

VENTURI AIR VALVE SYSTEM

Controlling Critical Environments



Overview

The Venturi valve is a device for regulation and control airflow, based on the Venturi effect. It is a pressure-independent, high-regulation-ratio, fast-response, high-precision air volume control valve, which is widely used in various critical environments.

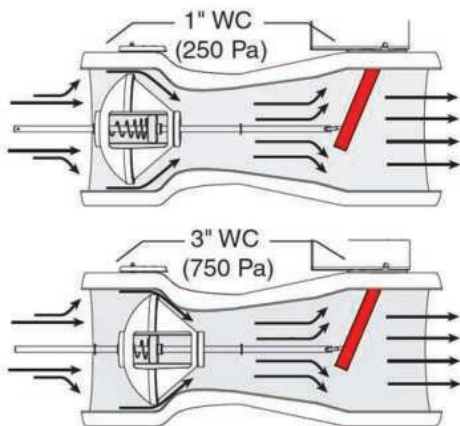
EB Air Control Venturi Valves utilize fast-acting electric actuators that provide a fast response (<1 second) to ensure the required airflow is maintained promptly. This is critical in areas requiring a specific air flow threshold to protect individuals from airborne chemicals or particulates. Currently, EB Air Control Venturi Valve series products have been successfully used in chemical laboratories, biosafety laboratories, animal laboratories, pharmaceutical factories, hospital isolation wards and other fields.



Venturi Air Valve Structure And Operation Principle

Venturi Air Valve combines an immediate-response mechanical assembly to maintain airflow set point as duct static pressure varies. This pressure-independent regulator, with a high-speed position/airflow controller, meets the unique requirements of airflow control in critical environments. These valves can be used in both constant volume and VAV applications.

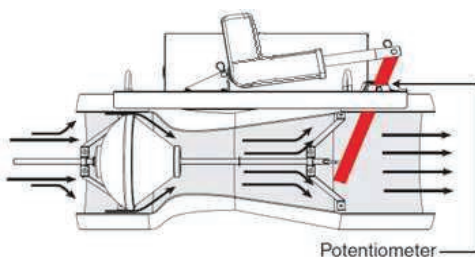
Pressure-Independent ---- Fully Mechanical



The valve pivot arm controls the airflow set point. It features an internal spring-loaded cone assembly designed to compensate for changes in duct pressure and maintain the set airflow rate at time < 1 second. The working principle as follows:

1. **Low Duct Pressure:** Less force is applied to the cone, causing the internal spring to expand. This results in a larger annular flow path.
2. **High Duct Pressure:** More force is applied to the cone, compressing the spring and moving the cone toward the Venturi throat. This results in a narrower annular flow path, maintaining the set airflow rate.

Airflow Set-Point Control ---- PLC Controller + Actuator

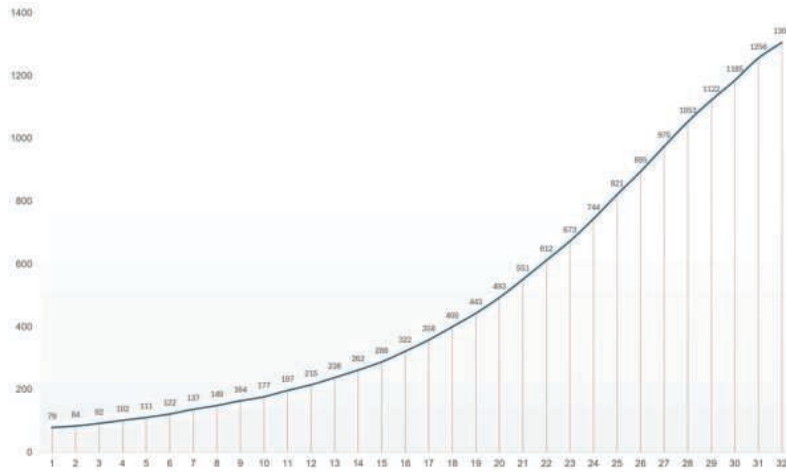


Each VAV Venturi Air Valve is equipped with a PLC controller, a position feedback potentiometer, and a high-speed actuator.

The valve pivot arm position is factory-calibrated. By adjusting the flow rate controller assembly, the airflow can be precisely set.

The valve's PLC controller can provides solutions for room-level ventilation, pressurization and temperature control in either standalone or integrated systems.

Calibration

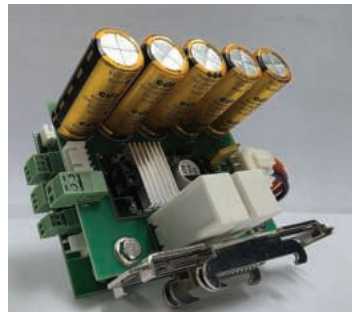


Position	Airflow l/s	Position	Airflow l/s
Min. 1	47452	17	43061
2	47178	18	42787
3	46903	19	42512
4	46629	20	42238
5	46354	21	41964
6	46080	22	41689
7	45805	23	41415
8	45531	24	41140
9	45257	25	40866
10	44982	26	40592
11	44708	27	40317
12	44433	28	40043
13	44159	29	39768
14	43885	30	39494
15	43610	31	39219
16	43336	32	38945
Max.	38945		1306

All EB Air Control Venturi Valves are factory-calibrated at 32 positions and guarantee control accuracy within < 5% of the command signal. Each calibration point will record the average reading between 150-750Pa and store in PLC controller. Our airflow calibration station uses bead-in-glass thermistor sensors, each sensor node is individually calibrated to NIST traceable standards.

All data, along with serial number, is stored at factory and a copy can be sent to end user if necessary for maintenance.

PLC Controller / Mini UPS / High Speed Actuator



intertek
Total Quality Assured. Report No.: 250506065GU-001

Test Items	Test Method	Requirement / Limit	Test Results
1. Venturi Air Valve Linear Actuator 350000 Cycles Durability Test	Per applicant's request.	-Operation test of 350,000 cycles at fix load with 50% duty cycle. -Push for 5 seconds, pull for 5 seconds and rest for 10 seconds.	Pass. All samples: ➤ During test: - At the beginning of test, used the spring as load. - After 15787 cycles, changed the spring load to a 20-kilograms weight load for the remained test. ➤ After 350000 cycles, -No obvious damage was found on these four products. -The products worked normally. See appendix I for more details.

PLC are used in a wide range of industrial equipment which offer advantages such as mature technology, reliability, high-speed computation and non-proprietary product. Open protocol - Modbus RTU / TCP.

The Venturi Air Valve PLC controller is modular. Featuring easy plug-and-play expansion modules, it simplifies programming, making it an ideal fit for end user's most demanding applications.

Mini UPS complete with 5x50F super capacitors. Provides adequate energy to drive the actuator to complete the power fail-safety action and provide a minimum of 20 second backup power to PLC.

Once valve power is lost, the PLC will continuously report the actual valve position to master valve/panel until the UPS is fully depleted. This eliminates false valve position readings from being transmitted to the master program when individual valve power failure and actuator jam happen at the same time.

High-Speed Actuator has passed a 350,000-cycles durability test under fixed load conditions.



Inlet / Outlet Insensitivity

Specification

Construction

- Body & Cone: 16-gauge spun aluminum or SS 304 with continuous welded seam.
- Internal Assembly: Spring-grade stainless steel spring and polyester slider.
- Brackets and Arm: SS 316 shaft support brackets and pivot arm.
- Shaft & Bearings: PTFE-coated SS 316 valve shaft and composite Teflon® bearing.

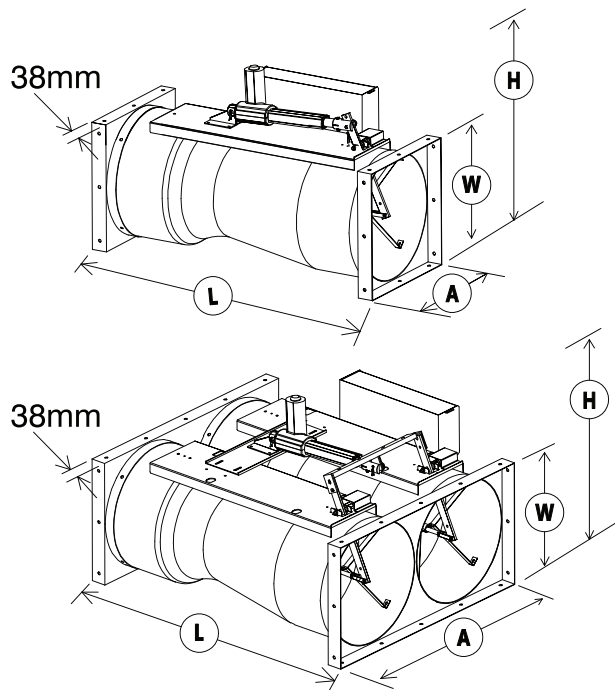
Operation Range

- Ambient Temperature: 0-50°C
- Relative Humidity: 10-90% (non-condensing)

Performance

- Pressure-Independent Range: 150-750 Pa pressure drop across valve.
- Accuracy: ±5% airflow volume against command signal.
- Installation: No additional straight duct runs needed before or after valve.
- Command Response Time: <1 second.
- Response Time to Duct Pressure Change : <1 second.

Dimension



Power Consumption

- 110-230V @ 50/60Hz
- 60VA at full load

Valve Controller I/O

AI:

- 1 universal inputs. Accepts volt, mA, or thermistor signals.
- 1 0-10Vdc input.

AO:

- 1 0-10Vdc output.

DI:

- 5 digital input (max. 24Vdc)

DO:

- 4 digital output (12Vdc signal)

*Additional I/O expansion module -- Please consult factory

Modbus Protocol Communication Port:

- 3 RTU (RS-485)
- 1 TCP/IP (Ethernet port)

Valve Control

Standalone Valve ----- 0-10Vdc input
 System Integration ---- RTU (RS-485)

Valve Size	A (mm)	W (mm)	L (mm)	H (mm)
D200	228	228	664	391
D250	277	277	620	440
D300	328	328	750	492
D350	401	401	831	556
2 x D300	667	328	750	492
2 x D350	798	401	831	556

EBAV - A 112 H G - RF

Valve Construction

- A.** Body and cone: uncoated aluminum.
Shaft: uncoated 316 stainless steel.
- B.** Body and cone: uncoated Stainless Steel 304.
Shaft: uncoated 316 stainless steel.
- C.** Body and cone: Teflon®-coated aluminum.
Shaft: 316 stainless steel with composite Teflon coating.
- D.** Body and cone: Teflon®-coated Stainless Steel 304.
Shaft: 316 stainless steel shaft with composite Teflon coating.

Valve Size

Pressure Drop Across Valve 150-750 Pa (0.6-3.0" WC)

108 - 1 x Ø200mm	20 - 330 l/s	35 - 700 CFM
110 - 1 x Ø250mm	25 - 470 l/s	50 - 1000 CFM
112 - 1 x Ø300mm	45 - 710 l/s	90 - 1500 CFM
114 - 1 x Ø350mm	95 - 1175 l/s	220 - 2500 CFM
212 - 2 x Ø300mm	90 - 1400 l/s	180 - 3000 CFM
214 - 2 x Ø350mm	190 - 2350 l/s	400 - 5000 CFM

Included Parts

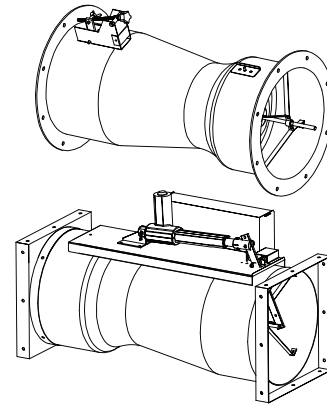
1. 60VA universal voltage power supply (110-220Vac input) for the valve controller.
2. Differential pressure switch for low static pressure alarm across the valve.
3. Double valve models (212 & 214) include a rectangular interface.

Remarks

1. Teflon® coating only available on single valve bodies with circular flange.
2. All valve communication is via Modbus RS485. 0-10Vdc command signal for valve airflow control available. *(consult factory)*
3. Command / Feedback signals base on SI units (L/s)
4. The fail-safe position can be programmed on-site.
5. The orientation (Vertical Up or Down) must be confirmed at the time of order and cannot be modified on-site.
6. Controller Type G - Suitable for supply, make-up air and general exhaust applications.
7. Controller Type H - Suitable for fume hood (FH) and biosafety cabinet (BSC) exhaust applications.

Duct Connection

- CF** - Circular Flange
- RF** - Rectangular Interface



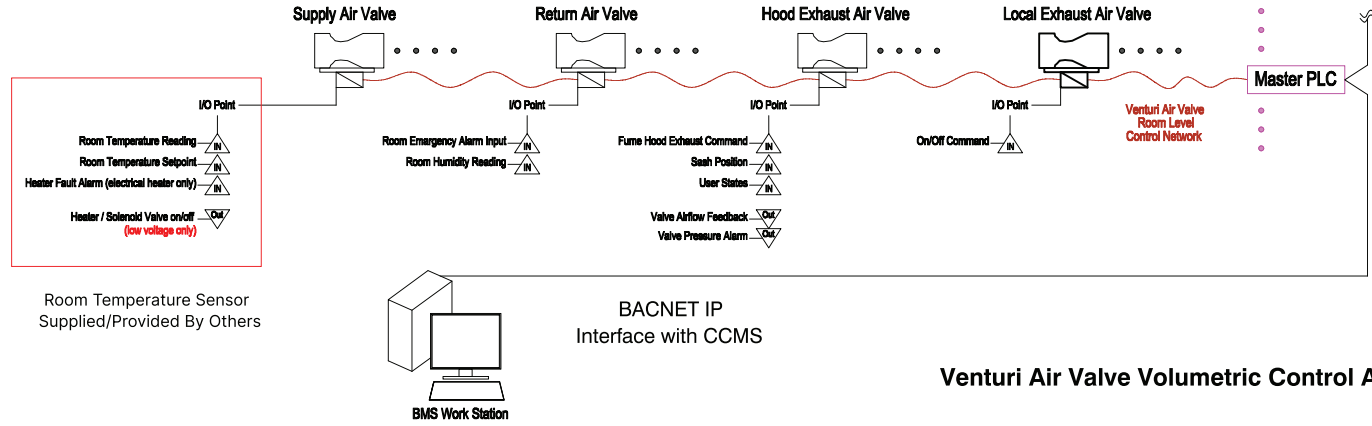
Valve Type

- G** - General Valve
- H** - Fume Hood / BSC Exhaust Valve

Installation

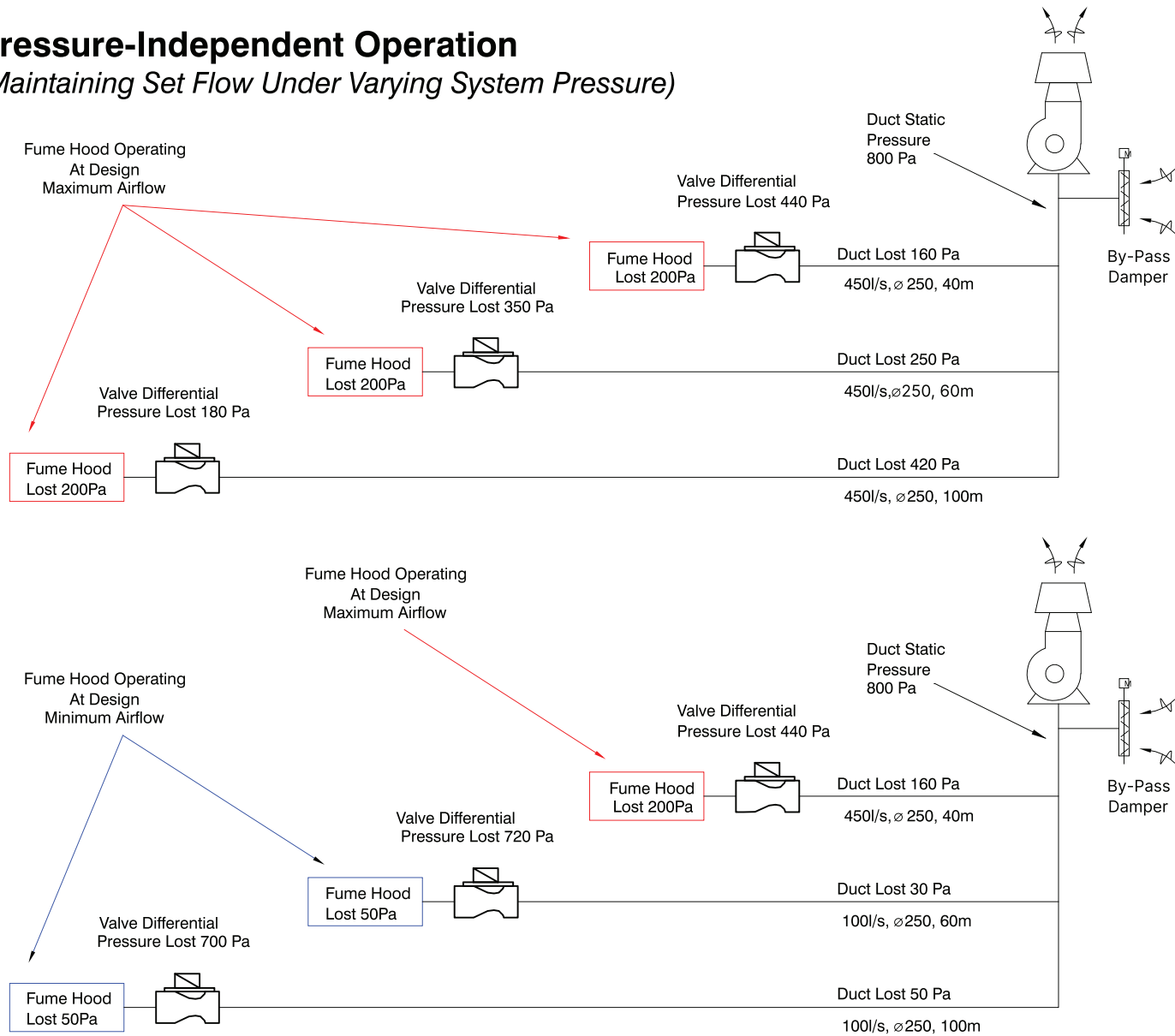
- H** - Horizontal
- U** - Vertical Up
- D** - Vertical Down

Venturi Air valve I/O Interface Points

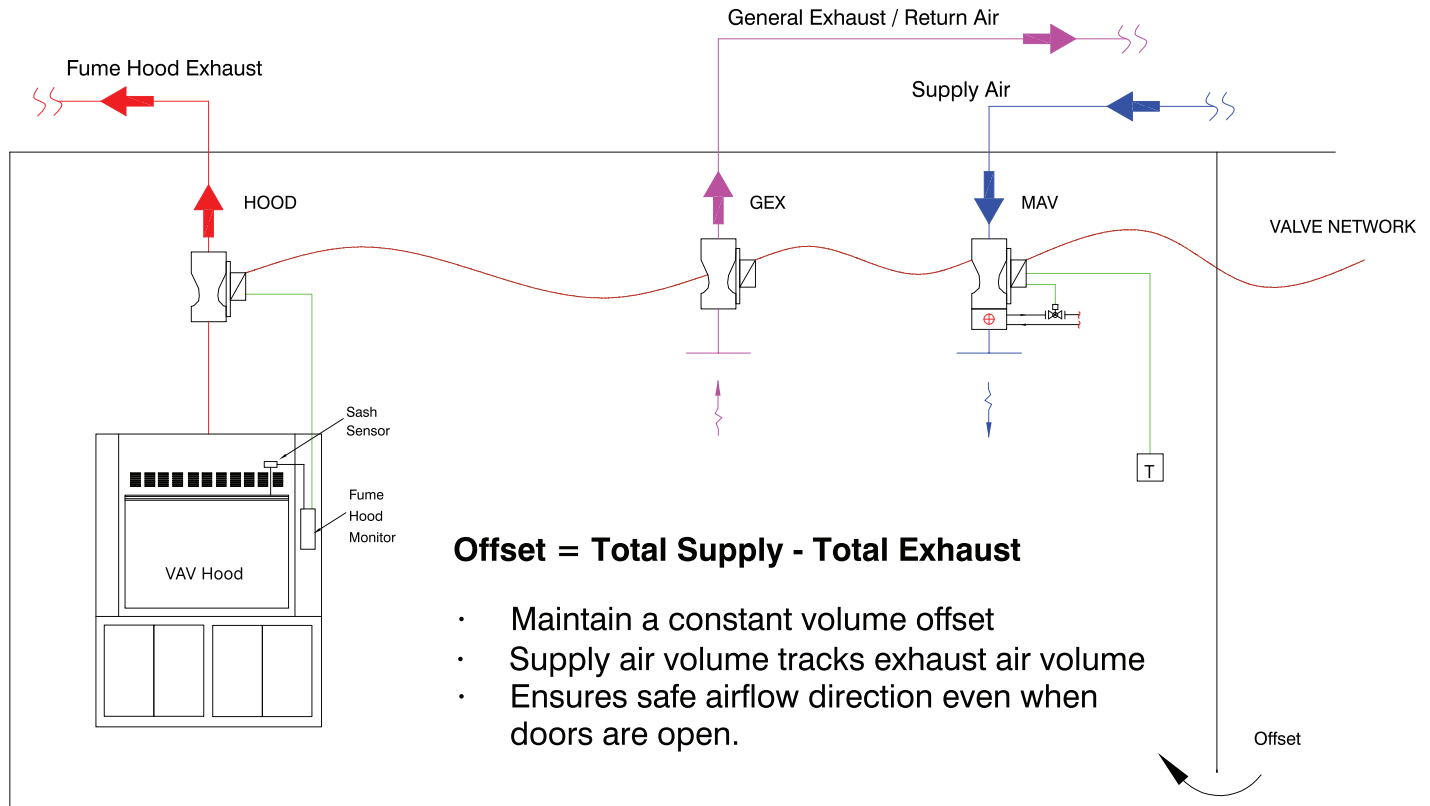


Venturi Air Valve Volumetric Control Area

Pressure-Independent Operation (Maintaining Set Flow Under Varying System Pressure)



Volumetric Control Applications



Example 1: Laboratory with Hood Control

Mode	Supply	Return	Hood	Offset
Unoccupied	200	250	50	-100
Occupied	400	450	50	-100
Hood Max.	450	50	500	-100

Room Balance
 Maintain Minimum Ventilation Rate

Example 2: Laboratory with Cooling & Hood Control

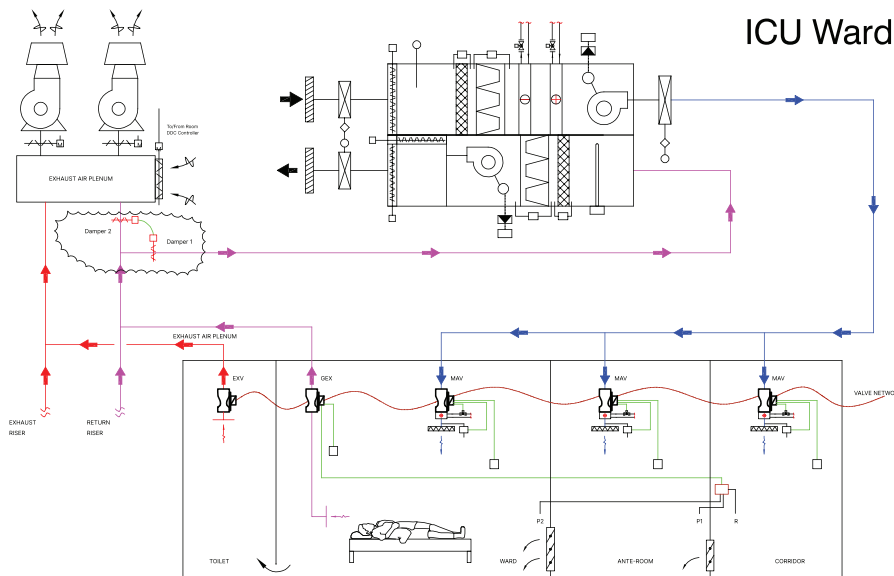
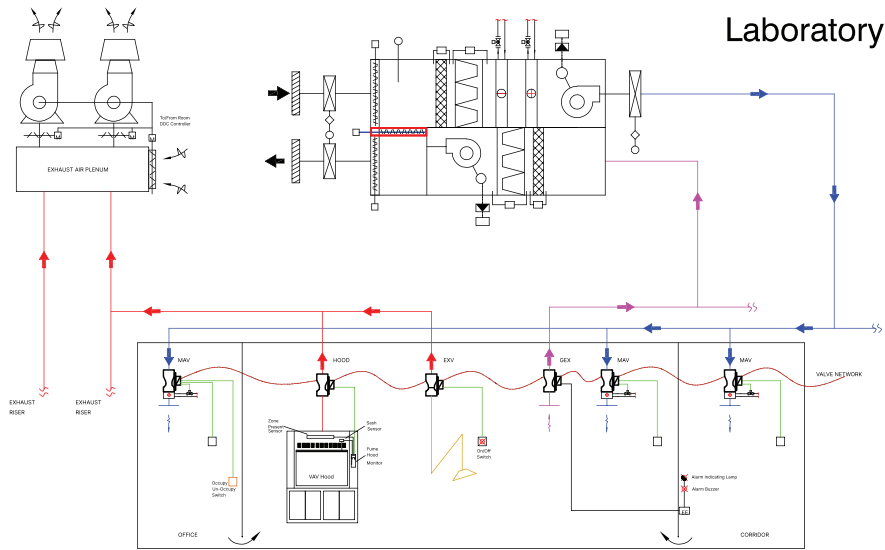
Mode	Supply	Return	Hood	Offset
Unoccupied	200	250	50	-100
Max. Cooling	600	650	50	-100
Hood Max.	600	200	500	-100

Thermal Control
 VAV

VENTURI AIR VALVE SYSTEM

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Application in Critical Environments



Teflon®



Stainless Steel



Aluminum

Five Key Points

- ✓ Pressure independent (Mechanical)
- ✓ Accurate to ±5% of Signal
- ✓ Inlet / Outlet Insensitive
- ✓ No Maintenance required
- ✓ Turndown ratio of up to 20:1

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