FVC-2100 & 2200 Plus Fume Hood Controller

Sample Specification

Variable Volume Control based on Sidewall Sensing, ARCnet for use with SmartLab System.

X. 1 FUME HOOD FACE VELOCITY CONTROLLER

A. Face velocity shall be controlled at each laboratory fume hood by a dedicated face velocity controller. The fume hood face velocity controller shall be a fully functioning, independent control unit, capable of operating as a standalone element in a distributed laboratory airflow control system. Control hardware distribution shall be such that the failure of one controller shall not affect any other fume hoods on the network.

B. The face velocity controller shall consist of a transmitter/controller, display module and two face velocity probes. Face velocity shall be sensed by a thermal mass flow sensor mounted in the transmitter and tubed to two probes in the Fume Hood. The face velocity probe shall be mounted in the sidewall of the fume hood and exposed to the hood interior. The reference probe shall be mounted in the wall of the hood and exposed to the room. On larger hoods, 8' wide and larger, two sidewall sensors and one reference sensor shall be provided: one for the left wall, and one for the right wall, with the reference probe mounted in the wall of the hood and exposed to the room. The controller shall have the availability of an exhaust duct airflow probe input for measurement of Fume Hood Exhuast Airflow Volume, and have the abiltiy to utilize this input for monitoring and/or High/Low Volume Limits if specified in Sequence of Operations.

C. The transmitter/controller module shall be microprocessor based and shall include the air velocity sensor. The transmitter module shall be powered by , 24 VAC , +/-20%. It shall be provided with two 4-20mA analog outputs, two contact inputs, a SPDT alarm relay output, and an RS-485 communications port.

D. The RS-485 communications port shall provide communications with all other Lab Airflow and Fume Hood Face Velocity controllers in the facility via a single network operating at 625 kilobits speed. This shall be a Peer-to-Peer, token pass type of communications network. The individual controllers shall not be dependent upon this communications port for operation, and communication interrupts shall not slow the control response of the system. In the event that the Network continuity is broken, the controllers shall automatically re-configure so that the Labs will continue to control.

E. The air velocity sensor shall be of the bi-directional thermal mass flow type. Units that cannot detect direction of airflow are not acceptable. Aspiration of air through the sensor shall not be greater than 14 CCM (cubic centimeters per minute) at 100 FPM face velocity.

F. The operational range of the monitor shall be scaleable in FPM. A 4-20mA transmitter output shall be provided which is proportional to the scaled range.

G. The sensor and microprocessor based transmitter shall be capable of measuring flow over the operating range with a resolution of +/- 5 feet per minute (FPM), and an accuracy of +/-10 FPM.

H. In the controller, the actual face velocity shall be compared to the desired face velocity set point. Control equations shall be of the P+I type. Microprocessor based controllers shall read the face velocity, perform control calculations, and update the output to the damper a minimum of five times per second. Floating “Gap” control will not be acceptable.

I. The controller shall be configurable to provide High Airflow Limit Control and Low Airflow Limit Control where duct airflow probes are provided and where specified in Sequence of Operation. Low and High values shall be entered separately in engineering units. The controller logic shall automatically switch from face velocity control to airflow control, and back again, when airflow volume values cross the High or Low Limits. Control equations shall be of the P+I type. The airflow control algorithm and tuning constants shall be separate from the face velocity algorithm and tuning constants.

J. The controller shall output a 4-20mA electronic signal to a dedicated electronic to pneumatic converter and airflow control valve, as specified elsewhere in this document. Control response time shall be sufficient to contain fumes at all times when the sash is opened.

K. The face velocity controller shall be capable of communicating digitally with the Lab Airflow Controllers and an Communication Interface Computer via an RS485 digital Peer-to-Peer, token-pass network operating at 625 kilobits speed. The adapter shall permit connection to the BAS. All appropriate parameters including face velocity, set point, alarm limits, output, and override condition, shall be available for communication to the BAS.

L. The Fume Hood Controller shall be fully configurable via a hand-held setup tool or a PC. The tool shall have a keypad and digital display. Configuration shall be accomplished through simple operator-selectable menus.

M. The Controller shall have unoccupied mode capability, identified as “NITE”, “UNOCC”, or “RESET” on the display. A digital input shall be assignable, through menu selction, to effect the transfer from occupied to unoccupied. The “Low Face Velocity Alarm” setpoint shall be replaced by a lower, adjustable, “Low-Low Alarm” setpoint during the unoccupied mode.

N. The unoccupied mode shall have the menu-selectable option for a countdown period with audible and visual warnings of the pending transfer to unoccupied mode. The duration of the countdown period shall be adjustable from 10 to 60 minutes in 10 minute intervals. The countdown shall also be defeatable for immediate change to unoccupied mode. The adjustable parameters shall be adjusted using the hand-held Programming Tool or a PC.

X.2 FUME HOOD CONTROLLER DISPLAY

A. The face velocity controller shall provide a 4-digit display to indicate the actual face velocity in feet per minute and set point parameters. Energy use meters shall not be acceptable alternatives to the digital display of face velocity in FPM.

B. A green LED shall indicate a safe condition at the fume hood. A red LED indicator shall display either a high or low face velocity alarm condition. When an alarm condition occurs, the alarm LED shall flash and the alarm beeper shall sound. The operator shall be able to silence the beeper through a mute button located on the face of the controller.

C. The display shall provide the option to read in “Alpha” mode instead of numeric. The “Parameters” button on the face of the Display shall allow the operator to scroll through all operating parameters and alarm setpoints, which shall be displayed on the LCD, including but not limited to:

1. Controller Software Revision number.
2. Face Velocity, FPM
3. Face velocity setpoint, FPM
4. High alarm setpoint, FPM
5. Low alarm setpoint, FPM
6. Low-Low alarm setpoint, FPM
7. Controller output level, %.
9. Exhaust Airflow Measurement, CFM (where sensors are provided)
10. High Airflow Limit Setpoint, CFM (where sensors are provided)
11. Low Airflow Limit Setpoint, CFM (where sensors are provided)

XX.1 SEQUENCE OF OPERATION

Fume Hood Face Velocity

A. The Fume Hood Face Velocity Controllers (FVC’s) shall control as stand-alone units, modulating the hood exhaust valves as required via the factory-mounted I/P’s. The FVC’s shall have local displays and alarms. They shall communicate operating parameters to the BMS via the Lab Controller Network through the communications adapter.

B. The face velocity controller shall measure the fume hood face velocity and compare it to the face velocity setpoint. The face velocity controller shall modulate the fume hood exhaust valve, via its I/P, to maintain the face velocity at setpoint. Under normal operating conditions, a green LED, located on the face of the Display, shall alert the operator that the unit is operational and the velocity is acceptable.

C. Should the face velocity remain off setpoint by a prescribed amount and for a prescribed period of time, the Fume Hood Controller shall initiate a local alarm and close a local contact which can be connected to a remote location for alarming. The local alarm shall consist of a flashing red LED and a beeper on the Fume Hood Display. The beeper shall be temporarily silenced by pushing a Mute button on the Fume Hood Display. The alarm light shall be de-energized when the alarm condition is rectified.

D. The Fume Hood Display shall report the face velocity in FPM on its 4-digit LCD. The display shall provide the option to read in “Alpha” mode (NORL/ALERT) instead of numeric. The “Parameters” button on the face of the Display shall allow the operator to scroll through operating parameters and alarm setpoints, which shall be displayed on the LCD.

THIS PARAGRAPH FOR FLOW LIMIT CONTROL ONLY

__. *The duct airflow probe in the Fume Hood exhaust shall measure airflow volume and report it to the controller. If the airflow volume exceeds the Highor Low Airflow Limits, preset in the controller, the controller shall automatically switch from face velocity control to airflow control. The controller shall modulate the airflow control valve to*

maintain the airflow volume desired. When the airflow volume returns to a value within limits, the controller shall automatically switch back to face velocity control.

E. In the event of a spill in the Fume Hood, the Display shall have an "Emergency" button which the operator can push to override velocity control and force a maximum flow purge mode of the Fume Hood Exhaust Valve. A red LED on the face of the Display shall light to alert the operator that the hood is in the purge mode. The controller will remain in "Emergency" purge mode and the LED shall remain lit until the button is pushed again.

F. Upon receipt of a dry-contact from the BAS input to a Digital Input on the controller for transfer to unoccupied mode, the controller shall begin a countdown sequence prior to transferring to unoccupied mode. The countdown time period shall be selected via a configuration menu.

G. The countdown sequence shall provide a "beep" tone (which can be silenced by the Mute button on the face of the controller) to acknowledge the commencement of the countdown sequence. This tone shall be accompanied by the Alpha display message "REST" and countdown period in minutes. Then the display shall change to "REST" alternating with present face velocity FPM during the countdown period. At the halfway point of the countdown period, the "beep" tone shall sound again, and remaining countdown time shall show momentarily. Then the display shall change again to "REST" alternating with present face velocity FPM during the countdown period. At one minute prior to transferring to unoccupied mode, the "beep" tone shall sound again, and remaining countdown time shall show until the controller actually transfers to unoccupied mode. Then the display shall change again to "REST" alternating with present face velocity FPM during the entire time that the controller remains in unoccupied mode. The controller shall remain in unoccupied mode until the dry contact input to the Digital Input is opened by the BAS.

H. When in the unoccupied mode, the "Low Face Velocity Alarm" shall be replaced by a "Low-Low Face Velocity Alarm", whose value is adjustable.

I. The duration of the countdown period shall be adjustable from 10 to 60 minutes in 10 minute intervals. The countdown shall also be defeatable for immediate change to unoccupied mode. The adjustable parameters shall be adjusted using the hand-held Programming Tool, lap-top computer or a PC.

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