

MODEL:
VM01: VAVMax Variable Air Volume Controller

VAVMax Controller,
Sub System Network

Overview

The Innotech *VAVMax Controller* is a state of the art digital processing system designed to control VAV Boxes in industrial, commercial or domestic environments. The *VAVMax* is designed to operate on Innotech's Sub System Network managed by an IG01 Sub System Gateway; this allows the *VAVMax* to receive time synchronisation signals and store logged data. Alternatively, the *VAVMax* can operate as a stand alone unit on Innotech's primary Netcomm network; however in these applications the device will not have all of its features available.

VAVMax is fitted with an on-board differential pressure sensor which allows *VAVMax* to track and calculate changes in air velocity pressure and respond as directed in its program.

VAVMax features Universal I/O channels (UIO), which combine the functions of Universal Input and Analogue Output channels into a single software programmable channel. Each UIO can be independently set via software to have input or output functionality.

VAVMax includes a dedicated Thermistor input channel, which when used with an Innotech SEN series of Thermistor Detector, *VAVMax* can accurately determine temperature readings within a range of -5°C to 60°C.

VAVMax also includes a series of TRIAC outputs capable of functioning as digital on/off switches, which can provide dynamic 24 volt AC power control for compact motors or small load devices.

The *VAVMax Controller's* configuration is fully programmable using the included Windows® based graphical configuration tool. This easy-to-use application features a series of operational building blocks which can be arranged using interconnecting lines. Through the use of this tool, the user can configure the operational modes of the *VAVMax* and its IO settings, creating the required control algorithm to get the job done.

Features

- Differential Pressure Sensor.
- 100 millisecond cycle/scan time.
- 1 x dedicated thermistor input.
- 2 x independent configurable universal inputs/outputs.
- 4 x 24 V AC TRIAC outputs.
- 1 x RS485 serial communication port.
- User selectable Baud Rate:
 - a) Innotech Net Comms 57600bps.
 - b) IG01 Sub System Gateway Comms 115200bps.
- All wire connections by pluggable screw terminals.
- Program resides in non-volatile flash RAM.
- Real-time Clock (not battery backed).
- Visual indication of Power, Comms and System Activity.

Approvals

The Innotech *VAVMax Controller* conforms to:

- EN 61326:1998 for CE Marking and C-Tick Labelling.
- Title 47 CFR, Part 15 Class A for FCC Marking.
- UL listed to UL916, File Number E242628.



Applications

The Innotech *VAVMax Controller* is designed for mounting inside an environment free from moisture and dust. It offers programmable channels, enabling it to monitor and control all types of external plant and equipment. Although the *VAVMax* is flexible, it is primarily designed for the air conditioning and building automation industry. The small size of the *VAVMax* also gives it the advantage of being installed in small places or duct sections.

The creation of control strategies is made simple by the use of the Innotech *MAXCon* utility. *MAXCon*, with its powerful Graphical User Interface, allows the user to create an entire control strategy in block-diagram form.

Specifications

Power Supply Requirements

- 24 V AC \pm 10% @ 50/60 Hz.
- Transformer nominal rating (maximum TRIAC load): 35VA.
- Transformer nominal rating (no TRIAC load): 10VA.

The operating voltage must meet the requirements of Safety Extra Low Voltage (SELV) to EN60730. The transformer used must be a Class 2 safety transformer in compliance with EN60742 and be designed for 100% duty. It must also be sized and fused in compliance with local safety regulations.

Temperature Ratings

- Storage: -5 to 60°C non-condensing.
- Operating: 0 to 50°C non-condensing.

Enclosure

The *VAVMax* is housed in a rectangular case suitable for DIN Rail mounting. The housing is moulded from flame retardant plastics recognised by UL as UL 94-V0.

Colour: Grey

Dimensions (max): 71 mm(w) x 115 mm(h) x 67 mm(d)

Universal Inputs/Outputs

2 Universal Inputs/Outputs, Independently configurable via software to either:

- Dry Digital Input.
- 0 or 10 V Digital Input.
- 10K Thermistor Input.
- 0-10 V DC Analog Input.
- LUX sensor input (Light sensor ORP12 LDR).
- 13Hz PWM (0/10 V) Output.
- 0-10V Analog DC Output.
- Digital Output (0 V / 10 V)
- Dry Pulse Counter Input.
- 0 or 10 V Pulse Counter Input.

Analogue Mode

- Input accuracy: ± 0.1 V
- Input Impedance: ~ 75 kOhms
- Input resolution: ~ 10 mV
- Output accuracy: ± 0.1 V ($R_{Load} > 2$ kOhms)
- Output resolution: ~ 40 mV

Digital Mode

- Output current: Max 10mA
- Output Voltage swing: 0.3 V - 9.5 V @10mA
- Input Voltage range: 0 V – 10 V
- Input Impedance (Dry): ~ 8.8 kOhms
- Switching threshold (Dry): 4.5 V
- Input Impedance: ~ 75 kOhms
- Switching threshold: 5 V
- PWM Duty Cycle accuracy is $\pm 5\%$

Temperature Mode

- Designed for use with Innotech SEN Series Detectors
- Nominal sensing range -5°C to 60°C .
- Accuracy $\pm 3.5\%$ FS ($R_{25^{\circ}\text{C}} = 10$ kOhms).

Fixed Thermistor Input

- 1 Fixed Thermistor Input
Designed for use with Innotech SEN Series Detectors
Nominal sensing range -5°C to 60°C
Accuracy $\pm 3.5\%$ FS ($R_{25^{\circ}\text{C}} = 10$ kOhms).

TRIAC Outputs

- 4 TRIAC Outputs
Switches 24 V AC Power Supply through to Outputs
Current rating (per output): min.20mA / max.250mA
Modes: Modulated PWM or Digital On/Off

Note: The use of pilot relays is recommended when switching high inductive loads.

UIO Type	Input Range	Output Range
0-10 Volts DC Input	0 to 10 V DC	0 to 10 V DC
Dry Digital Input	Open or Closed	OFF or ON
Voltage Digital Input	0 to 10 V DC	OFF or ON
Thermistor Input	96k to 677 ohms	-20 to 100°C
LUX Sensor Input	20kOhm to 400 ohms	0 to 2500 LUX
Dry Pulse Counter Input	Open or Closed 20ms Min. ON Time 20ms Min. OFF Time	0 to 25 pulses per second ± 1 pulse accuracy
Voltage Pulse Counter Input	0-10V Square Wave 20ms Min. ON Time 20ms Min. OFF Time	0 to 25 pulses per second ± 1 pulse accuracy
0-10 V DC Output	0 to 100%	0 to 10 V DC
Digital Output	OFF or ON	0 or 10 V DC
PWM Output	0 to 100%	0 to 100% Duty Cycle at 13Hz

Pressure Input

- 1 Differential Pressure Input
3000 Pa maximum static operating pressure
0..+250 Pa differential operating pressure
-10..+300 Pa maximum rated differential pressure
Non corrosive gases only
Accuracy: $\pm 5\%$ FS

Caution: Pressure sensors for VAVs are generally very sensitive electromechanical devices. To guarantee best performance, the Pressure Sensor of the *VAVMax* is factory calibrated for best performance. Excessive stress will irreparably damage the sensor.

Therefore do not:

- Apply pressure from sources other than a pitot tube.
- Apply excessive static or differential pressure when connecting or disconnecting air supply hoses to the *VAVMax*.
- Drop the device.

LED Indication

Red LED

- Indicates 24V AC power being present.

Orange LED

- Activated when communications software is communicating with the device.
- Is activated when the programming tool is communicating with the device.

Bicolour LED

- Indicates general comms activity on the RS485 network.
- Transmit (Red), Receive (Green)

Communications

- 1 x RS485
 - Serial communications channel optimised for fast data transmission with the IG01 Sub System Gateway
 - Providing Netcomms only if used without the IG01 Sub System Gateway.
 - Communication to Handheld Commissioning Tool.
 - Connectivity is provided through a 5-way pluggable screw terminal connector.

Note: This connector is not compatible with the standard 5-way connector used for Global and Net Comms on other Innotech products.

Installation

The *VAVMax* should be installed in an environment that does not exceed the maximum operating parameters of the device. It should be mounted in a dry, clean and vibration free environment.

It is important to ensure proper ventilation, especially when the Digital TRIAC Outputs are in use. Ensure the *VAVMax* is installed vertically for best accuracy and pressure sensor protection from dirt and fluids.

The pressure ports should be connected with a minimum of 2 x 50 cm of soft tubing with an inside diameter from 5.5 mm to 7.5 mm.

Configuration

The *VAVMax* is a fully configurable digital controller. This provides the user with full flexibility in designing a workable configuration. To ensure maximum accuracy and reliability, example configurations are provided with the configuration software. Those configurations can be modified to suit the application.

Auto Zero Function (Sensor Re-Calibration)

Each sample configuration is issued with an auto zeroing function. When activated, the *VAVMax* fully closes the damper for a period of 4 minutes. It is expected that the airflow is reduced to minimal leakage. The pressure reading is set to zero and the *VAVMax* returns to normal operation.

Note: This function should be executed every 24 hours.

Safe guards are in place to prevent false re-calibrations. Those safe guards can be bypassed with the following commands:

Software Menu: "Save the next VAVMax calibration"
Commissioning Tool Menu: "F.SP Calib"

RS485 Comms Termination

Generally a daisy chain network configuration is recommended for a high speed network such as the one provided from the IG01 Sub System Gateway. If the *VAVMax* is situated at the end of such a network, please move the jumper to the 'End Of Line' [EOL] position.

Attention!

Without any exceptions, there are always only 2 devices on a properly terminated Sub System Network that have this jumper fitted.

All other devices should have the jumper in position [NODE]. If the *VAVMax* is fitted to a standard Innotech Network (Netcomms), please move jumper to position [NODE].

For more information please refer to the Installation Guide and Innotech Network Cabling Manual DS99.04.

Networks and Addressing

Network

The *VAVMax* is designed primarily for use with the IG01 Sub System Gateway, but can be used as a part of the standard Innotech Network or standalone. The mode of operation is configured by setting the User Selectable Baud Rate.

In a standard Innotech Network, the *VAVMax* uses NET 57600 baud rate. Since the controller does not have Global Comms and data logging memory, it does not provide the following features:

- Data Logging.
- Global Points.
- Alarms.
- Real Time Synchronisation.

In a Sub System Network, the *VAVMax* uses 115200 baud rate. The IG01 Sub System Gateway transparently provides, for any *VAVMax* on its network, the above features that the *VAVMax* does not support in the standard Innotech Network mode.

Addressing

The *VAVMax* has different addressing schemes associated with the network that it is configured for. The two addressing schemes are:

- IG01 Sub System Gateway Automatic addressing – the IG01 Sub System Gateway will dynamically assign the address.
- Standard Innotech Network Static addressing – the *VAVMax* is assigned the address by the same means as any other controller on the standard Innotech Network.

Please note, in IG01 Sub System Gateway Addressing Mode the IG01 Sub System Gateway assigns the *VAVMax* its address when it joins a Sub System Network or power cycles.

Commissioning Tool

A special handheld Commissioning Tool (CT01) can be used to configure a *VAVMax* on a Sub System Network. The configuration loaded on the *VAVMax* determines the parameters associated with the control strategy that can be adjusted with the CT01.

If there is no configuration loaded into the *VAVMax*, then the *VAVMax* is not operational; therefore no parameters can be changed or monitored.

The CT01 can be connected directly to the *VAVMax* or to the Sub System Network using the supplied adapter cable to configure multiple *VAVMax* controllers. The IG01 Sub System Gateway has to be disconnected from the network when the CT01 is connected to the Sub System Network.

For ease of use the CT01 has a 4 line, 20 character Liquid Crystal Display and Keypad. The Keypad consists of seven push buttons to provide input into the *VAVMax* of interest. These buttons are “Up”, “Down”, “Left”, “Right”, “Log On”, “Enter” and “Escape”. Using these buttons, the user can gain access to the *VAVMax* controller’s menu structure shown below.

```
Default ----Status----Clock----Setup---Commission
                                     • Var Setup
                                     • IO Config
                                     • PID Par
```

For more detailed instructions, please refer to the documentation supplied with the Commissioning Tool CT01.

Associated Software

MAXCon - Innotech MAXIM Controller Configuration utility. It allows the user to internally configure a *VAVMax* by a simple point-and-click approach on a Personal Computer (PC) running Windows.

MAXMon - The Innotech MAXIM Monitor is a monitoring and debugging utility designed to help with commissioning and trouble-shooting a *VAVMax* Controller. It displays the configuration which resides on a *VAVMax* Controller and allows the user to inspect, trend or modify the value at any of the points in the configuration while the controller is running.

VAVMax Simulator - The Innotech *VAVMax* Simulator utility is a Windows-based software program that simulates a *VAVMax* Controller. The virtual *VAVMax* can be powered on, configured and interrogated in the same way as a physical *VAVMax*. Configurations can be downloaded and checked without requiring any hardware installation.

iComm - A communications server used by application software to communicate with Innotech digital controllers. It supports multiple concurrent applications communicating to multiple device networks and serves as the communications hub of any HMI-integrated device network.

MAXtract - The data log extraction utility for a range of Innotech digital controllers. It allows extraction of all or part of the history log data associated with MAXIM Controllers into a specified data format.

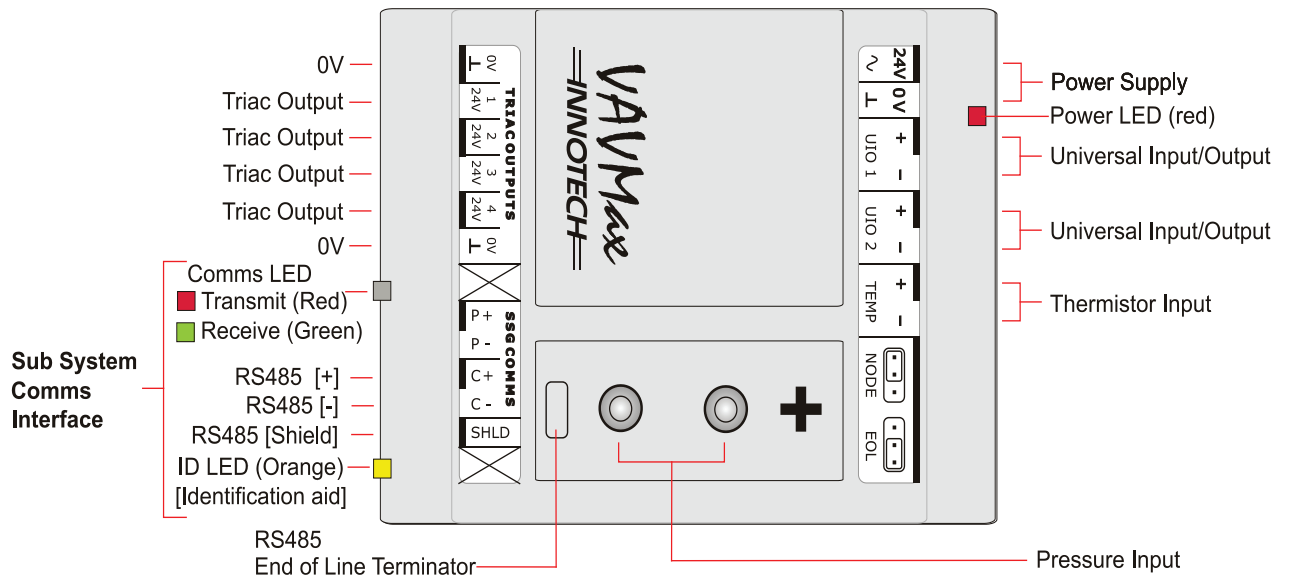
InnoGraph - Innotech’s data log graphing and analysis tool. While it has been designed to specifically cater for the data log graphing capabilities of the Innotech range, it has the flexibility to display data log graphing information from other sources. InnoGraph allows multiple graphs to be displayed in multiple windows simultaneously. Complete with a host of configurable display options, statistical analysis of data points, analogue and digital value support, active cursors, colour printing capability and comprehensive zooming and panning features, InnoGraph is your complete graphing package.

Supervisor/Supervisor Plus - A specialised dynamic monitoring utility for the Genesis II and MAXIM Series Digital Controllers. It provides all the functionality that is available from the Genesis II and MAXIM Series Digital Controller display panels with greater ease-of-use and flexibility. It is aimed at those users who require some feedback or control of the Genesis II and MAXIM systems, but have no desire to be immersed in the technical details of a Genesis II and MAXIM configurations.

Note: Supervisor Plus allows the user to change the way the watch items are displayed so that the information is presented in a better and more easily understood manner. The user can set background images, arrange the watch items around the page and customise the fonts used.

Magellan - An event-driven, object oriented real-time Supervisory Control and Data Acquisition package. It provides a simple, intuitive mechanism to effortlessly design either trivial or sophisticated supervisory or control programs using a drag-and-drop approach.

VAVMax Connection Diagram



FCC Class A Notice

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

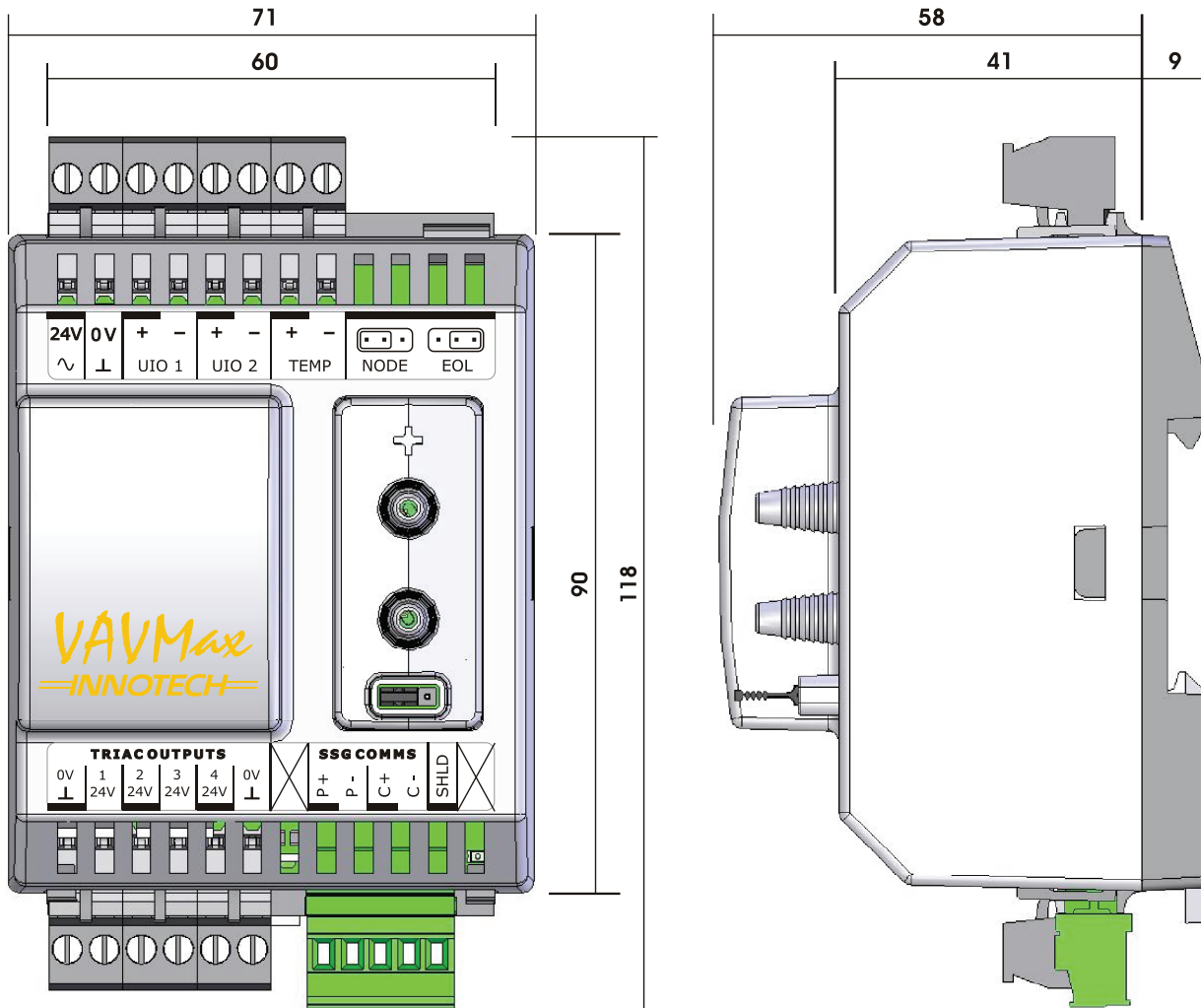
1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

Note – This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.

Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Modifications to this device, may void the authority granted to the user by the FCC to operate this equipment.

VAVMax Dimensions



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