

Demand-Air™ CO₂

Demand Response Ventilation Carbon Dioxide

By Young Regulator Co.

Your source for Quality Air Distribution Products



QR Codes make it easy to access information from the

Young Regulator website. Scan the code at left with a smart phone and be taken right to the site. Product labels will carry a QR image that will take you to specific information, Frequently Asked Questions, and Wiring Diagrams all without leaving the jobsite.

www.YoungRegulator.com

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Demand Response Ventilation

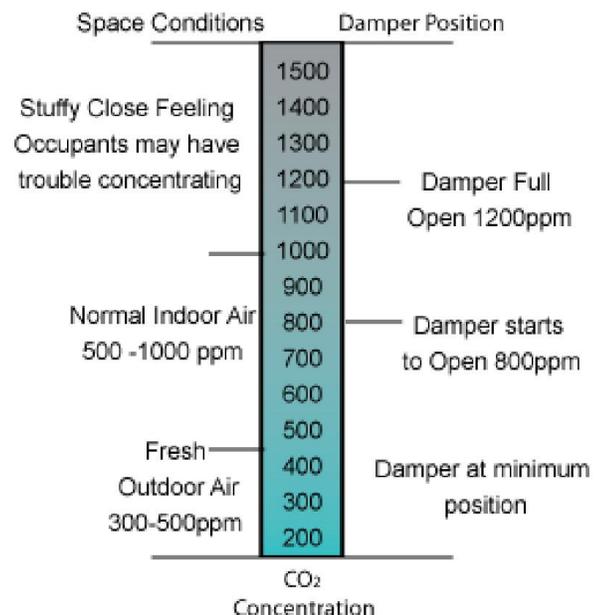
Ventilation is seeing a resurgence of importance. ASHRAE Standard 62.1 (2013) “Ventilation for Acceptable Indoor Air Quality” describes ventilation rates for commercial and industrial spaces. Standard 62.2 prescribes ventilation for low-rise residential buildings. Air change rates have been determined 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 costs dollars and carbon impact. Demand Response Ventilation is the task of limiting ventilation based on Actual Demand.

System Description

The Demand-Air™ system features a high-quality, round, modulating, fresh-air damper paired with a specially calibrated Carbon Dioxide Sensor. As people load and therefore CO₂ increase the damper modulates open to bring in an appropriate amount of clean fresh air without over-ventilating the space.

The damper begins to open at approximately 800 parts per million (ppm). The damper will reach full open at approximately 1200 ppm flooding the space with outside air to dilute the stale trapped interior air. The rugged brushless DC floating point motor will effortlessly move the damper open and closed as required to provide just enough air to keep the space healthy without spending too much money heating or cooling ventilation air.

Young Regulator Co. Demand-Air™



Warnings and Cautions: Read this section carefully.

Failure to follow these warnings may cause hazardous condition and/or cause damage to the Demand-Air™ or other HVAC equipment.

WARNINGS

- Disconnect the power supply to the damper before making any wiring connections to prevent the danger of electrical shock or equipment damage.
- Care must be taken where the fresh-air intake is placed. Avoid areas of possible contamination such as: dryer or furnace vents, driveways, trash containers, swimming pools. The intake must be mounted above any expected snow accumulation. Consult local codes for further guidance.
- All wiring must comply with all applicable local and national, electrical and safety codes, ordinances and regulations.
- Use properly grounded tools and safety glasses and gloves when drilling or cutting sheet metal or fiberglass products, ducts, fittings or equipment.
- Do not trap a finger between the damper blade and the low-leak seal. It could cause injury or ruin the low leak seal.

Cautions

- The Demand-Air™ system is designed for indoor use only.
- You must touch a grounded metal object before handling the damper motor or the sensor circuit board to protect electronic parts from electrostatic discharge.
- Install the damper in areas between 22°F and 122°F, non-condensing. The sensor must be mounted in conditioned space.
- Check system operation and measure intake draw to ensure that the proper amount of outside air is being brought in.
- Carefully follow the enclosed wiring diagram to ensure the Demand-Air™ system works correctly.
- If the sensor fails the damper will go closed.
- If the motor fails the damper blade will stop where it is. If fail-safe, spring closed operation is required specify the optional TFB24-SR motor.
- Leave these instructions with the HVAC system for future use.

Dampers

The Demand-Air™ system features commercial-quality Young Regulator round dampers. Specify the diameter of the round intake duct. Round dampers up to 16" feature heavy-gauge rolled steel construction. 18" and 20" dampers are built in rigid, spiral duct shells.

Dampers are designed to close tightly. Low-leak seals are standard on all dampers.

Rectangular dampers can be built. Contact the factory for help in designing custom applications.



Demand-Air™ Round Damper
Available Sizes 4" - 20" Diameter

Damper Installation

Round dampers feature a bead on the "Upstream" end (inlet) and a crimp and bead on the "Downstream" end (outlet). Ideally, the damper should be at least three duct diameters back from the intake to encourage smooth flow as the fresh air mixes with return air. Simply zip screw the damper in-line with the intake ductwork. Mastic or UL approved duct tape should be used to further seal the joints.

Motors

Demand-Air™ dampers are driven by rugged, brushless DC motors. They power the damper open and closed; controlled by the carbon dioxide sensor. If your application requires a fail-safe damper (closed) failure mode, then specify the TFB24-SR Motor.



Brushless DC Motor
Standard LMB24-SR

- For more motor choices and information, visit <http://tinyurl.com/pfnj826>
- The wiring diagram is available online at www.youngregulator.com/products/DA-CO2

Intake Duct Considerations

Minimize the equivalent length of the intake duct. Recommendations on intake sizing are calculated for an intake of 10 feet (3 meters) or less with a simple screened hood and a good intake fitting. If your application requires longer equivalent length ductwork, appropriate increases in duct sizes will be required.

See www.YoungRegulator.com/intakeCalc for assistance in sizing the intake duct/damper.

Carbon Dioxide Sensor Installation

Young Regulator has sourced a high quality carbon dioxide sensor. This sensor has been proven in commercial and industrial settings all over the world. The “Automatic Background Calibration” function provides robust reliable operation regardless of temperature or barometric pressure. It comes from the factory with a specially calibrated for this application (See graph on next page.) eliminating the need for any sort of scaling device.

Mount the Sensor

The sensor is a wall mount unit. It should be installed five feet off the ground, away from direct heat sources (direct sunlight, over a register or lamp). It should be representative of the spaces it controls. The sensor can cover up to 7500 square feet. See the Sensor installation instructions packed in the carton with the sensor for wall mounting instructions. They can also be found at www.youngregulator.com/CO2inst.pdf. Figure 5 (pg. 6) is a reproduction of the Wall Plate Template. Cut it out and place it on the wall if required.

Wiring the Sensor

The sensor will require a three (3) wire connection to the damper. See Figures 2 and 3 below. Note that the ground is both the common for power and the reference voltage for the sensor and motor. Shielded 18 to 22 gauge cable is recommended for all sensor wiring. Shielded cable will reduce errors caused by ambient electronic noise which could cause potential over cycling.

Notice that the sensor outputs 0-10 vdc and the motor responds to 2-10 vdc signals. The sensor has been calibrated taking this difference into account. Special calibration allows us to eliminate the need for other scaling hardware.

Figure 2 Demand-Air™ Wiring Diagram

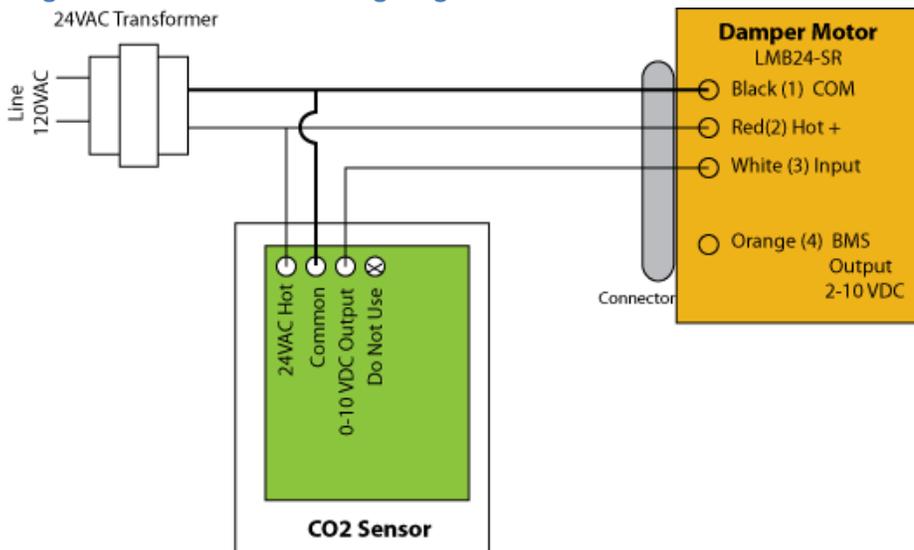
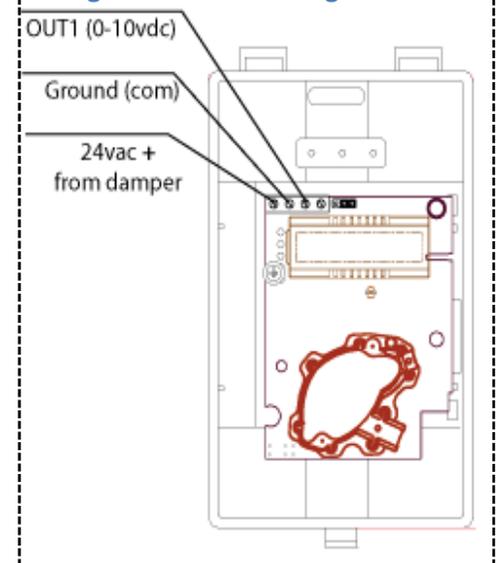


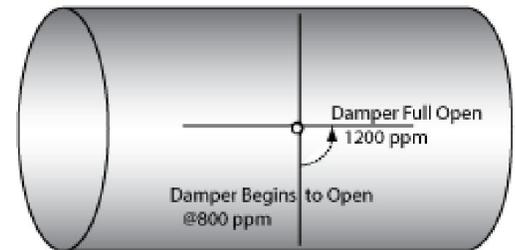
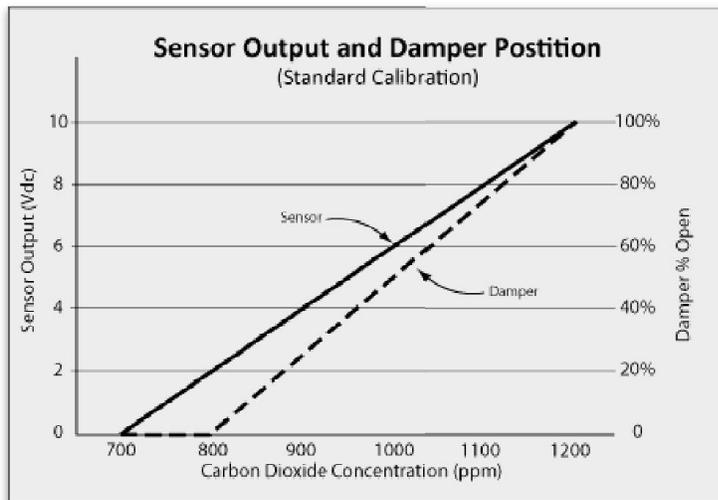
Figure 3 Sensor Wiring Detail



Wiring diagram is also available online at www.youngregulator.com/products/CO2.pdf

Sequence of Operations

Once wired, the system will continuously monitor carbon dioxide in the space through a process called Single Beam, Non-dispersive Infrared. The sensor essentially counts the number of carbon molecules in a sample of air. From that, it calculates the concentration in the air sample. Then it scales a 0 to 10vdc signal to reflect that concentration. The motor sees that signal and moves the damper blade to a proportional position. The graph illustrates the relationship between the sensor output and the blade position.



Blade Position
Damper Begins to Open at 800 ppm
Full open at 1200 ppm

See Page 1 for a concentration to damper position graphic.

The motor takes 90 seconds to cycle between full open and full closed. The sensor has a 2 minute response time. So anytime the concentration rises above 800 ppm then the damper will slowly modulate to bring in the required amount of fresh air without over-ventilating.

Additional Resources

ASHRAE Standard 62.1 -2013 “Ventilation for acceptable Indoor Air Quality” (American Society of Heating, Refrigerating and Air Conditioning Engineers) www.Ashrae.org

Check out www.YoungRegulator.com for several online resources.

1. “**62.1 CALC**” this simple spreadsheet excerpts Table 6.1 from ASHRAE Std. 62.1 2013 to assist you in calculating how much fresh air you need to bring into your space.
2. “**Intake CALC**” Intake Calculator this spreadsheet takes your 62.1 requirements and helps you size a fresh air intake.

These estimating calculators are offered as a convenience to our customers. They should be thought of as rough, rule of thumb estimates. They are not intended to take the place of complete and proper engineering. Young Regulator believes them to work in most simple cases but does not guarantee them on any particular application. Young Regulator does not accept any responsibility for their use.

Sensor Installation Instructions: www.youngregulator.com/products/CO2.pdf .

Young Regulator Limited Parts Warranty Summary

The Demand-Air™ system is warranted from defects in material and workmanship for a period of five (5) years from the date of purchase. During the covered period, Young Regulator will repair or replace at its discretion any part that fails because of faulty material or workmanship. Damage due to negligence or improper use or other causes beyond the company's control are excluded from coverage. The company's liability extends to parts replacement only. It accepts no liability for labor to remove, repair or replace the product. It accepts no liability for incidental expenses or consequential damages. The warranty is null and void if the product is repaired or modified in the field.

The design engineer and the contractor bear all responsibility for appropriate application, installation and commissioning of Young Regulator equipment. Failures due to misapplication of the product are not a valid claim for warranty replacement.

To obtain warranty service, contact the installing contractor or design engineer.

There are no other explicit or implied warranties. Young Regulator does not assume, nor does it authorize any person to assume on its behalf, any other liability in connection with the sale of its products.

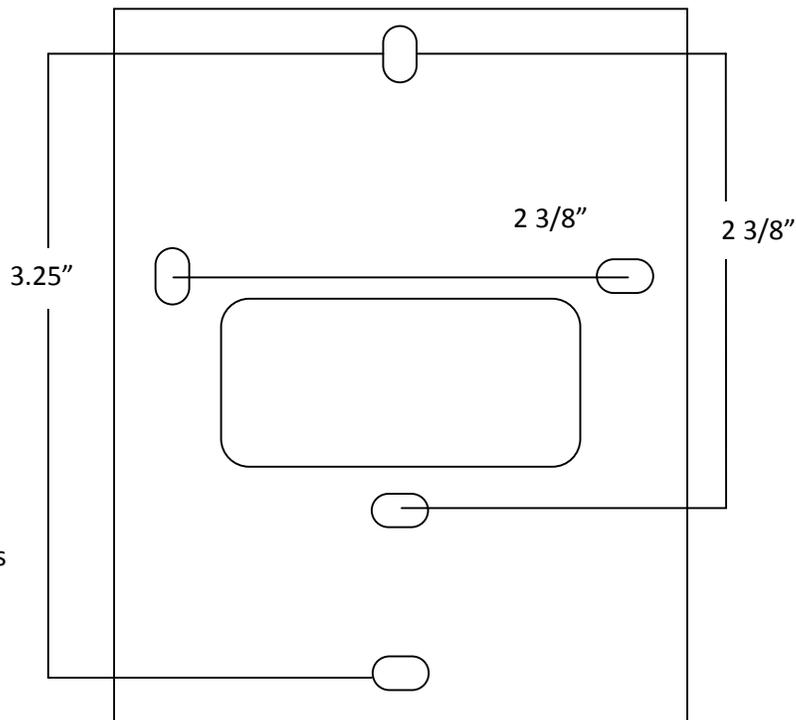


Figure 5 Wall Template

See Installation section for details