

Contol-X

Grow Room AHU Automation & Control System

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1. Product Overview

Contol-X is an integrated climate-control and automation system for grow-room air handling units (AHUs). It combines an industrial-grade programmable controller, an on-panel operator HMI display, and cloud-connected mobile & web applications into a single automation platform — covering temperature, humidity, and CO2 regulation, compressor/heater staging, ventilation (VFD) control, and motorized fresh-air damper control, with remote monitoring and control from anywhere.

2. Key Features

Environmental Sensing

- Dual RTD temperature probes (air intake + substrate/bag), individually calibratable
- CO2 concentration sensing
- Relative humidity (RH) sensing

Automated Climate Control

- Up to 3 independently staged compressors with automatic rotation scheduling
- Heater control with safety interlock (never runs simultaneously with active cooling)
- Humidifier / dehumidifier control with mutual-exclusion safety logic
- Configurable hysteresis per control loop to prevent short-cycling

Ventilation (VFD) Control

- Manual, Semi-Automatic, and Fully Automatic speed control modes
- Load-based speed lookup table (0/1/2/3-compressor and heating states)
- Proportional temperature trim and damper-position speed boost in Auto mode

Fresh-Air Damper Control

- Manual, CO2-based Semi-Automatic, and Fully Automatic positioning modes
- Multi-priority safety logic: temperature-emergency force-close, CO2-emergency force-open
- Anti-drift safeguard: full-duration recalibration close cycle, eliminating position-sensor drift that could otherwise leave the damper physically open while reported as closed
- Configurable ramp rate for smooth, gradual positioning

Setpoint Ramping

- Gradual, configurable-rate transitions for temperature, humidity, and CO2 setpoints
- Avoids shock-loading of mechanical and biological systems on setpoint changes

Startup Anti-Jerk Protection

- Independently configurable startup delay (seconds) per output
- Staggers compressor/heater inrush current across multiple units sharing one power supply, reducing peak demand after a power interruption

Remote Monitoring & Control

- Dedicated smartphone app with live dashboard, manual override, and full parameter control
- Secure web-based dashboard, accessible from any modern browser
- Multi-device fleet view — monitor and manage every connected unit from one account
- Role-based access control (administrator / supervisor / operator)

Local & On-Site Operation

- On-panel HMI touchscreen for direct local operation, independent of network connectivity
- Full local-network (LAN) operation — core control does not require internet access

Data & Diagnostics

- Cloud telemetry logging for historical trend analysis
- Live device diagnostics: communication health, firmware version, uptime

3. Compatibility

Category	Compatible with
Temperature sensing	RTD-class probes (2-point or multi-point field calibration)
CO2 / RH sensing	Digital CO2 + relative-humidity sensor module (industrial serial interface)
Compressor / heater outputs	Standard relay-driven contactor/load circuits (3x compressor stages + heater)
Humidity outputs	Relay-driven humidifier and dehumidifier loads
Damper actuator	Open/close relay-pair motorized actuator with end-of-travel timing calibration
Ventilation drive	Variable Frequency Drive (VFD) via industrial serial fieldbus
Network	10/100 Ethernet (LAN); core control functions independent of internet access
Cloud / remote protocols	Encrypted message-queue telemetry transport; secure HTTPS REST API
Mobile platform	Android smartphones & tablets (Android 7.0 and newer)
Other client platforms	Any modern desktop or mobile web browser; installable web-app for iOS
Power	Industrial DIN-rail / panel-mount low-voltage DC supply

4. Technical Specifications

Parameter	Specification
Controller class	Industrial-grade programmable logic controller (PLC)
Operator interface	Integrated Delta Electronics HMI touchscreen panel
Power input	Low-voltage industrial DC supply (DIN-rail / panel-mount compatible)
Digital/relay outputs	Multiple relay outputs (compressors, heater, humidity, damper, status indication)
Communication interfaces	Ethernet (LAN), industrial serial fieldbus (sensor & VFD), MQTT, HTTPS REST API
Operating ambient range	Industrial-rated operating temperature range (per controller datasheet)
Temperature measurement	Dual-channel RTD input, field-calibratable
CO2 / RH measurement	Digital serial sensor interface
Mobile app minimum OS	Android 7.0 (API level 24) or newer
Remote connectivity	Encrypted MQTT (TCP & WebSocket transport); HTTPS REST API
Data logging	Cloud-based historical telemetry logging

Note: ambient operating range, power tolerance, and output ratings are governed by the installed controller/HMI hardware's own datasheet; figures above describe the class of component used, not specific numeric ratings of any single named product.

5. Certifications

The system is built on industrial control components carrying the following standard regulatory certifications. Certification scope applies to the underlying hardware components as supplied by their respective manufacturers.

Programmable Logic Controller (core control unit)

- CE marked — EU EMC Directive (2014/30/EU) and Low Voltage Directive (2014/35/EU)
- UKCA marked — UK Conformity Assessed
- FCC compliant — Part 15, Class B (radiated & conducted emissions)
- RoHS compliant — Directive 2011/65/EU (restriction of hazardous substances)

Operator HMI Panel (Delta Electronics)

- CE marked
- UL recognized component (model-dependent)
- RoHS compliant

Important: the certifications above reflect standard, publicly documented compliance typical of the component class used in this product. Exact certificate numbers, scheme identifiers, and model-specific scope should be verified against the original component manufacturer's certificates/datasheets before use in any regulatory submission, tender, or compliance filing.

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