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Demand-Air™ CO₂ DAE-CO2-XXXX

Rectangular Modulating Damper and Sensor

for Demand Response Ventilation

Application and Design

The Demand-Air™ Economy Kit (DAE-CO2-XXXX) is the simple answer to Demand Response Ventilation. The Carbon Dioxide Sensor monitors concentrations in the space and causes the damper motor to modulate open or closed as required to maintain a healthful indoor environment while reducing operating cost. The damper is available in any rectangular size needed. The kit features a high-quality Siemens brushless DC motor. To preclude over-ventilation, the damper begins to open at 800ppm and is full open by 1200ppm.

24VAC Transformer included.



STANDARD CONSTRUCTION	
Frame	14 ga. Galvanized Steel
Blades	16 ga. Galvanized Steel
Shaft	½" Zinc Plated Steel
Blade Bushings	Oil Impregnated Bronze
Low Leak Seals	EPDM Rubber

SIZE INFORMATION	
Damper 1/4" undersized high & wide	
Frame Width	3 1/2" wide
Max Size	48" x 48" in one section
Min Size	6" x 6"

SENSOR DATA	
Supply Voltage	24VAC +/- 20%
Power Consumption	<1 Watt average
Output Signal	2-10 VDC
Sensor Dimensions	(H) 5.12" x (W) 3.35" x (D) 1.18"
Sensor Coverage Area	7,500 Sqft maximum
Calibration lifecycle	15 years
Sensing Technology	Single Beam Infrared (NDIR)

QUANTITY	DIAMETER	NOTES

PROJECT	LOCATION
CONTRACTOR	DESIGN SPECIFIER

SIEMENS GDE 161.1P ACTUATOR

24V, 2-10VDC Control Input w 2-10VDC Position Feedback

Volts	24V
Watts	1
VA	2
Timing	90 Seconds Constant
Torque	44 in. lb.

Minimum and Maximum Air Adjustment Reflective Visual Position Indicator

OPTIONS

304 Stainless Steel Damper Construction	Rectangular Dampers
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Belimo LMB24-SR Motor	Duct Mount Sensor
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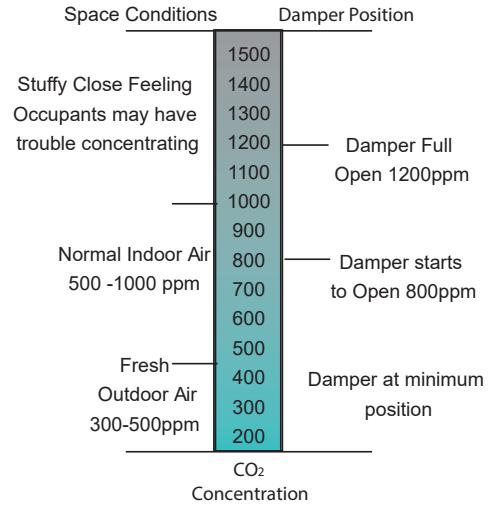


Demand Response Ventilation

Ventilation is seeing a resurgence of importance.

ASHRAE Standard 62.1 (2013) "Ventilation for Acceptable Indoor Air Quality" describes ventilation rates for commercial and industrial spaces. Standard 62.2 prescribes ventilation for low-rise residential buildings. Rates have been determined to provide healthy, productive places for people to live and work. There is an understanding that meeting these standards imposes a large cost on building/home owners. In order to bring in fresh air, conditioned air must be exhausted. Each unit of fresh air that must be re-conditioned cost dollars and carbon impact.

Demand Response Ventilation is the task of limiting ventilation based on Actual Demand. Carbon Dioxide is a good measure of how many people are using a particular space and how much fresh-air they require. ASHRAE has set 1000 ppm as a high normal CO₂ concentration. Above that point people may start to feel stuffy or notice unpleasant levels of bioeffluence.



Case Study

ASHRAE 62.1 dictates how much fresh air should be brought into the building. To illustrate how this works, consider a simplified branch bank building. Table 1 outlines how the interior space is configured and the 62.1 airflow requirements for each zone.

Table 2 Compares three scenarios

1. Uncontrolled Intake of 62.1 required air all the time.
2. Uncontrolled intake of required air only when the bank is open.
3. Each space being fully occupied only half the time.

Savings comes from closing the intake when CO₂ is low because there are fewer than predicted people right now.

Wiring Diagram Demand-Air Kit

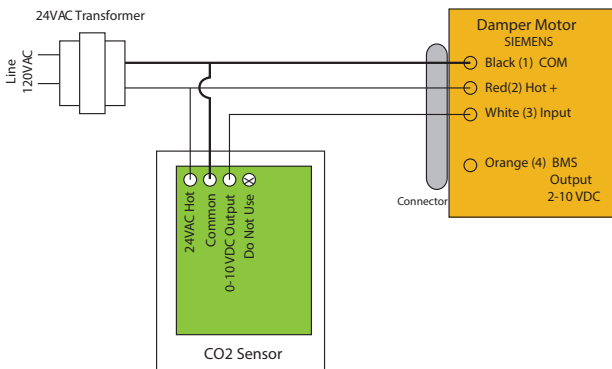


TABLE 1 62.1 REQUIREMENTS

Zone	Floor Space	CFM/Sqft	Area Req.	People	CFM/Person	People Req.	
	A	B	A*B	C	D	C*D	
Lobby	1200	0.06	72	10	7.5	75	
Offices	1000	0.06	60	7	5	35	
Vault	250	0.06	15	1	5	5	
Break Room	150	0.12	18	1	5	5	
Storage	100	0.06	6	0	5	0	
Corridors	300	0.06	18	0	5	0	
Total	3000	Total Area Requirement		189	19	Total People Requirement	120
				Area+People	Breathing Zone Requirement	309	

TABLE 2 COST TO OPERATE

Scenario	Min/Yr	62.1 Mandate	CFM/yr	Cost to Operate	Savings
Uncontrolled 24/7	525,600	309 CFM	262,800,000	\$618.00	---
Uncontrolled 12 hr. Workdays	183,600	309 CFM	56,732,400	\$257.88	\$402.12
Half Occupancy 12 hr workdays	183,600	150 CFM	27,540,000	\$104.80	\$513.20

Pay Back is less than a year in this scenario.

Cost figures are taken from Paul Raymer's Article, "The Cost of Ventilation" Ventilation News and Views blog. Aug 2013. 3299 55 degree days, Gas @ \$1.28/therm Electricity @ \$0.18/kWh

Demand-Air™ CO2 Typical Specification

The Demand-Air™ CO₂ is a controlled fresh-air intake system that can be used either as a standalone product or as part of a building management system. Damper action will be modulating and proportional to carbon dioxide concentration in the space. Blade must be at least 20 gage galvanized steel and feature EPDM Low-Leak seals. Shell must be at least 24 gage for sizes 4 inches through 10 inches and 20 gage for dampers 12 inches through 20 inches. Shaft shall be ½ inch plated steel and turn inside an oil-impregnated bronze bearing. The damper will be driven by an electronic, direct coupled, brushless DC motor. The motor must accept either a 2 to 10 vdc or a 4 to 20 mA input from the CO₂ sensor. The motor must also output that signal as feedback to a building management system. It will have a reflective position indicator and adjustable position stops. The motor must be able to deliver 44 inch pounds of torque and have a 90 second timing interval. The sensor must feature Single Beam Non-Dispersive Infrared Technology and Automatic Background Calibration. It should be able to sense Carbon Dioxide from 0 to 2,000 parts per million and display the same on an attractive led display. It should have a calibration interval of not less than 15 years. The sensor must have factory configurable scaling. The system must carry a 5 year parts warranty.