hg</td>
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</table>

Fig. 1. Flow chart of modules connection.
The modular approach is used when producing the device. The main modules are:
- DSV-16 – acoustic thermoanemometer for measuring initial data on air temperature and three orthogonal components of wind velocity (Fig. 2);
- DDV-12 – atmospheric pressure gauge and humidity detector (Fig. 4);
- DSV-15 – meteorological parameter sensor for measuring initial data on air temperature, three orthogonal components of wind velocity, atmospheric pressure and air humidity (combines functions of DSV-16 and DDV-12 modules) (Fig. 3);
- PPU-25 – control console for autonomous calculation and indication of mean values of meteorological parameters, as well as for connection of the devices to a PC (Fig. 6)
- BPN-52 – power supply unit (Fig. 5).
“METEO 3.0” Windows application (Fig. 8) is also included into AMK-03 set. This application records initial data, processes the data obtained and automatically saves the results.

Fig.8. The main window of “METEO 3.0” application.

**Technical appraisal and economic benefits**

The ultrasonic method is used in the AMK-03 complex for measuring air temperature and wind parameters that allows increasing substantially an information content of measurements, improving their accuracy and sensitivity, as well as improving stability of information acquisition under impact of unfavorable climatic factors.

Absence of mechanical meteorological sensors (spiral or cup anemometers, liquid thermometer-psychrometer, hair hygrometers, etc.) improved essentially functional performance of the AMK-03 complex, made it insensible to exposure of condensed precipitation (icing up) and extended interservicing interval.

Application of ultrasonic method provided very small response time (no more than $10^{-3}$ s), high sensitivity to turbulent changes of meteorological parameters and zero effect of solar radiation on measurement results.

During measurement session, initial data from meteorological sensors are automatically transferred into remote computer as a digital noise combating code of RS-485 standard, where they are converted into RS-232 standard.

An application of a PC provided with the “METEO 3.0” specialized software gives the following possibilities:

− real-time calculations of a number of secondary characteristics of meteorological fields that are of great importance for solving many specific problems (associated with physics of atmospheric ground layer, forecasting spread of pollution, etc.);
− running complementary modes of operation (automatic round-the-clock measurements without an operator, dialog mode of operation, self-testing of functioning of hardware components of the complex, and automated calibration mode);
− creation and maintenance of a local database containing values of the main meteorological parameters over a long period of time with automatic storage of new data.
Application areas
− Routine and automated meteorological observations in ground atmospheric layer;
− ecological air monitoring;
− monitoring of ambient air in industrial areas;
− research into physical processes in the atmosphere.

Development stage
Initial stage of production.
Produced by the Institute of Monitoring of Climatic and Ecological Systems SB RAS together with a small-scale enterprise Sibanalitpribor, Ltd.

Patent situation
Patent has been granted.

Commercial offers
- Contracts for manufacturing and direct supplies;
- marketing agreements;
- contracts for rendering measurement services.

Estimated cost
Price is determined in an agreement and depends on complex modification and complete set.

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