M9-IAQS

Indoor Air Quality Monitor

Description

M9-IAQS is a commercial grade indoor air quality monitor with a robust multiparameter sensor array. It has flexible options for dashboard visualizations, reporting, wireless communication, and integration with building automation systems. It is ideally suited for optimizing ventilation rates taking into account not only occupancy, but common indoor pollutants such as particles and chemicals. The monitor display screen has optional lockout mode. Size: 3 ¼" x 3 ¼" x 1"

Application Options

- Standalone IAQ monitoring; screen display readings only. Data is not transmitted or stored.
- Dashboard visualization for monitoring real-time, historical trends, reporting, alarms.
- Demand control ventilation via integration with BMS.

Features

- Advanced sensing elements for continuous monitoring from world leader in sensor design and manufacturing.
    - Carbon Dioxide (CO2)
    - Particles (PM1, PM2.5, PM10)
    - Total Volatile Organic Compounds (TVOC)
    - Temperature
    - Humidity
- Third party accreditation through RESET Air; Grade B Compliant; accepted for well-building certifications.

Magnum First - 1 Seneca Street, 29th Floor, M55 - Buffalo, NY 14203 - phone 716-293-1588 - www.magnumfirst.com - info@magnumfirst.com v033023

(Features, continued)

- Simple, low-cost calibration; 10 year expected life for CO2 & PM sensors. TVOC Metal Oxide element can be swapped out every 2 to 4 years. Annual calibration available for well-building certifications.
- Internal fans draw air in and across sensors for consistent accuracy and faster response.
- Display screen lockout option.
- Multilevel dashboard visualizations: Portfolio, Site, and Sensor views. Historian level for additional granularity & reporting.
- Wireless communication from monitor via EnOcean™ RF protocol to gateway device (M9-EBOX) which converts signal to BACnet IP with streamlined point mapping; IT friendly. Easily scalable.
- Compatible with other EnOcean HVAC / Lighting control devices; same wireless infrastructure can be used.
- In-house IAQ / WELL Building Certification expertise available.
- Low lifecycle cost + subscription plan options.

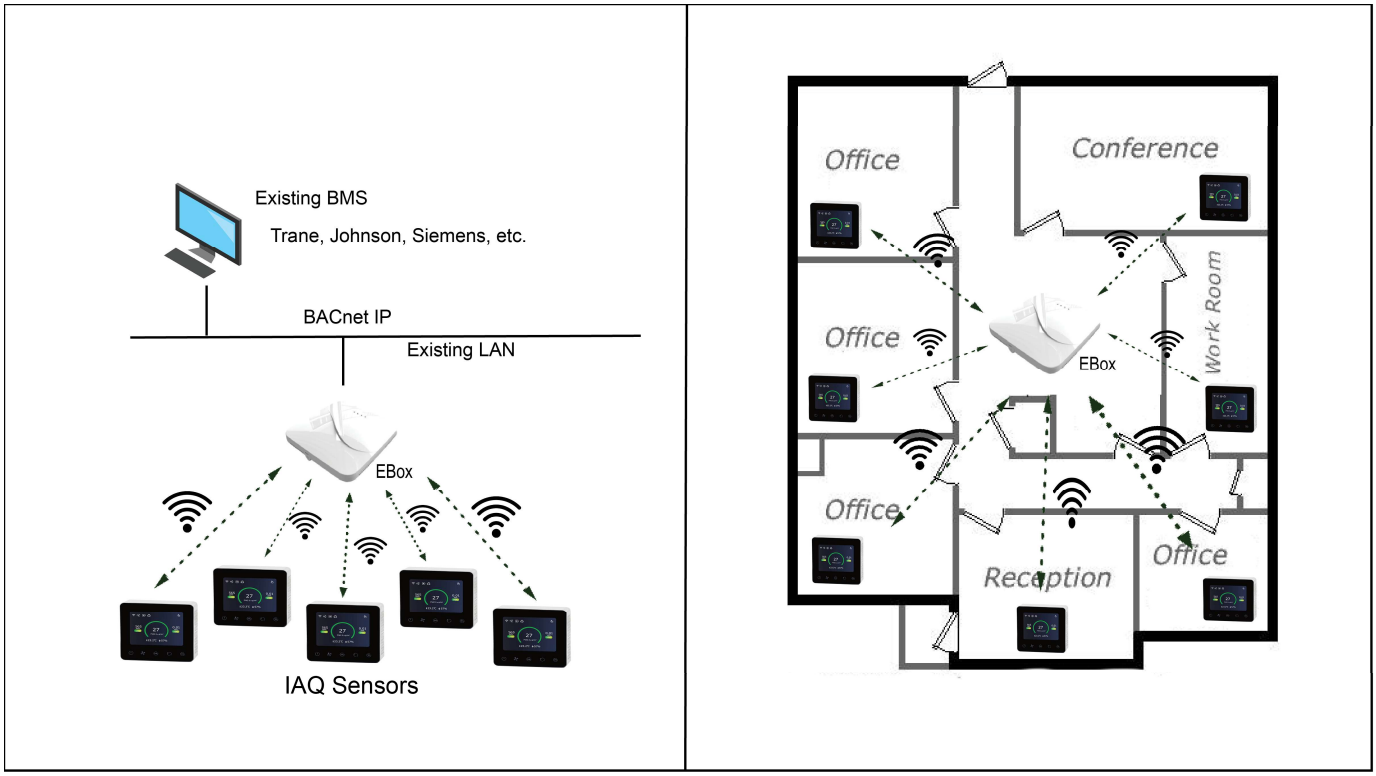
Dashboard Visualizations

Sensor view

- Magnum First developed a user interface to make the sensor data easy to understand through colorized visualizations. The traffic light mode communicates at-a-glance the current status of the air quality in the zone being measured by the sensors. Parameter thresholds are adjustable by user.
- An Air Quality Index is modeled after the EPA's outdoor index to provide an overall measure of all parameters.
- A trend graph shows a timeline of the day's parameters in the same view. Drop down menu for week, month, year, etc. Hovering with a mouse over the graph will pinpoint exact time and level of the sensed parameters.
- Portfolio view (multiple sites), Site view (within a building), and historian (unlimited granulation) along with reporting options are also available.

Architecture

Integration with existing BMS



If there is no existing BMS the Magnum First Smart Edge Controller can be used (includes graphics / visualizations).

- M9-EBOX converts wireless EnOcean signal to BACnet IP. Available in 902, 868, and 928 MHZ. 1 GB RAM Does not use WiFi.
- EBOXES discoverable via BACnet IP or EnOcean radio.
- One EBOX can serve up to 110 monitors in range; 100 – 300' range depending on site conditions.
- EBOX is POE.

Sensors - Working Principal

- Carbon dioxide (CO_2) sensor uses the principle of Non-Dispersive Infrared (NDIR) technology to detect indoor CO_2 concentration in real time (ppm).
  - The CO_2 sensor leverages "Automatic Baseline Correction" (ABC) algorithms that are designed to maintain the stated device accuracy throughout the entire installed life. ABC stores all the measured values within a one-week time period and will identify which value(s) reflects ambient atmospheric CO_2 levels (approx. 420 ppm) and uses this value(s) to execute a single point recalibration of the CO_2 sensor in real-time.
  - Alternate calibration methods are available upon request.
- TVOC sensor uses a Metal Oxide Semiconductor (MOX) to measure a typical IAQ mix of compounds found in office environments. Depending on the exposure levels of the VOCs the MOX element will remain reasonably accurate for between two and four years. Sensor output is measured in parts per billion (ppb). The MOX element is the only consumable in the monitor. Magnum provides several options for replacement.
- The Relative Humidity &Temperature sensor uses a capacitor resistance material to detect the indoor temperature (° F) and humidity (%) in real time.
- Particle sensors use the principle of laser scattering technology to detect the indoor PM2.5, PM1.0 and PM10 mass concentration in real-time. ($\mu g/m^3$). The following series of unmatched features and innovations are designed to remove the need for calibration through the installed life of the device:

- (Sensors – Working Principal, continued)

  - The laser diodes and internal constant-speed fans are manufactured internally to ensure consistent performance, reliability, and repeatability. These components are the main failure points for competitive PM sensors.
  - Anti-dust structure – the PM sensor "scavenges" a small portion of the incoming air sample, passes this sample through an internal HEPA filter, and then uses this filtered air sample as an "air dam" between the critical measurement surfaces and the incoming air sample to be measured. This prevents any particulate build-up on the measurement surfaces.
  - Auto Particle Identification (API) – using four individual calibration curves the PM sensor has an algorithm that continually evaluates the measurements coming from the sensor and determines which calibration curve is the best fit for the given measured environment and selects the appropriate calibration curve in real-time.
  - Matrix Calibration – the PM sensors have an additional calibration curve that can normalize the measured value based on a series of temperature and humidity measured values.
  - Sensing system calibration is against the METONE BRIMM Lab-Grad Calibration Instrument. This allows individual calibrations of PM1.0, PM2.5, and PM10. All competitors use other standards which only allows calibration of PM1.0, and use a rough estimate for PM2.5 and PM10.

Specifications

Working principle	CO_2: NDIR PM: Laser scattering principle
Measurement range	PM2.5: 0~999μg/m³ CO_2: 0~5000ppm VOC: 0~10ppm Temperature: -10~50℃ Humidity: 0%~95%RH
PM measurement accuracy	PM1.0/2.5: 0~100μg/m³, ±10μg/m³; 101~500μg/m³, ±10% of reading PM10: 0~100μg/m3: ±25μg/m³; 101~500μg/m3: ±25% reading (25°C±2°C, 50±10%RH, GRIMM)
CO_2 measurement accuracy	±(30ppm+3% of reading) @ (0~50℃, 0~2000ppm)
Temperature Measurement Accuracy	±1℃
Humidity Measurement accuracy	±8%RH
VOC consistency	Typical/Max: 200ppb/250ppb OR 20%/25%, whichever is larger
Resolution	PM:1μg/m³; VOC: 1ppb; CO2: 1ppm Temperature:0.1℃; Humidity:0.1%
PM Response time T90	≤8s
CO_2 Response time T90	<90s
VOC Response time T90	≤180s
Working condition	-10~50℃, 0~95%RH(Non-condensing)
Storage condition	-20~60℃, 0~95%RH(Non-condensing)
Working voltage	15-30V DC/24V AC
Average power	4.3W nominal, 5W max
Communication interface	RS485/EnOcean gateway module[1]
Dimensions	86*86*24.9 mm
Lifetime	≥10 years[2]

Note:

1. RS485-Modbus communication cannot be used with Enocean network communication simultaneously;
2. Continuous operation at room environment without high silicon concentration.