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| |  |  |  | | --- | --- | --- | | **Smart Integrated Greenhouse Climate Control System.**  **Functional Features.**  Climate control system options include:   * monitoring of the indoor parameters in greenhouse and outdoor environment, * programming diurnal schedules for climate control settings, * archiving and graphic analysis of measured data, * environmental control in two Greenhouses or in four Greenhouse zones Etc.   Environmental control is based on monitoring and control of the air temperature and relatively humidity as well as concentration of Carbon Dioxide gas in greenhouse.  Software-based algorithms of system operation supply the coordinated control of the several heating pipes in climate zones: the pipe of the lower (over soil) heating, the pipe of the upper (hip-roof) heating, the pipe of local (side) heating, the pipe of the under soil heating, the pipe of under hip-roof chute heating and other execution units: passive roof vents, CO2 enrichment, thermal/shade curtain (screen), ventilation fans, hot air heaters and evaporative cooling and humidity system.  **Structure of the System.**  Climate control system includes supervisory PC, controlling unit, control relay unit and sensor kit. PC and controller unit are connected by RS-485 bus. One supervisory PC may connect up to 12 controller units. Overall block diagram of climate control system is presented on Fig:01  Controller unit has universal input ports. It supplies monitoring up 20 indoor/outdoor parameters and controlling up 24 executive units. All parameters wire to supervisory PC for graphic analysis and archiving. Controller unit is equipped with button console and LCD indicator for operating control and setup. In standard specification sensor kit supplies the monitoring of indoor temperature and relative humidity, temperature of roof glass, soil temperature and leaf temperature. In addition there is capability to receive the temperature information from some indoor points. Temperature and relative humidity air sensors are mounted in ventilation cells. Wetwell temperature sensors are used in every supply pipes to provide feedback correction for mixing valve positioning. Also Wetwell temperature sensors are mounted in main supply and return pipes to provide general information about incoming heat energy. Monitoring of outdoor environment is provided by outdoor air temperature sensor, solar radiation sensor and combined mechanical wind speed and direction sensor.  The control of execution units is provided by relay unit with working current up to 8 A for one execution unit. There is manual system control panel on controller unit for setting either automatic or manual control for individual execution in system.  **System Software.**  Controller unit provides the direct measurement of all indoor and outdoor parameters at a set time intervals, after that calculates control actions in accordance of specified EEPROM-based algorithm and diurnal,schedules.  PC software allows to archive and to visualize in real-time all given and measured parameters of the greenhouse climate, as well as calculated controlling influences. Each minute controller calculates and sends to supervisory PC more than 280 measured and control values. The supervisory software provides user with the full information to adjust parameters that are being controlled and with all diagnostic and emergency messages in text and voice modes in real-time. User assigns daily climate task, strategy of control, control parameters, calibration data for all sensors and borders of the measured values. Local supervisory PC can be included in network by standard facilities. Thus all data from any controller can be displayed at any supervisory computer. Outdoor environment parameters, obtained by some controller from different sensors, are collected in local supervisory PC and then distributed among all controllers. In case of appearance of the problems in quality of control, you can send all archive data to our specialists for analyzing and preparing recommendations on adjustment of control parameters. The possibility of remote control from supervisory PC exists.  **Water Management System** Nutrient solution units for various technologies:Drop irrigation, lettuce lines and seedling sections watering, floricultureFiltered water flows to the mixing tank (the mixer) of the nutrient solution unit. Water is pumped into the drop irrigation system and provides the necessary pressure for the ejectors’ work. Ejector consists of a nozzle and a mixing chamber. Water flows through the narrow nozzle under pressure. Mixing chamber produces rarefaction. And due to the fact that the pressure inside mixing chamber is lower than atmosphere one, mother solution flows into the chamber and is mixed with the water flowing through the ejector. Measuring of the mother solution is fixed by the electromagnetic valves that are managed by controller. Fertilizer measuring system provides preparation of the nutrient solution:   * using fertilizers of any quality; * keeping accurate concentration of nutrient materials; * running measurements and controlling conductivity and pH permanently.   After water filtration solution is injected into the distributive system according to the schedule set by an agronomist or a technologist.  The irrigation task programming   * offers friendly interface; * doesn’t  require expert knowledge; * becomes familiar within the several hours; * allows user to organize balanced plant nutrition all day long.   Controllers can be joined by the network and connected to a PC. Special PC software is developed for remote controlling and monitoring the nutrient solution unit.  “ASCENSORTECH” solution units are easy and reliable in operation. Control and power units are placed in hermetic enclosures (IP65). All the elements of the solution unit are made of non-corroding materials.  Also we offer preliminary project inspection, preparing of all project documentation, patron-assemblage, fettling and putting into operation for free.  The service maintenance (during the warranty and after it) is an essential part of our firm policy. Equipment and spare parts are delivered to consumers at the earliest possible date.  Through all work period firm use to carry out in-depth study of the consumer market and polishes up its equipment in order to satisfy the increasing requirements of our partners. | http://www.fito-agro.com/images/spacer.gif |  | |
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