Maestro Digital Mine

Real time data means more time at the face.

NEW & IMPROVED

Maestro Vigilante AQS™ Air Quality Station

Engineered for the harsh underground mine environment.

The Vigilante AQS™ accurately measures airflow and direction, wet and dry bulb temperature and gas concentration – reducing downtime and enabling miners to return to the face sooner and safer.

“A fit for purpose” solution.

Vigilante AQS™

Air Quality Station

Enabling your miners to return to the face sooner and safer

The **Vigilante AQS™** is a multivariable air quality station designed to monitor and control air quality in underground mines that accurately measures airflow rate, direction, wet and dry bulb temperature, and gas concentration, enabling miners to return to the face sooner and safer. This Industrial Internet of Things (IIoT) device connects directly to any network without the need of a complex programmable logic controllers (PLC).

Featuring up to fourteen fully customer configurable plug & play digital sensors and module inputs, that can be freely mixed and matched according to underground requirements.

Whether two airflow measurements and three different gas sensors are required, or control of a mine booster fan. The **Vigilante AQS™** can easily be reconfigured in minutes to adapt to the changing mine requirements.
All sensors and modules that connect to the **Vigilante AQS™** utilize industry standard digital protocols. This enables remote mounted sensors, increasing coverage area and data accuracy while reducing CAPEX.

The **Vigilante AQS™** fully supports the two most popular network communication protocols Modbus TCP/IP and Allen-Bradley EtherNet/IP™. Simply plug the Vigilante AQS™ into a network switch, configure the settings via the built-in web pages and start measuring. Alternately, the Vigilante AQS™ offers an optional digital to analog I/O module that can tie into any legacy system.

This solution is compact, easy to install and use. Best of all, the system is 50-70% less expensive than conventional options.

Monitor and Control Capacity

Read real-time conditions from the Vigilante sensors, enabling your existing control system to automatically adjust underground (U/G) fan and regulator settings via the Ethernet I/O™ module to maintain setpoint. Automatically change U/G fan and regulator settings as part of a schedule, such as shift changes or blasting events.
When communication networks fail, the system can function in autonomous mode or go to a predetermined state (fail open, fail close or fail last position, fail at x% open).

Improved air quality means more time at the face.

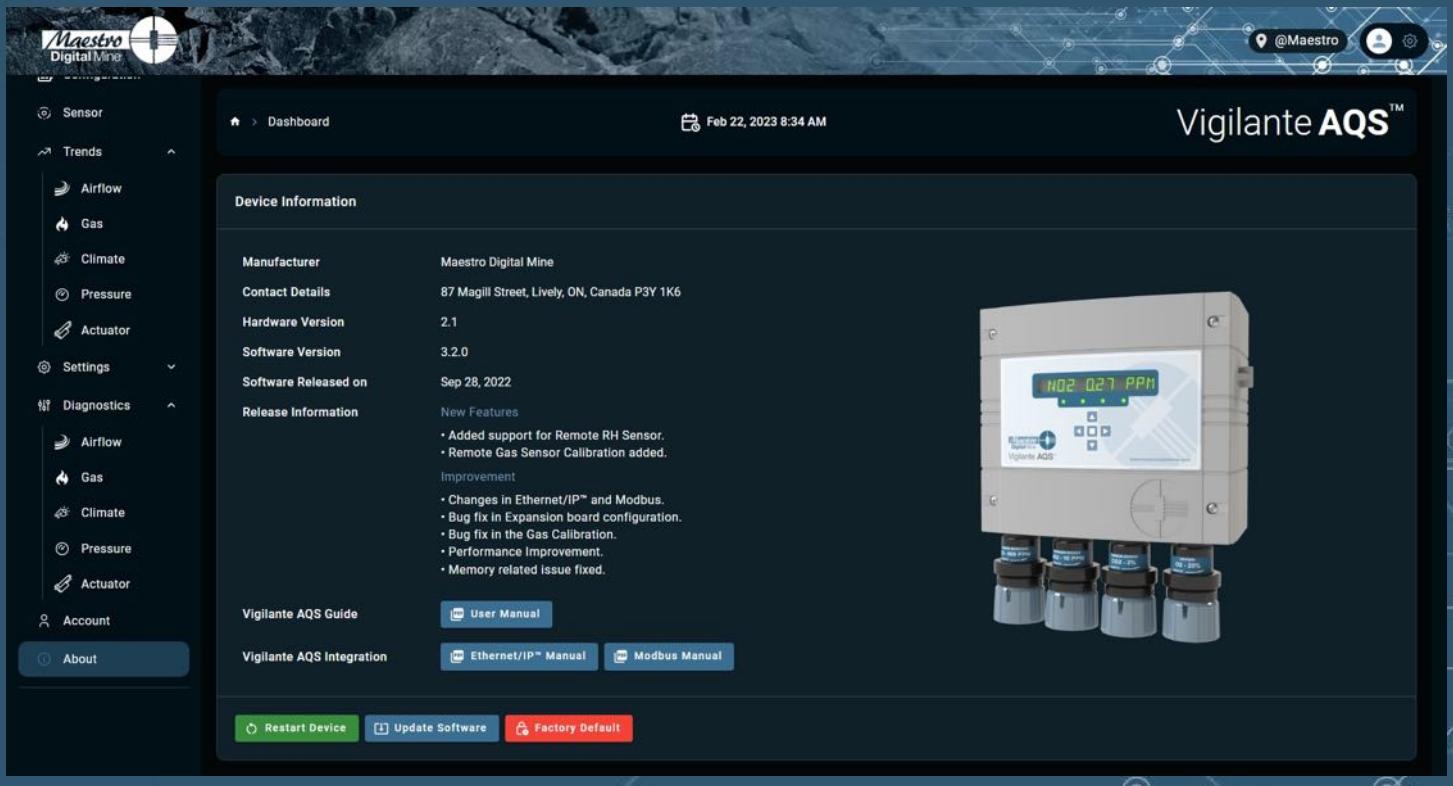
Increase production, reduce costs and integration time

Based on direct customer feedback, Maestro's digital products save mining companies on average 40-70% of CAPEX compared to conventional monitoring solutions.

Maestro supports its equipment with free firmware updates for the life of the mine. Full savings are in the range of 70-80% over **the full life cycle**.

Reliable & Maintainable

The smart digital sensors provide real time diagnostic faults and predictive maintenance information to the user on surface or anywhere on the network. From a damaged sensor to a scoop tram blocking the airflow sensors – digital diagnostics will increase system uptime and reduce maintenance costs.



One AQS for multiple applications

Mix and match multiple digital sensors for gas, airflow, humidity, worker heat stress and more. Measure multiple airflows from intersecting drifts. Control and monitor fans, louvers, or doors – all within the same device.

Light weight and portable for easy movement

The light weight design allows the system to be either fixed mounted or portable as the mine continues to advance. A complete system mounted on a rigid aluminum back plate typically weighs between 10 to 30 lbs (5 - 15kg).

Gas and humidity sensors can be mounted integral to the **Vigilante AQS™** enclosure or remotely up to 1200 metres in distance.

Gas Sensors

The digital gas sensors can be “hot swapped” under full power without the requirement of skilled technicians or electrically isolating the equipment. This allows the sensors to be calibrated on surface instead of lugging around calibration gas bottles, regulators and tubing.

Each sensor contains a non-volatile memory chip that stores calibration data, dates, hours of use, minimum and maximum gas concentration and temperature to provide both advanced diagnostics functions and a digital calibration record.

Airflow Sensors

The digital airflow sensors utilize dual-head ultrasonic transit time technology and temperature compensation to ensure the highest accuracy and repeatability in the most difficult applications. A sudden change in airflow direction is a substantial safety concern which is why the sensors provide bi-directional airflow measurement. Universal digital sensor design allows a single sensor pair to be used on all drift, fan and duct applications.

Each airflow sensor has a directional built-in laser that can be initiated during installation for easy alignment. Once installed, configured, and calibrated, the sensors require next to zero maintenance.

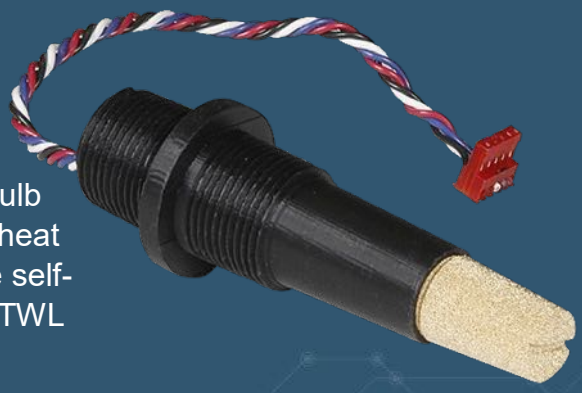
Sensors are available for regulator 7m x 7m drifts or larger galleries found in salt or potash mines and road or rail tunnels.

Pressure and Differential Pressure Sensors

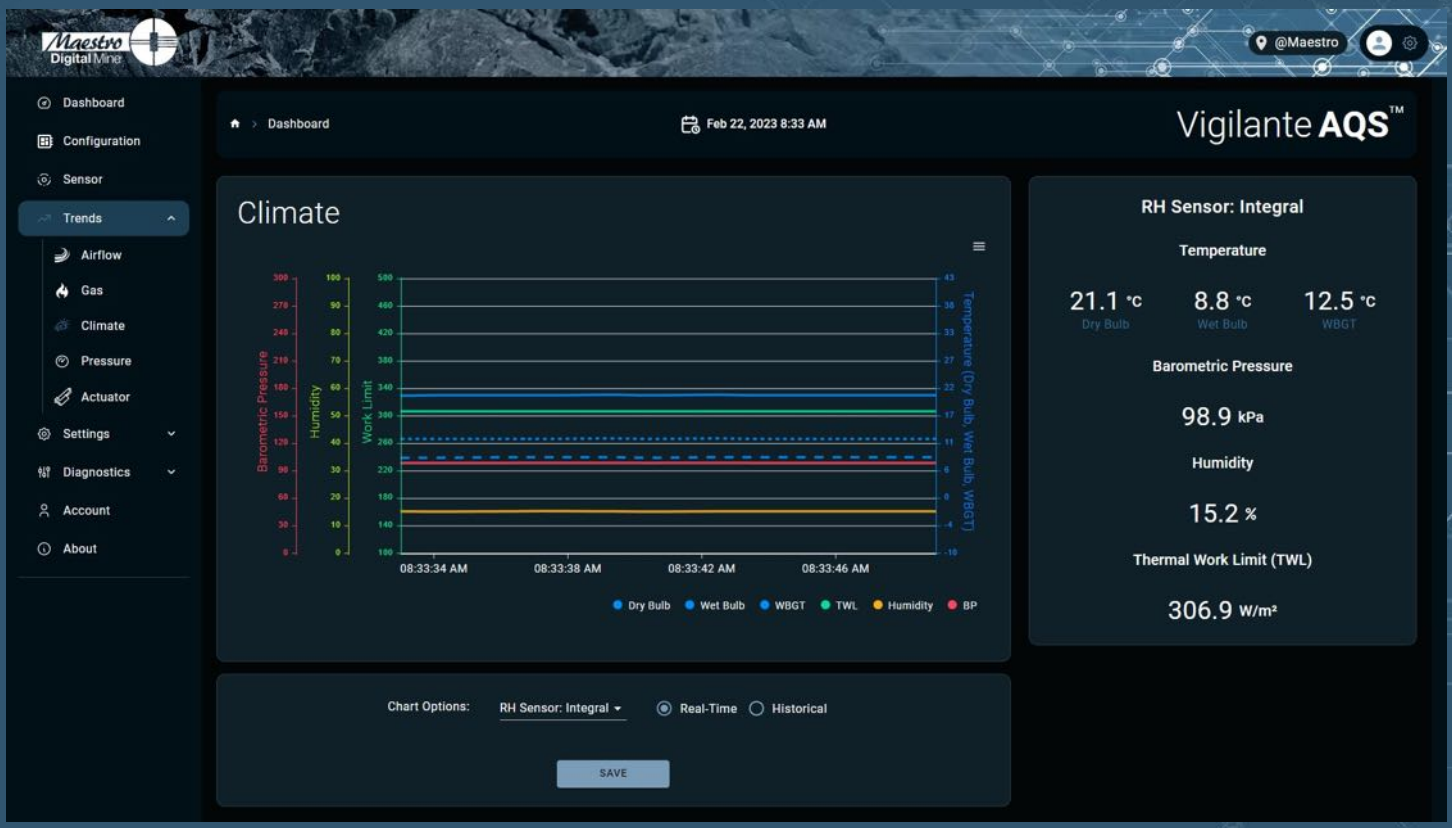
The digital design greatly cuts down on the infrastructure costs associated with adding conventional analog transmitters. Remote PLC I/O is no longer a requirement. Simply wire the digital transmitter to any available Vigilante AQS™ port, configure, and the data and diagnostics can be directly captured by any SCADA, HMI, PLC or DCS system.

The robust ceramic sensor utilizes a large flush mounted process connection thereby eliminating any impulse lines that can plug up in underground applications. It is designed to be used in conjunction with booster fans, primary fans and regulators. All of which requires differential pressure measurement across the bulkhead or fan.

Dry Bulb Temperature, Relative Humidity, Barometric Pressure Sensors



Provide measurement values of dry bulb temperature, wet bulb temperature, relative humidity, barometric pressure, worker heat stress and thermal work limit (TWL). The measurements are self-compensating for changes in barometric pressure while the TWL output is further compensated for air velocity.



Efficient Maintenance.

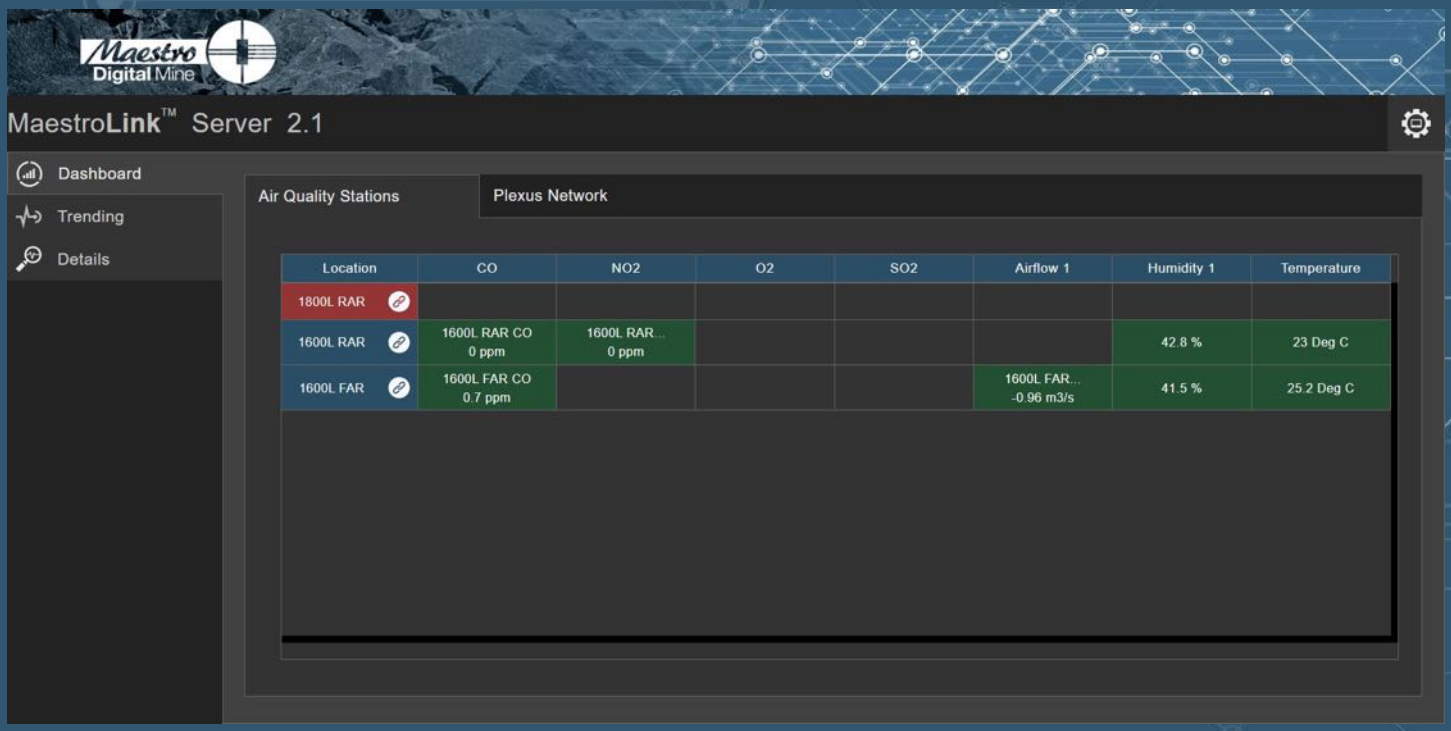
Drive down mine OPEX using MaestroLink™ Server for simplifying maintenance

All Maestro's IoT devices utilize embedded webservers along with digital technology right to each individual sensor, enabling remote diagnostics for solving maintenance problems as well as assuring sensor calibration compliance.

MaestroLink™ Server is a software platform that monitors all of Maestro's equipment underground and enables troubleshooting from surface, as well as real-time measurements and trending functions. **MaestroLink™ Server** can detect network problems, communication problems, and sensor problems using the diagnostic data.

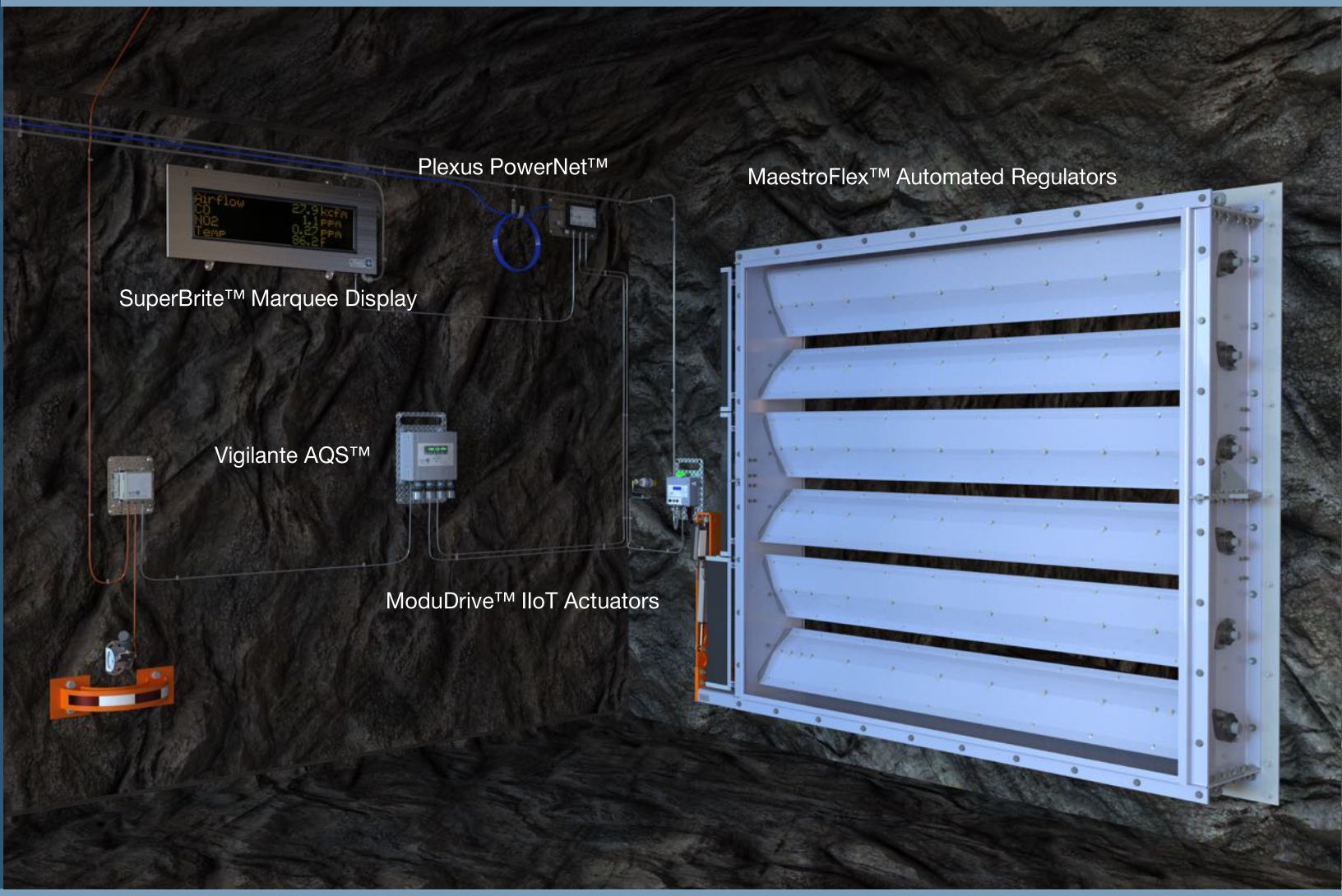
It saves time and cost by giving miners the ability to poll the diagnostics and then turning the data into tangible actions from surface before having to go underground. The support team will go underground the first time with the proper tools, spare parts and equipment to do the maintenance once instead of multiple trips.

This diagnostic data allows **MaestroLink™ Server** to give in depth information regarding sensors and devices to help customers fix problems and prevent future problems, thus ensuring sensors are calibrated. The platform also notifies when sensors are about to expire and finds sensors that are reading unusual or bad information.



We make the complex, simple!

The Maestro Ecosystem



Universal and open communications

The **Vigilante AQS™** is an air quality monitoring solution with flexible integration options to any SCADA, PLC, DCS, PLS or HMI system. We provide the complete automation package – the entire digital solution on every mine level.

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

Technical Specifications

Technical Specifications	Vigilante AQS™
Physical & Environmental Parameters	• Enclosure Envelope 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 • Enclosure mounted barometric pressure, humidity and temperature sensor (calculated wet bulb, Thermal Work Limit, worker heat stress)
Power Requirements	• Power over Ethernet (PoE) • 24 VDC • 110-220 VAC, 50/60 Hz CUL • <300mA current draw • CE Compliant
Communications	• Open communication protocol for easy connection to any PLC, SCADA, HMI, DCS or PC based system • Ethernet Modbus TCP/IP protocol • Allen Bradley EtherNet/IP™ protocol • Optional analog and discrete inputs/outputs • Optional Wireless 802.11 g Ethernet • Optional Wireless Leaky feeder VHF or UHF
Fully Digital Plug and Play Sensors	• 8 ports that will support any combination of Maestro Digital Mine sensors and modules • Built in webpages for configuration, alarm functionality

Leasing solutions – made simple

Not all mines want to own and maintain non-production related equipment.

The **Vigilante AQS™** is for hire for either short-term or long-term rentals. Eliminate capital expenses and move to small monthly or weekly operational rental rates. Replacement – fully calibrated smart gas sensors are rotated out on a bi-annual basis or as required.

Technical Specifications

Sensors and Modules	
Gas Sensors	• Smart & digital electrochemical and infrared gas sensors • Available as integral or remote mounted with a maximum of 1200 metres of separation between sensor and Vigilante • CO, NO2, NO, O2, H2S, SO2, ClO2, CL2, NH3, CO2, LEL Methane, LEL Propane, HCN sensors are available • Real time values along with built-in TWA and STEL calculations • See 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 • On board laser alignment • Maximum of 300 metres separation distance with power booster • See 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. • Digital pressure sensors to measure pressure in water, compressed air or paste/back fill lines. • Digital communication to **Vigilante AQS™** • Remote mounted with a maximum of 1200 metres of separation

Click link to learn more about the **Vigilante AQS™.**

Maestro Digital Mine

We leave no one stranded

www.maestrodigitalmine.com
Sudbury, Ontario, Canada
+ 1 705-805-6918
sales@maestrodigitalmine.com

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