

Vigilante AQS™ V2 Air Quality Station

Real-time data means more time at the face.





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A “Fit for Purpose” Solution


The Vigilante AQS™ V2 is a versatile air quality station designed for underground mines. It accurately measures airflow rate, direction, wet and dry bulb temperature, and gas concentration, helping miners return to the face sooner and more safely. This Industrial Internet of Things (IIoT) device connects directly to any network without needing complex programmable logic controllers (PLC).


It features up to thirteen customizable plug-and-play digital sensors and module inputs, which can be mixed and matched according to underground requirements. Whether you need two airflow measurements, three different gas sensors, or control of a mine booster fan, the Vigilante AQS™ V2 can be reconfigured in minutes to adapt to changing requirements. All sensors and modules use industry-standard digital protocols, allowing for remote-mounted sensors that increase coverage area and data accuracy while reducing capital expenditure (CAPEX).

Monitor and Control Capacity


The digital sensors provide real-time conditions, enabling your existing control system to automatically adjust underground (U/G) fan and regulator settings via Maestro’s Ethernet I/O™ to maintain setpoints. You can also schedule automatic changes to U/G fan and regulator settings for events like shift changes or blasting. If communication networks fail, the system can operate autonomously or revert to a predetermined state (fail open, fail close, fail last position, or fail at a specific percentage open).



 Easy to install

 Easy to use

 Compact

 Easy to maintain

The Vigilante AQS™ V2 supports the two most popular network communication protocols: Modbus TCP/IP and EtherNet/IP™. Simply plug the Vigilante AQS™ V2 into a network switch, configure the settings via the built-in web pages, and start measuring. Additionally, the Vigilante AQS™ V2 offers an integration with Ethernet I/O™ that performs digital to analog and analogue to digital operations that can be used with any legacy system.

Increase Production Reduce Costs

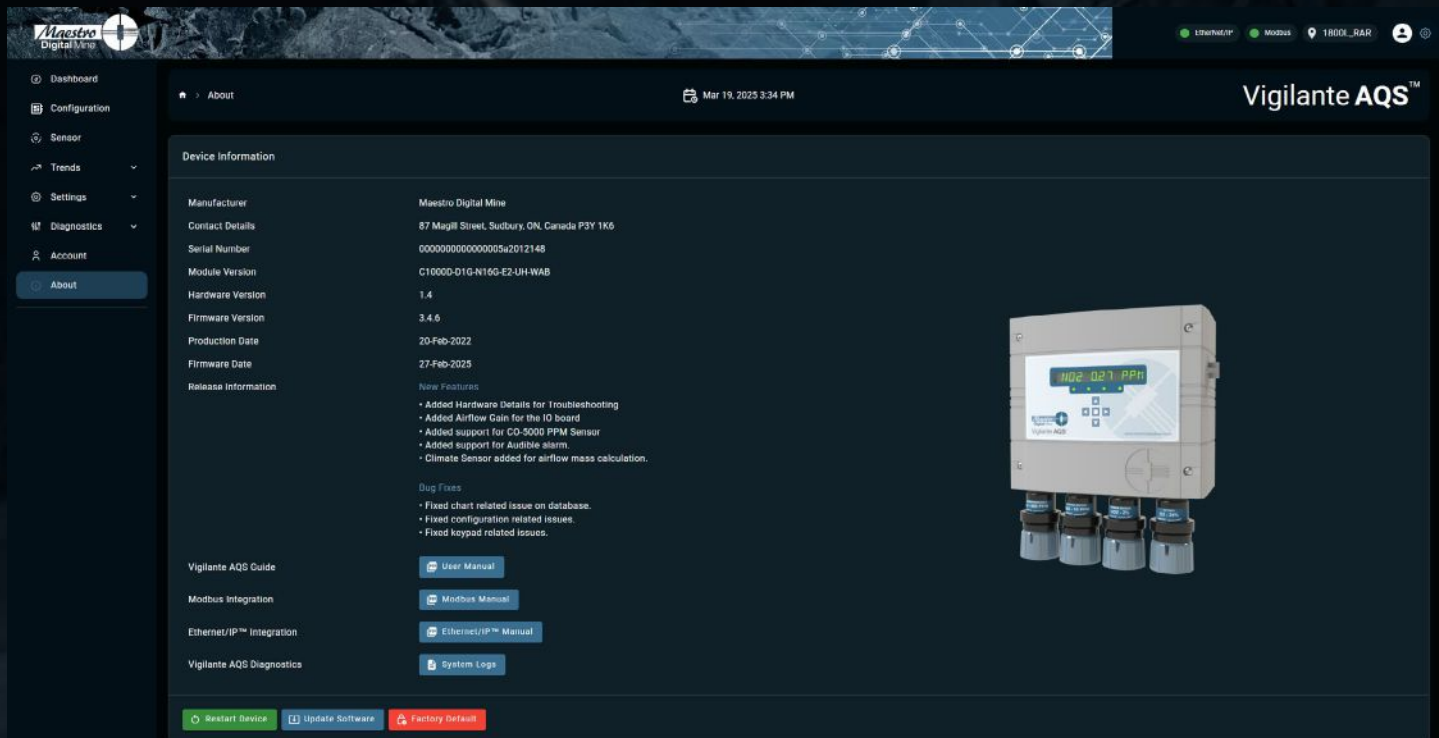
Based on direct customer feedback, Maestro's digital products save mining companies an average of 40-70% in capital expenditures (CAPEX) compared to traditional monitoring solutions. Maestro offers free firmware updates for the lifespan of the mine, resulting in total savings of 70-80% over the entire lifecycle.

Reliable & Maintainable

The smart digital sensors provide real-time diagnostic fault detection and predictive maintenance information to users, whether on the surface or anywhere on the network. From identifying a damaged sensor to detecting an LHD blocking the airflow sensors, digital diagnostics enhance system uptime and reduce maintenance costs.

One AQS for Multiple Applications

You can mix and match various digital sensors for gas, airflow, differential pressure, climate, and more. Measure multiple air flows from intersecting drifts and control and monitor fans, automated regulators, or doors—all within the same device.



The screenshot displays the Maestro Digital Mine Vigilante AQS web interface. The interface is dark-themed with a sidebar on the left containing navigation options: Dashboard, Configuration, Sensor, Trends, Settings, Diagnostics, Account, and About. The main content area shows the 'About' page for a device, with the following information:

- Manufacturer:** Maestro Digital Mine
- Contact Details:** 87 Magill Street, Sudbury, ON, Canada P3Y 1K6
- Serial Number:** 000000000000005u2012148
- Module Version:** C1000D-D1G-N16G-E2-UH-WAB
- Hardware Version:** 1.4
- Firmware Version:** 3.4.6
- Production Date:** 20-Feb-2022
- Firmware Date:** 27-Feb-2025

Below the device information, there are sections for 'New Features' and 'Bug Fixes':

- New Features:**
 - Added Hardware Details for Troubleshooting
 - Added Airflow Gain for the IO board
 - Added support for CO-5000 PPM Sensor
 - Added support for Audible alarm.
 - Climate Sensor added for airflow mass calculation.
- Bug Fixes:**
 - Fixed chart related issue on database.
 - Fixed configuration related issues.
 - Fixed keypad related issues.

At the bottom of the interface, there are buttons for 'Restart Device', 'Update Software', and 'Factory Default'. On the right side of the interface, there is an image of the physical Vigilante AQS device, which is a white rectangular unit with a digital display showing '102.021 PPM' and four sensors at the bottom.

Improved Air Quality with AQS Sensors

Lightweight and Portable for Easy Movement

The lightweight design allows the air quality station to be either fixed-mounted or portable as the mine advances. A complete AQS mounted on a rigid aluminum back plate typically weighs between 10 to 30 lbs (5 to 15 kg).

Gas and humidity sensors can be mounted integrally to the Vigilante AQS™ V2 enclosure or remotely up to 1000 meters away.



Airflow Sensors

The digital airflow sensors use dual-head ultrasonic transit time technology with temperature compensation to ensure the highest accuracy and repeatability, even in challenging applications. Sudden changes in airflow direction in fire conditions pose significant safety concerns, which is why these sensors offer bidirectional airflow measurement.

The digital sensor design allows a sensor pair to be used across most drift, fan, and duct applications. Each airflow sensor includes a built-in directional laser that can be activated during installation for easy alignment. Once installed, configured, and calibrated, the sensors require minimal maintenance.

Sensors are designed for standard drifts up to 7m x 7m and larger galleries commonly found in salt or potash mines, as well as road and rail tunnels.



Gas Sensors

The digital gas sensors can be “hot swapped” while fully powered, eliminating the need for skilled technicians or electrical isolation. This enables surface calibration without the hassle of carrying calibration gas bottles, regulators, and tubing.

Each sensor includes a non-volatile memory chip that stores calibration data, dates, hours of use, minimum and maximum gas concentrations, and temperature, offering advanced diagnostics and a digital calibration record.



Pressure and DP Sensors

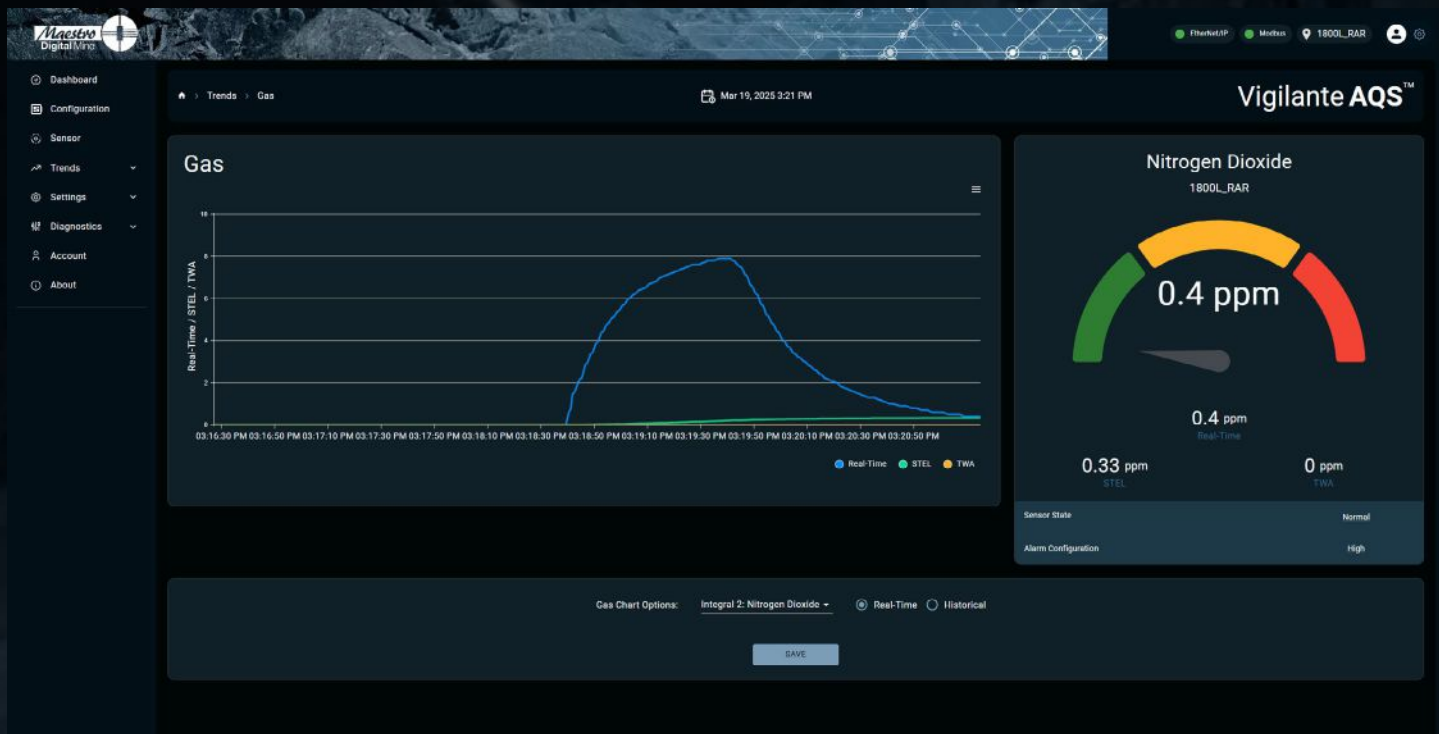
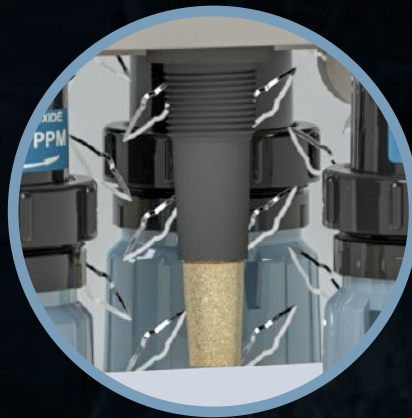
The digital design significantly reduces infrastructure costs compared to conventional analog transmitters. A PLC is no longer necessary; simply connect the digital pressure transmitter to any available Vigilante AQS™ V2 port, configure it, and the data and diagnostics can be directly captured by any SCADA, HMI, PLC, or DCS system.

The robust ceramic sensor features a large flush-mounted process connection, eliminating impulse lines that can clog in underground applications. It is designed for use with booster fans, primary fans, and regulators, all of which require differential pressure measurement across the bulkhead or fan.



Climate Sensors

These digital sensors measure dry bulb temperature, wet bulb temperature, relative humidity, barometric pressure, worker heat stress, and thermal work limit (TWL). The measurements automatically adjust for changes in barometric pressure, and the TWL output is further compensated for air velocity.



Planned Maintenance Saves Time & Cost

Reduce mine OPEX with Duetto Analytics™ for Streamlined Maintenance

All of Maestro's IIoT devices feature embedded webserver and digital technology integrated into each sensor, enabling remote diagnostics for maintenance issues and ensuring sensor calibration compliance. Duetto Analytics™ is a software platform that manages the IIoT devices, facilitating surface troubleshooting, providing real-time measurements, and trending functions. It identifies network, communication, and sensor issues using diagnostic data, saving time and costs by allowing miners to convert diagnostics into actionable steps from the surface before going underground. When the support team does go underground, they arrive equipped with the necessary tools, spare parts, and equipment to complete maintenance in one visit.

Duetto Analytics™ provides detailed information about sensor and device issues, helping customers fix current problems and prevent future ones. It ensures sensors are calibrated, notifies users when sensors are nearing expiration, and identifies sensors reporting unusual or incorrect data.

The screenshot shows the Duetto Analytics software interface. At the top, there are five status cards: 32 Devices Total Devices, 32 Devices Active, 0 Devices Pending Service, 1 Devices Alarms, and 0 Devices Offline. Below this is a navigation bar with categories: Air Quality Stations, Plexus PowerNet™, ModuDrive™, SuperBrite™, and Marquee Display. The main content area is a table with columns for Product, Location, and seven Sensors. The table lists various devices like ZEPHYR FAR, Vigilante AQS V2, and 2400-AQS models, each with its location and sensor readings. One CO sensor reading is highlighted in red as -99.9 ppm Integral.

Product	Location	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
ZEPHYR FAR	192.168.10.62	CO 0 ppm Gas 1	Temperature 24.4 °C RH 1	Humidity 13.3 % RH 1	Wet Bulb 10.8 °C RH 1			
Vigilante AQS V2	192.168.10.65	CO2 0 % Integral	CO -99.9 ppm Integral	Air flow -0.19 kcfm Remote	Temperature 22.6 °C Integral	Humidity 14.8 % Integral	Wet Bulb 9.7 °C Integral	WBGT 13.5 °C Integral
Vigilante AQS V2	192.168.10.203	NO2 0 ppm Integral	SO2 0 ppm Integral	O2 20.8 % Integral	SO2 6.6 ppm Integral	Temperature 22.8 °C Integral	Humidity 15 % Integral	Wet Bulb 9.8 °C Integral
2400-AQS-5108	192.168.1.65	CO 2.2 ppm Integral	Air flow 15 kcfm Remote	Air flow 10 kcfm Remote	Temperature 25.6 °C Integral	Humidity 39.1 % Integral	WBGT 19.38 °C Integral	
2400-AQS-6858	192.168.1.178	NH3 2.1 ppm Integral	Air flow 15 kcfm Remote	Air flow 10 kcfm Remote	Temperature 25.6 °C Integral	Humidity 38.3 % Integral	WBGT 19.38 °C Integral	
2400-AQS-7542	192.168.1.167	CO 1.2 ppm Integral	Air flow 15 kcfm Remote	Air flow 10 kcfm Remote	Temperature 28.6 °C Integral	Humidity 37.5 % Integral	WBGT 19.38 °C Integral	
2400-AQS-6068	192.168.1.160	SO2 1 ppm Integral	Air flow 15 kcfm Remote	Air flow 10 kcfm Remote	Temperature 22.7 °C Integral	Humidity 38.7 % Integral	WBGT 19.38 °C Integral	
2400-AQS-4481	192.168.1.18	CO 4.2 ppm Integral	Air flow 15 kcfm Remote	Air flow 10 kcfm Remote	Temperature 23.2 °C Integral	Humidity 39.5 % Integral	WBGT 19.38 °C Integral	
2400-AQS-9719	192.168.1.111	SO2 9.1 ppm Integral	Air flow 15 kcfm Remote	Air flow 10 kcfm Remote	Temperature 24.2 °C Integral	Humidity 39.7 % Integral	WBGT 19.38 °C Integral	

Making the Complex Simple



SuperBrite™
Marquee Display.



ModuDrive™
IloT Ethernet Actuators



Bi-directional Airflow
Sensor



Vigilante AQS™ V2
Air Quality Station



The Maestro Ecosystem

Plexus PowerNet™

**MaestroFlex™
Automated Regulators**

Universal and Open Communications

The Vigilante AQS™ V2 is an air quality monitoring solution with flexible integration options for any SCADA, PLC, DCS, PLS, or HMI system.

Whether using Modbus TCP/IP or EtherNet/IP™, the Vigilante AQS™ V2 operates efficiently. An IP address makes it quick, simple, and economical to connect to any Ethernet-based network. Simply plug the Vigilante AQS™ V2 into a network switch, configure the settings via the built-in web pages, and start measuring. The register maps can easily be paired to any current or legacy monitoring platforms.

Technical Specifications

Physical and Environmental Parameters	Enclosure Dimensions: 31.8cm W x 43.2cm H x 15.2cm D (12 ½"W x 17"H x 6"D) Enclosure Rating: NEMA 4X / IP66, CE Operating Temperature Range: -20 to 60°C (-4 to 140°F) Push buttons and 12 segment LED display Features: Push buttons and 12-segment LED display
Power Requirements	Power over Ethernet (PoE) 24 VDC 110-220 VAC, 50/60 Hz CUL Power consumption: <25W (at maximum load) CE Compliant
Communications	Open communication protocol for easy connection to any PLC, SCADA, HMI, DCS or PC-based system Ethernet Modbus TCP/IP protocol EtherNet/IP™ protocol Optional Wireless 802.11 g Ethernet
Fully Digital Plug and Play Sensors	8 Remote ports supporting any combination of Maestro digital sensors and modules. 4 Integral gas sensor ports 1 Climate sensor port Built-in webpages for configuration and alarm functionality.
Climate Sensor	Integral mounted climate sensor with dry/wet bulb temperature, barometric pressure, relative humidity, worker heat stress and Thermal Work Limit measurements.
Gas Sensors	Smart & digital electrochemical and infrared gas sensors Available as integral or remote-mounted with up to 1000 metres of separation between sensors and the controller. Available sensors: CO, NO2, NO, O2, H2S, SO2, Cl2, NH3, CO2, LEL Methane, LEL Propane, HCN Real-time values with built-in TWA and STEL calculations Refer to individual gas specifications sheets for additional information on ranges and accuracy.
Airflow Sensors	Smart digital ultrasonic transit time airflow and temperature measurement. Bracket options for drift, tunnel, ducting, or fan applications Onboard laser alignment Maximum of 300 metres separation distance with power booster Refer to individual airflow specifications sheets for additional information on ranges and accuracy.
Pressure and Differential Pressure Sensors	Digital differential pressure (DP) sensors to measure pressure across bulkheads, booster fans, or regulators. Remote-mounted with up to 1000 meters of separation.

The Maestro Ecosystem



SuperBrite™
Marquee Display



DustMon **PM™**



Plexus PowerNet™



ModuDrive™
IIoT Ethernet Actuators

For more information on the Maestro ecosystem visit maestrodigitalmine.com



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complex simple

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