MS-Word 2003 Format for inclusion in bidding specification documents.

EDIT: All notes shown in red shall be edited in or out. Add or delete device options as required of individual project. Delete red “Edit Notes” in final copy. This specification is a "specification outline" and requires final editing by a sales representative to ensure completeness. This guide specification may be edited into a "Performance Guide for Design-Build"; or it can be edited to provide specific items to be bid by the Installing or General Contractor.

Metric conversion, where used, is soft metric conversion.

This specification utilizes the Construction Specifications Institute (CSI) Manual of Practice, including MasterFormat™, SectionFormat™, and PageFormat™. It is a manufacturer-specific proprietary product specification.

Please check the Phoenix Controls website at [www.phoenixcontrols.com](http://www.phoenixcontrols.com) for the most current equipment specifications updates.

Phoenix Controls Actuator Control Module (ACM) and Fail-Safe Module (FSM)

Guide Specification

Table of Contents

[PART 1 - ACTUATOR CONTROL MODULE (ACM) 2](#_Toc158839718)

[1.01 SUMMARY 2](#_Toc158839719)

[1.02 OVERVIEW 2](#_Toc158839720)

[1.03 DEVICE DESCRIPTION 3](#_Toc158839721)

[1.04 MOUNTING AND INSTALLATION 3](#_Toc158839722)

[1.05 SERVICABILITY 3](#_Toc158839723)

[1.06 PERFORMANCE 4](#_Toc158839724)

[PART 2 - FAIL-SAFE MODULE 4](#_Toc158839725)

[2.01 SUMMARY 4](#_Toc158839726)

[2.02 OVERVIEW 4](#_Toc158839727)

[2.03 DEVICE DESCRIPTION 4](#_Toc158839728)

[2.04 MOUNTING AND INSTALLATION 5](#_Toc158839729)

[PART 3 - AGENCY APPROVALS 5](#_Toc158839730)

[PART 4 - ACM PINOUT 6](#_Toc158839731)

[PART 5 - FSM PINOUT 6](#_Toc158839732)

[PART 6 - INTEGRATION POINTS 7](#_Toc158839733)

Table of Contents shown for reference only.

Delete this Table of Contents and Notes page and Page Break prior to specification submission or use.

1. ACTUATOR CONTROL MODULE (ACM)
   1. SUMMARY

As a component of the Phoenix Controls Critical Spaces Control Platform (CSCP), the Actuator Control Module (ACM) is required on all Phoenix Controls High-Speed electric valves. The ACM is used for the purpose of building HVAC control and functions as a characterization module for the venturi valve, controls the position of the high-speed electric actuator, monitors the input from an optional pressure transducer or low pressure switch, and receives input from the fume hood sash sensors and zone presence sensor. The ACM guarantees the speed of response, accuracy, repeatability, and reliability of the actuation control of a Phoenix Controls high speed venturi valve.

NOTE: For more information about Critical Spaces Control platform components, reference the Critical Spaces Control Platform Guide Specification (MKT-0529), Critical Spaces Control Platform Valve Guide Specification (MKT-0526), Programmable BACnet Controller Guide Specification (MKT-0520), and FHD500 Guide Specification (MKT-0515).

* 1. OVERVIEW
     1. The ACM shall be factory mounted to the venturi valve.
     2. The ACM shall be factory characterized with flow data on every venturi valve to capture the unique characteristic of every venturi valve and provide accurate and repeatable controllability.
        1. Characterization shall be completed across the entire pressure range and flow range of specified valve.
        2. Characterization shall guarantee +/- 5% of airflow to setpoint throughout the specified pressure range and flow range of the venturi valve. Devices that require K factors or multiple adjustments for different pressures or flows shall not be acceptable.
        3. Characterization shall be stored in backup at the manufacturers facility and upon request shall be available to customer for validation (fees may apply).
        4. Characterization shall be completed on a NVLAP accredited and NIST traceable air station. Upon request validation of air stations shall be provided to customer.
        5. The ACM Shall store configuration parameters in flash, non-volatile memory so that power cycles will not require data to be re-written to the controller.
     3. The ACM shall have capability to have a pluggable fail-safe module that allows the ACM a soft shut-down on power loss, and drives the valve to maximum flow, minimum flow, shutoff, or a pre-determined configurable flow upon power loss.
     4. The ACM shall have LED array on face of the unit to show status of (at a minimum) power, communication, Universal Input Output (UIO) status, Fail-Safe Module (FSM) status, and flow position.
     5. The ACM shall support 24vdc linear High Speed Electric Actuators (HISEA).
        1. When used as High Speed application the ACM shall initiate valve movement and achieve the commanded airflow value with no more than 5% overshoot or undershoot within 1 second or less. Full stroke time is less than 3 seconds from shutoff to full open, or from full open to shutoff.
        2. The ACM shall be able to be configured for slower speed actuation if desired.
  2. DEVICE DESCRIPTION

A. The ACM shall be a microprocessor-based controller with LED array and pushbutton/rotary knob for user override operations.

B. Core processor is an MIMXRT1051CVJ5B (or greater) from NXP manufacturer, the specifications for this processor are:

1 (Minimum) Core Arm Cortex-M7 MCore™ Platform

2. Frequency up to 528 MHz (for industrial chip)

1. The ACM shall connect to:

1. Programmable BACnet Controller (PBC) when used in a high speed laboratory environment via RS485 connection.

2. BAS network as a standalone BACnet controllable interface on a high speed venturi valve.

3. Third party controller via Universal Input Output (UIO) as a standalone analog device utilizing analog signal for command/feedback/alarming.

4. Fume Hood sash sensors and Zone Presence sensor when used with a Fume Hood.

D. Ratings

1. Power

1. The ACM requires 24VAC (±15%) input that can be connected via pluggable connector; 50 – 60 Hz rating.
2. 50 VA Max
3. Operating Environment
   * + - 1. Operating Temperature range shall be between 32 – 122°F (0 – 50°C)
         2. Storage and Shipping Temperature range shall be between 32 – 122°F (0 – 50 °C)

c. Operating and Storage Humidity range shall be between 5 - 95% RH, non-condensing

E. Dimensions

4.31 in.× 4.70 in. × 2.32 in. (109.5 mm × 119.4 mm × 59 mm)

The ACM consists of a plastic enclosure with vents for passive dissipation, access to the DIP switches for address and mode configuration, electrical connections to the pluggable interfaces, and touch-flakes terminals for communication and power.

F. Weight

* 1. lbs (295.8 g)

1.04 MOUNTING AND INSTALLATION

* + 1. The ACM shall be factory mounted on a Phoenix Controls Venturi Valve and is suitable for mounting in boxes conforming with standard DIN43880 and having a maximum slot height of 1.77 in. (45 mm). The ACM is suitable for panel rail mounting on a 1.38 in. (35 mm) standard panel rail.
    2. System transformers used to power up the ACM must be safety isolating transformers according to IEC 61558-2-6. In the U.S.A. and Canada, NEC Class 2 transformers must be used.
    3. Suitable wire specifications can be found in Phoenix Controls Cabling Guide (MKT-0521).
  1. SERVICABILITY

Controllers in the field shall be replaced as a single unit. The controller cover is not intended to be removed in the field. Handling of the printed circuit board is not recommended due to risk of damage from electro-static discharge.

* 1. PERFORMANCE

The ACM shall provide a set of features to allow it to be connected into a CSCP platform or to be installed as a standalone network. Features include:

A. 24 VDC Linear High Speed Electric Motor output capable of handle up to 2A continuous output via pluggable connector.

B. 24 VAC main power input.

C. One Differential Pressure Sensor analog interface for external sensors.

D. Two Universal Input/Output interfaces for general purposes or Fume Hood inputs when use with fume hood.

E. Valve position feedback interface: Potentiometer.

F. BACnet MS/TP and RS485 communications protocol.

G. Status LEDs, push buttons and a rotary knob user interface for local flow override and controller reset.

H. External (optional) Fail-Safe module pluggable via touch-flake connections for emergency power backup during power-lost scenarios.

1. FAIL-SAFE MODULE
   1. SUMMARY

In fail-safe conditions the Airflow Control Device must remain mechanically pressure independent and in control of airflow at its failed position; i.e., if a device fails in position at 500 cfm, the airflow control device must remain pressure independent regardless of having power/controller operating and will deliver the 500 cfm at that given control point regardless of duct pressure (within product specifications). Airflow control devices with single or dual blades that fail in position or fail open will not be acceptable as the airflow delivered cannot be guaranteed due to device not being mechanically pressure independent.

* 1. OVERVIEW

The ACM shall support the Fail-Safe Module (FSM) via touch-flake connection on the right side of the ACM controller. By connecting the FSM on the right-side touch-flakes to the ACM emergency power backup shall be provided when main input power has been lost, enabling the valve and the ACM to run the power loss sequence, and drive the valve actuator to a pre-determined setpoint (Fully Open, Fully Closed, Shut-off , or a predetermined flow setpoint) 24VAC main power input. The ACM shall utilize a pluggable Fail-Safe Module (FSM) to allow ease of replacement or addition to ACM after the valve has been installed.

* 1. DEVICE DESCRIPTION

A. The Fail-Safe Module (FSM) shall be a supercapacitor-based module capable of driving the actuator when the venturi valve has fan pressure.

B. FSM supercapacitors shall charge continuously from the ACM during normal operation.

C. The FSM shall have analog circuitry that enables the discharge of the supercapacitors when needed.

D. The FSM shall utilize BACnet MS/TP and RS485 communications protocol.

E. The FSM shall be external and optional, pluggable via touch-flake connections for emergency power backup during power-lost scenarios.

F. Power

1. 24VAC (±15%) input that can be connected via ACM touch flake connector. 50 – 60 Hz rating

2. 50 VA Maximum

G. Dimensions

4.70 in. × 1.55 in. × 1.91 in. (119.4 mm × 39.5 mm × 48.6 mm)

H. Dimensions

21 lbs (95.7 g)

* 1. MOUNTING AND INSTALLATION
     1. The FSM can be factory mounted or mounted in the field and is hot-swappable.
     2. The FSM is suitable for mounting in fuse boxes conforming with standard DIN43880 and having a slot height of max. 1.77 in. (45 mm) and is suitable for panel rail mounting on 1.38 in. (35 mm) standard panel rail.
     3. The FSM mounts to the right side of the ACM using keyed slots and touch flake connections. No additional wiring is required when field mounting.

1. AGENCY APPROVALS

A. The ACM is certified to meet the following EMC standards: UL60730-1, UL60730-2-9, UL916, EN60730-1, EN60730-2-9, CAN/CSA-E60730- 1:02

B. FCC Part 15 Class B:

1. Conducted Emissions: FCC Part 15 Subpart B Section 15.107 Class B / ANSI C63.4 (2003)

2. Radiated Emissions: FCC Part 15 Subpart B Section 15.109 Class B / ANSI C63.4 (2003)

C. UL60730-1, UL916, CE, BTL B-BC, BACnet Standard 135 version 1.14, ISO 16484-5, FCC Part15, Subpart B, CAN ICES-3 (B)/NMB-3(B), BQB, RCM, AMEV AS-B, KBOB, EAC, RoHS III, Ethernet Protocol version IEEEC 802.3, EN-1434-3 and EN-13757-3

1. ACM PINOUT

|  |  |  |
| --- | --- | --- |
| **Connector** | **Interface** | **Pinout** |
| P10 | Main Power Input | Pin 1: EGND  Pin 2: V0  Pin 3: +24VAC |
| P20 | Actuator Output | Pin 4: M1  Pin 5: M2 |
| P30 | DP Sensor | Pin 13: Not used  Pin 14: +3V3  Pin 15: GND  Pin 16: Analog Input |
| P60 | RS485 | Pin 24: D-  Pin 25: D+  Pin 26: COM (GND) |
| P70 | UIO 1 & 2 | Pin 27: UIO\_1  Pin 28: GND  Pin 29: UIO\_2  Pin 30: GND |
| P80 | Vpot | Pin 31: 5V  Pin 32: VPOT  Pin 33: GND |

1. FSM PINOUT

|  |  |
| --- | --- |
| **Location** | **Description** |
| Right-side power touch-flake | Pin 1: Vin for charging supercapacitors |
| Right-side power touch-flake | Pin 2: GND |
| Right-side power touch-flake | Pin 3: Vout for dis-charging supercapacitors |

1. INTEGRATION POINTS

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Object Identifier** | | **Name** | **Unit** | | **Specification** | | |
| **Type** | **ID** | **Unit Property Set?** | **Unit Type** | **Function** | **Access** | **Range** |
| BI | 1 | FlowAlarm |  | Alarm/Normal | Feedback | R |  |
| BI | 2 | JamAlarm |  | Alarm/Normal | Feedback | R |  |
| MSV | 1 | FSMStatus |  |  | Feedback | R |  |
| MSV | 2 | EmergencyMode |  |  |  | R |  |
| MSV | 3 | ValvePositionStatus |  |  | Feedback | R |  |
| MSV | 4 | AcuatorStatus |  |  |  | R |  |
| MSV | 5 | CurveStatus |  |  |  | R |  |
| AO | 20 | FlowCmdOverride |  | CFM |  | R/W |  |
| AO | 21 | VpotCmdOverride |  | Volt |  | R/W |  |
| AI | 20 | FlowFdbk |  | CFM |  | R |  |
| AI | 21 | Vpot |  | Volt |  | R |  |
| AI | 22 | EffFlowSetpoint |  | CFM |  | R |  |
| AI | 200 | UIO1\_PresentValue\_In |  | % |  | R |  |
| AO | 200 | UIO1\_PresentValue\_Out |  | % |  | R |  |
| AI | 201 | UIO2\_PresentValue\_In |  | % |  | R |  |
| AO | 201 | UIO2\_PresentValue\_Out |  | % |  | R |  |
| AI | 202 | UIO3\_PresentValue\_In |  | % |  | R |  |
| AO | 202 | UIO3\_PresentValue\_Out |  | % |  | R |  |
| AV | 211 | DPSensorOutput |  | In-water-column |  | R |  |
| BV | 300 | ManOvrdMode |  | True/False |  | R/W |  |
| AV | 300 | ManOvrdModeRemainTime |  | seconds |  | R/W |  |