## Engineering Change Notification

## Software Upgrade with Additional Functions And enhanced Hardware performance upgrade

# AFA1000/E VAV Airflow Controller



Rev01



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#### **General Overview 2.0**

The next generation AFA1000 has been designed to incorporate additional features and performance upgrades considering the current trends in airflow monitoring and customer feedback.

The AFA1000 has been designed to fit into the existing mouldings with identical connections so that the AFA is backwards compatible and can be directly changed for an older unit in the field.

The AFA1000 is fitted with a new high resolution full colour backlit screen that dims when the AFA1000 is in standby mode or the fan is switched off. The screen has a high contrast Blue background with White text and full colour alarm text.



#### **Additional Features Overview 3.0**

| ltem | New Feature              | Location                                      | Function  | AFA1000 Version | Page |
|------|--------------------------|---|---|-----------------|------|
| 1    | Diagnostics Menu         | Access by pressing<br>+/- buttons<br>together | A full diagnostics menu showing I/O status, alarm test feature and Coms information.  | AFA1000/1-2-E   | 5    |
| 2    | Factory Reset            | Config menu                                   | Resets all parameter values to Factory settings.  | AFA1000/1-2-E   | 6    |
| 3    | Econ Status<br>display   | Not accessible                                | Display shows "Automatic" or "Manual" text<br>above VAV output Bar Graph  | AFA1000/E       | 7    |
| 4    | Volume Pressure<br>Input | Config menu                                   | New method of measuring volume for bell<br>mouth venturi / orifice plate section with<br>pressure cell input and set up menu.   | AFA1000/E       | 7/8  |
| 5    | Linear Econ<br>Output    | Econ Config menu                              | Added Output type giving linearized output<br>for a butterfly type damper so that output %<br>is equal to volume.   | AFA1000/E       | 8/9  |
| 6    | Fan Stop                 | Config menu Pb1                               | New Feature to hide airflow value when Fan is switched off, displays "Off"  | AFA1000/2-E     | 10   |
| 7    | Fan Start up             | Config menu Pb1                               | New feature with Startup timer to keep<br>audible alarm muted until the Fan has<br>run up to full speed, displays "Fan start xx<br>seconds"   | AFA1000/2-E     | 10   |
| 8    | Fan Stop                 | Input 1/2/3                                   | New Feature to hide airflow value when<br>Fan is switched off, displays "Off". Used in<br>Master / Slave systems, input signaled from<br>Master.  | AFA1000/1-2-E   | 11   |
| 9    | Fan Start up             | Input 1/2/3                                   | New feature with Startup timer to keep<br>audible alarm muted until the Fan has<br>run up to full speed, displays "Fan start xx<br>seconds". Used in Master / Slave systems,<br>input signaled from Master. | AFA1000/1-2-E   | 11   |
| 10   | Display Backlight<br>dim | Not accessible                                | Backlight reduces when in Fan Off, Setback or Min conditions.   | AFA1000/1-2-E   | 12   |
| 11   | Display smoothing        | Cal Config Menu                               | Replaces Sensitivity parameter with time averaged based parameter.  | AFA1000/1-2-E   | 12   |
| 12   | Airflow Graph            | Cal Config Menu                               | Shows airflow status in colour over last 60 minutes in graph format.  | AFA1000/1-2-E   | 13   |
| 13   | Set up<br>notifications  | Not accessible                                | AFA shows which function is assigned<br>if a relay is already assigned to another<br>function.  | AFA1000/1-2-E   | 13   |
| 14   | Airflow sensor<br>curve  | Not accessible                                | Updated to give enhanced performance at low velocities.   | AFA1000/1-2-E   | 14   |



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#### 1. Diagnostics Menu

A new Diagnostics menu has been added that includes the following features:-

a. Alarm Test

- b. Coms data
- c. I/O Status

From the run screen Press the "+" and "-"buttons together to access the diagnostics menu.

Use the +/- buttons to scroll and Enter to select the required parameter.

a. *Alarm Test* - the Screen will show "Testing Safe LED" and the Green Safe LED will illuminate. The screen will then show "Testing Warning LED" and the Amber Warning LED will illuminate. The screen will then show Testing Alarm" and the Red Alarm LED will illuminate and the audible alarm will sound.

The screen will then return to the Diagnostics menu.

b. *Coms data* - the Screen will show the coms setting data for the relevant selected protocol:-

Protocol = None/TEL/Modbus/BACnet ID = Slave ID for Modbus or Device Instance for BACnet Baud Rate = Shows selected Baud Rate Parity = Shows selected Parity

Tx & Rx = the display will show the current data packets sent and received, the displayed value will rollover to zero when the maximum count is reached.

c. *I/O Status* - when selected the following options are shown:-

Input Data Output Data Sensor Data Done

#### Input Data:-

Input 1 - 0 / Off / On / Not Used Input 2 - 0 / Off / On / Not Used Input 3 - 0 / Off / On / Not Used

0 = Analogue Input e.g. Temperature sensor Input Voltage Off = Input Open On = Input Closed Not Used = Input not assigned

#### **Output Data:-**

| Output 1 - Off / On | A Out 1 - 10.0 |
|---------------------|----------------|
| Output 2 - Off / On | A Out 2 - 10.0 |
| Output 3 - Off / On |                |

Output Off = Output Open or not assigned Output On = Output Closed A Out 1 = Analogue Output 1 voltage A Out 2 = Analogue Output 2 voltage

#### Sensor Data:-

Airflow 00.0 % Volume 000 Sash Position mm Temperature °C

Airflow % = Output of airflow sensor in %, 100% = no airflow Volume = Measured or calculated volume in l/sec or CFM Sash Position = Sash Opening in mm or inches Temperature = Temperature in °C or °F

Done - returns to Diagnostics menu.





#### 2. Factory Reset

Factory Reset is a new password protected feature in the Config menu. When selected the Enter Password prompt appears. Once the password is entered a warning screen appears showing "Reset factory settings" Press "Enter" for Yes or "-" for No.

Yes - resets all of the parameter values back to factory settings. No - returns to config menu.

Note - the airflow calibration is not affected by restoring factory settings.



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#### 3. Econ Status Display.

The output status is now permanently displayed under the VAV output Bar Graph showing "Automatic" or "Manual" mode.

| 0 Automatic 1.00           |
|----------------------------|
| 0.52<br>m/sec              |
| Fan Light Pump<br>On On On |
|                            |
| 0 Manual 1.00              |
| 0 Manual 1.00 O.52 m/sec   |

If an input function is set to Personnel Sensor (Dual Set point Input operation) the output status will show "High Set Point", "Low Set Point" or "Manual".

#### 4. Volume Pressure Input.

The AFA1000/E controller can measure actual volume using a 3rd party orifice place or bell mouth venturi restrictor or a TEL supplied damper with built in venturi restrictor. An auxiliary pressure cell PCB can be fitted to the Econ power supply unit with that will accept 2 x 6mm OD pressure tubes. The pressure cell PCB is hard wired to input 2.

The AFA1000/E controller gives a 0-10VDC output over a scalable pressure range on Econ Output 2.





To Setup the AFA1000/E VAV controller to measure volume:

|   | Parameter       | Location        | Range  |
|---|-----------------|-----------------|--|
| 1 | Input 2         | Config Menu     | Set to "Analogue type" then "Volume Pressure" function.  |
| 2 | Dual Output     | Config Menu     | Set to "Volume Pressure"   |
| 3 | Volume Pressure | Config Menu     | See below for Volume Pressure parameter options  |
|   | 2 2             |                 |  |
| а | Pressure Range  | Volume Pressure | 0-50/100/250/500 - set to match pressure cell range dependant  |
|   |                 |                 | on measurement type and volume range.  |
| b | Output          | Volume Pressure | 0-10VDC over 0-1000l/sec (2119CFM) scalable  |
| с | Input Filter    | Volume Pressure | Time averaging filter 0-100 seconds  |
| d | K Factor        | Volume Pressure | Constant Factor for restrictor device 00.00 to 100.00  |
| е | F Factor        | Volume Pressure | Fume Cupboard leakage offset value - if Fume Cupboard<br>volume output is required instead of duct measurement<br>the parameter offsets the volume measurement, 100.00 to<br>200.00% |
| f | Density         | Volume Pressure | Air Density value, 1.0 to 1.2 kg/m3  |

#### 5. Linearized Econ Output.

The 0-10VDC control output can be set to the following options:-

a. Damper

b. Inverter

c. Valve

a. Damper - the damper output is linearized for a butterfly type damper so that the output is proportional to volume not damper position. The linearized output gives increased speed of response when the sash is opened. This setting should be used for TEL supplied Econ VAV dampers. The output is direct so that 0V = Max volume

b. Inverter - the Inverter output is proportional to volume when used with an Inverter and is reversed so that 10V = max volume,

c. Valve - the valve output is linear to damper position e.g. 50%= 45 Degrees on a 90 Degree actuator. The output is direct so that 0V = Max volume





Typical butterfly damper curve to face velocity (Valve Output).



Damper Output%

Typical linearized butterfly damper curve to face velocity (Damper Output).





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#### 6. Fan Stop Pushbutton Option.

An new parameter has been added to the PB1 sub menu that allows the airflow velocity reading and alarms to be disabled when Pb1 is set to Fan On/Off and Fan Off is selected,

When the Fan is switched off the screen will display "OFF" and the display backlight will dim.

The Fail Red LED will also be permanently illuminated in Fan Off mode. The Fan Off parameter can be set to Hide or Show airflow. In Show airflow mode the unit will display velocity and alarms when the Fan is switched off.



#### 7. Fan Start up Pushbutton Option.

A Fan Start up parameter has also been added to the PB1 sub menu that allows the Fan to start as soon as the Fan is switched on but inhibits all alarms (audible/visual/output relays & coms) for a time period to allow for the Fan to run up to full speed.

During the Start Up period the display will show "Start Up xxx seconds" and display the countdown time until the alarm functions are enabled. The Start Up parameter can be set from 0 to 100 seconds.







#### 8. Fan Stop Input Function.

The Fan Stop PB1 function has also been added as an Input function to all 3 Inputs so that the Fan Stop can be used on the Slave units when using a Master / Slave system.

The Input would be activated by the Master Unit or BMS and the operation is identical to the Fan off Pushbutton function.



#### 9. Fan Start up Input Function.

The Fan Start Up timer function has been integrated into the Fan Stop Input function.



Typical setting: - Input 1 / Enabled / Fan Off - Fan Start Up Time - 10 Seconds.





#### 10. Display Backlight.

The display backlight will dim in certain modes to save energy. The brightness level is not adjustable.

Modes:-

- 1. Fan Off input display backlight reduces until Fan On is selected. Backlight will resume to normal level whilst Set Up or Diagnostics menus are accessed.
- 2. Setback Input is active display backlight reduces until input is not active. Backlight will resume to normal level whilst Set Up or Diagnostics menus are accessed.
- 3. VAV Pb3 Min function display backlight reduces until Pb3 is set to Run or Max. Backlight will resume to normal level whilst Set Up or Diagnostics menus are accessed.

#### **11. Display Smoothing.**

The Sensitivity parameter found in the Cal Config menu has been replaced with a time averaging filter named "Display Smoothing".

The Display smoothing parameter will average the displayed airflow velocity over time. The Display Smoothing parameter range is 1 to 100 seconds.





#### 12. Airflow Bar Graph.

The Airflow Bar Graph has been enhanced to show a graphical colour display of the airflow face velocity over the last 60 minutes. The graph is ranged over 0-1.00m/sec and consists of 60 x 1 minute segments. The segments are coloured as follows:-

Safe Airflow = White Warning level Airflow = Amber Low level Airflow = Red

If the AFA1000 is power cycled the graph will start from zero time. If the Fan is switched off using Pb1 the graph will pause and continue when the Fan is switched back on.



#### **13. Set Up Notifications.**

The software has been updated so that the "already assigned" Relay function is displayed if a Relay is already assigned to another function e.g.

Low Air Alarm relay = Relay 3 Fan On/Off - set to Relay 3, display shows "Relay already assigned to Low Air Alarm".





#### **10. Airflow Sensor Curve.**

The AFA1000 airflow sensor software has been updated to give enhanced and stable performance for airflow face velocities as low as <0.10m/sec.

Velocities under 0.40m/sec are less robust so are greatly affected by turbulence caused by cross draughts or people walking past the Fume Cupboard, the software update further stabilizes the airflow sensor so that low velocity airflows can be captured ensuring greater accuracy and better response over a wider range of airflows.

