CAMS

Combustion Airflow Management System

Proven solutions for a tough industry

Air Monitor
Precision Airflow Measurement
An ONICON Brand

CAMS ™ – Combustion Airflow Management System

Product Description

The Air Monitor Power CAMS™ – Combustion Airflow Management System is designed to fulfill the need for a reliable and accurate means of flow measurement in combustion airflow applications. Combined into a single engineered package are the CAMM™ – Combustion Airflow Management Module containing the microprocessor based instrumentation to measure the airflow and manage the purge cycle, and AUTO-purge to protect against any degradation in performance of the duct mounted measurement device(s) due to the presence of airborne particulate.

CAMM™ Performance Specification

Accuracy. ±0.1% of Natural Span, including non-linearity, hysteresis, and non-repeatability.

Stability. ±0.5% of Natural Span for six months.

Temperature Effect. Zero. None; corrected by AUTO-zero. Span. 0.015% of Full Span/ºF.

Mounting Position Effect. None; corrected by AUTO-zero.

Transducer Response Time. 0.5 second to reach 98% of a step change.

Power Consumption. 35VA at 24VAC, 20VA at 24VDC, and 42VA at 120VAC.

CAMM™ Functional Specification

Digital Output. Form "A" dry contacts (maintained) for AUTO-purge activation and acknowledgment.

Digital Inputs. External dry contact closure for AUTO-purge external start and purge interrupt commands.

Analog Outputs. Four outputs for flow, temperature, absolute pressure, and special function individually configurable via jumper for 0-5VDC, 0-10VDC or 4-20mADC.

Analog Inputs. Dual inputs are field configurable via jumper for 0-5VDC, 0-10VDC, or 4-20mADC. One is reserved for temperature input; the other for use with optional special function.

Network Communication. Optional ModBus TCP/IP over Ethernet.

AUTO-purge Management. The AUTO-purge cycle is initiated via an external dry contact input, or via the CAMM timer, with field selectable frequencies of 1 to 24 hours in 1 hour increments. A pair of CAMM dry contacts control the AUTO-purge System, and third dry contact provides remote purge activation acknowledgment.

Power Supply. Standard 24VAC (20-28VAC) or 24VDC (20-40VDC), with automatic selection. Optional 120VAC (100-132VAC) via external UL listed transformer.

Overpressure and Static Pressure Limit. 25 psig.

Low Pass Filtration. Response time to reach 98% of a step change is adjustable from 2.0 to 250.0 seconds.

Automatic Zeroing. Accuracy. Within 0.1% of calibrated span. Frequency. Every 1 to 24 hours selectable on 1 hour intervals.

Circuit Protection. Power input is fused and reverse polarity protected.

Span and Zero Adjustment. Electronic adjustment via keypad.

Display. Backlit, graphical LCD provides indication of up to four process variables. Triple-size digits for main process variable, standard size characters for the other process variables.

Temperature Compensation Selection. Push-button selection of linearized or nonlinear input. Choice of thermocouple (Type E, K, J, and T) or 100 ohm platinum RTD temperature sensor type.

Pressure Compensation. Absolute pressure (atmosphere or duct static), up to 60"Hg.

Humidity Limits. 0-95% RH, non-condensing.

Temperature Limits. –20ºF to 180ºF Storage.
+40ºF to 140ºF Operating.

CAMM™ Construction Options

Special Functions
- ❑ Summed Flow
- ❑ Differential Flow

Power
- ❑ 24VAC
- ❑ 24VDC
- ❑ 120VAC

Certification
- ❑ Standard
- ❑ NIST Traceable

Rapid Stop
- ❑ Yes
- ❑ No

AUTO-purge

Product Description

Air Monitor Power's AUTO-purge is designed for applications where the presence of airborne particulate might impair the measurement accuracy of Air Monitor Power's Combustion Air (CA) Station or VOLU-probe array. When activated by a CAMM™ or distributed control system, a combination of fail-safe valves are operated to introduce high pressure/high volume air to the flow measuring device's sensing ports for a short duration while simultaneously isolating the CAMM™ from overpressurization. This periodic purging assists in maintaining the sensing ports of the total and static pressure manifolds in a clear, unobstructed condition.

Standard Construction

Brass and Copper Construction
- All wetted tubing, fittings, and valves constructed of copper and/or brass.
- Enclosure is NEMA 4 painted steel.
- External connection fittings are stainless steel FPT.

Stainless Steel Construction
- All wetted tubing, fittings, and valves constructed of 316 stainless steel.
- Enclosure is NEMA 4 painted steel.
- External connection fittings are stainless steel FPT.

Optional Construction

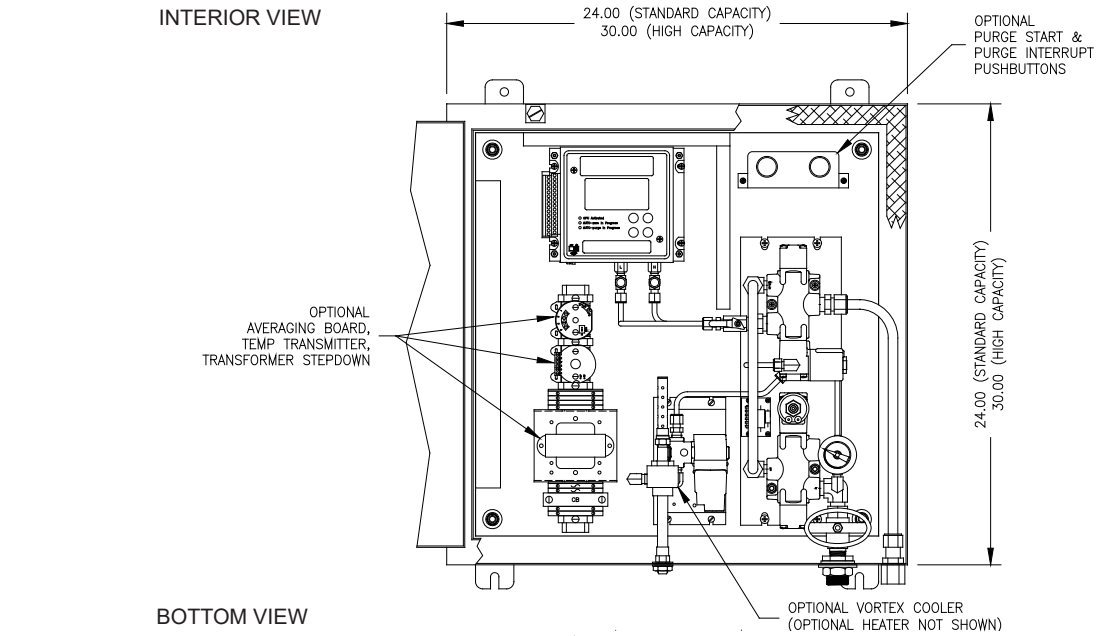
- ❑ NEMA 4X Stainless Steel Enclosure
- ❑ Vortex Cooler. Requires 80-100 psi air supply.
- ❑ Rapid Stop™
- ❑ Enclosure Heater. Requires 120VAC power supply.
- ❑ Viewing Window

Power
- ❑ 24VAC
- ❑ 24VDC
- ❑ 120VAC

Capacity
- ❑ Standard
- ❑ Low – Model SP
- ❑ High – Model HP

Dimensional Specifications

STANDARD CAPACITY



CONNECTION CODE	STD. CAP.	HIGH CAP.
A. STATIC PRESSURE (LO) SIGNAL FROM FLOW ELEMENT	1/2" (F)NPT	3/4" (F)NPT
B. TOTAL PRESSURE (HI) SIGNAL FROM FLOW ELEMENT	1/2" (F)NPT	3/4" (F)NPT
C. SUPPLY AIR 80–125 PSIG	1/2" (F)NPT	3/4" (F)NPT
F. VORTEX COOLER EXHAUST	N/A	N/A
G. ENCLOSURE VENT	N/A	N/A
H. ELECTRICAL CONNECTION POWER WIRING	1/2" CONDUIT SEAL	1/2" CONDUIT SEAL
J. ELECTRICAL CONNECTION SIGNAL WIRING	1/2" CONDUIT SEAL	1/2" CONDUIT SEAL

AUTO-purge

Sequence of Operation

Automatic purging at regular field selectable intervals utilizes short duration, high pressure (up to 125 psig) air to maintain signal lines and the sensing orifices of the total and static pressure manifolds in a clean, unobstructed condition. For the duration of the purge cycle the CAMM maintains the last transmitted process outputs. At the start of the purge cycle the CAMM first activates solenoid purge valves to isolate the transmitter from the signal lines, then energizes a separate main air purge valve, allowing the high pressure purge air to flow through the shuttle valves, flushing out all particulate contaminants in the signal ports of the airflow station or probe array.

At the end of the timed purge cycle or upon receipt of a purge interrupt signal the CAMM first de-energizes the main air valve to shut off the supply of compressed air, followed by a short period to allow the pressures in the signal lines to bleed down to process levels, then the purge valves are shuttled to reconnect the CAMM to the process signal lines. The final step in the sequence releases the output signal hold, allowing the resumption of transmitting active process information.

Purge Frequency & Cycle Management

The CAMM can be configured to fully manage both the frequency and duration of the purge cycle, or allow the DCS to control either. When operating independently, and depending upon the concentration of airborne particulate, the frequency of purge is user selectable via set-up menu to activate as infrequently as once every 24 hours, or as often as hourly. In a similar manner the active purge duration is adjustable from 30 to 150 seconds, while the combined purge plus recovery cycle is adjustable from 60 seconds to 10 minutes.

The CAMM can also be configured to allow the DCS to determine the frequency or scheduling of the purge cycle, by means of providing a dry contact purge start input to the CAMM. A separate purge interrupt dry contact input from the DCS will trigger the CAMM to terminate the purge cycle and return to normal operation. When equipped with optional Rapid Stop™ valving, the resumption of active process measurement can be reduced from a typical 30 seconds to as short as 5 seconds.

Installation Guide

Air Requirement

- 80 to 125 psig at 100 CFM, oil and dirt free.

Line Size

- If the distance from the CAMS™ Panel to Flow Measuring Station or Probes is less than 25', tube size to be 1/2" O.D. Wall thickness no greater than 0.065".
- If the distance from the CAMS™ Panel to Flow Measuring Station or Probes is 25' to 50', tube size to be 3/4" O.D. Wall thickness no greater than 0.065".
- If the distance from the CAMS™ Panel to Flow Measuring Station or Probes is greater than 50', tube size to be 1.0" O.D. Wall thickness no greater than 0.065".

Ambient Temperature

- 40ºF to 140ºF.
- For ranges above or below this ambient temperature, the use of an enclosure heater and/or cooler is required.

Accumulator Tank (strongly recommended)

- Requires coalescing filter, pressure regulator, and check valve at the tank inlet.

120 gallons – All CA stations.

120 gallons – Multiple VOLU-probes having a combined length greater than 10'.

80 gallons – One or more VOLU-probes having a combined length less than 10'.

Line from Accumulator Tank to AUTO-purge Panel

- 25' maximum length, 1/2" pipe (minimum).
- Recommend locating accumulator tank as close as possible to CAMS™ Panel.

Electrical Power Requirement

- 35VA at 24VAC; 20VA at 24VDC; 42VA at 120VAC.
- 120VAC, 10 amp when an optional enclosure heater is installed.

CAMM ™ – Combustion Airflow Management Module

Construction Features

Features

Accuracy. The CAMM™ is designed to maintain a measurement accuracy of ±0.1% of Natural Span. For a span of 0 to 0.05 IN w.c., this accuracy is equivalent to an output accuracy of ±0.00005 IN w.c. differential pressure or ±0.45 FPM velocity at Natural Span.

Continuous Display of Process. All CAMMs™ are equipped with a large multi-line, backlit, graphical LCD for use during transmitter configuration and calibration, and to display multiple measured process variables (Flow, Temperature, Absolute Pressure, Differential Pressure, or Special Function). For high visibility, the main process variable (flow) is displayed with easy-to-read, triple-size digits. Other process variables are displayed with standard size digits. Each measured process variable is individually scalable in user selectable engineering units.

Special Functions Capability. Built into the CAMM™ micro-processor is the capability to perform special application functions involving two transmitters. Using a second transmitter as an input, the CAMM™ can compute the sum of, or differential between the two measured flows. The special function output can be both displayed and provided as an analog output signal.

Microprocessor Based Functionality. The CAMM's™ on-board microprocessor performs the functions of operating parameter selection, transmitter configuration, input/output and display signal scaling, density correction, and transducer calibration.

Keypad. A cover mounted keypad provides instant access to all CAMM configuration menus and calibration functions. The durable membrane keypad is user configurable for password protection

ModBus Network Communication. Each analog input and output signal can be individually configured for 0-5VDC, 0-10VDC or 4-20mADC by means of a single jumper.

High Turndown Ratio Operation. The CAMM™, with its high level of accuracy and automatic zeroing circuitry, can maintain linear output signals on applications requiring flow measurement turndown of 10:1.

Primary Signal Noise Filter. To eliminate background noise and pulsations from the flow signal, the CAMM™ is equipped with a user selectable digital low pass filter.

Air Density Correction. The CAMM™ is capable of performing density compensation for both air temperature and air pressure variations. Temperature input is an analog signal from a remote temperature transmitter; non-linear temperature inputs can be linearized by the microprocessor. Process pressure is measured by means of an internal absolute pressure transducer connected to the transmitter static pressure signal input.

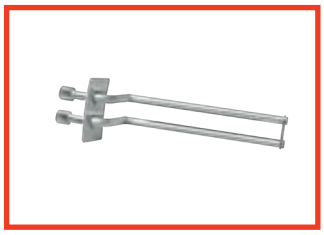
Optional Rapid Stop™. The Rapid Stop™ valving combined with purge sequence timing in the CAMM™ permits a reduction of the recovery portion of an AUTO-purge cycle from a typical 30 seconds to as short as 5 seconds.

Built-In Characterization Function. For installations requiring a field characterization factor (K-factor) the CAMM has an integral "K-factor" calculator with gain and/or bias, or multi-order polynomial function to accurately match field testing results throughout flow turndown.

Air Monitor Power's Product Families of Air & Coal Flow Measurement Systems

Pf-FLO™ – Pulverized Fuel Flow Management

The Pf-FLO™ system performs continuous and accurate fuel flow measurement in pulverized coal fired combustion applications, providing boiler operators with the real-time data needed to balance coal mass distribution between burners. Balanced fuel improves combustion efficiency and lowers emissions while reducing in-furnace slagging, coal layout, fuel slagging, and coal pipe fires.

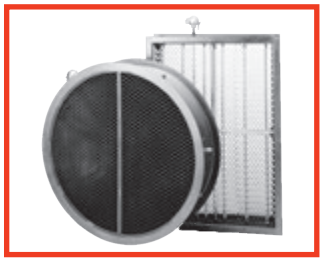


IBAM™ – Individual Burner Airflow Measurement

The IBAM™ – Individual Burner Airflow Measurement probe is ideally suited for new or retrofit applications where a reduction in plant emissions and improvement in efficiency can be obtained through accurate measurement of burner secondary airflow. The IBAM™ probe has been designed to accurately measure in the particulate laden, high operating temperature conditions found in burner air passages.

VOLU-probe/SS™ Stainless Steel Airflow Traverse Probes.

Multi-point, self-averaging, Pitot-Fechheimer airflow traverse probes with integral airflow direction correcting design. Constructed of Type 316 stainless steel and available in externally and internally mounted versions for harsh, corrosive or high temperature applications such as fume hood, laboratory exhaust, pharmaceutical, and clean room production and dirty industrial process applications.



CA™ – Combustion Airflow Measuring Station & VOLU-probe/SS™ Traverse Probes.

Air Monitor Power's duct mounted airflow measurement devices have been designed to accurately and repeatedly measure air mass flow in power plants. The Combustion Air (CA) Station™ includes honeycomb air straightener to accurately measure in shorter straight duct runs than any other flow measurement device. The VOLU-probe/SS™ delivers accurate airflow measurement performance in the form of an insertion probe. Both devices feature Type 316 stainless steel flow sensing arrays.

CEMS™ – Continuous Emissions Monitoring System

Air Monitor Power's CEMS™ – Continuous Emissions Monitoring Systems assist in complying with the Clean Air Act's stringent emission measurement standards and the requirements of 40 CFR 75. Air Monitor has assembled a cost effective integrated system consisting of in-stack flow measurement equipment and companion instrumentation to provide continuous, accurate, and reliable volumetric airflow monitoring of stacks and ducts of any size and configuration.

Engineering & Testing Services. Air Monitor Power offers complete engineering and testing to analyze air and coal delivery systems. Air Monitor Power's field testing services use 3D airflow traversing and Pf-*FLO* coal flow measurement systems for the highest possible accuracy. To ensure cost effective and accurate solutions, Air Monitor Power has full scale physical flow modeling capability and in house Computational Fluid Dynamics (CFD). CFD analysis is used to analyze flow profiles and design/redesign ductwork to improve overall performance. Full scale model fabrication and certified wind tunnel testing is used to develop application specific products that will measure accurately where no standard flow measurement can.

P.O. Box 6358 • Santa Rosa, CA 95406 • P: 800-AIRFLOW • F: 707-526-9970
www.airmonitor.com • amcsales@airmonitor.com

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