AFA1000/1 MK3
Airflow Monitor

Installation & Operating Manual

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1. SAFETY

1   SAFETY

1.1 Safety Practices

This document describes the general safety practices and precautions that must be observed when operating the Airflow Monitor.

This advice is intended to supplement, not supersede, the normal safety codes in the user's country. The information provided does not cover every safety procedure that should be followed. Ultimately, maintenance of a safe laboratory environment is the responsibility of the user and the user's organisation.

Please consult all documentation supplied with the Airflow Monitor before starting to work. Carefully read the safety information in this document and in the other documentation supplied. When setting up the equipment or performing analysis or maintenance procedures, strictly follow the instructions provided.

1.2 Warning Notices

Within this User Guide WARNINGS are used to highlight information or instructions that must be followed in order to avoid personal injury to yourself or other people in the vicinity, eg. switch off the mains voltage before any maintenance.

WARNINGS appear as below:

⚠️ **WARNING**	**Switch off the mains voltage and remove the power supply before maintenance.**

1.3 Precautions

The following precautions must be observed when using the Airflow Monitor and associated systems:

- Be sure that the voltage of the Airflow Monitor equipment corresponds to the voltage available where it is to be installed.
- Never remove the side or back panels of the Airflow Monitor without first shutting down the equipment and disconnecting the power supply.

1.4   General Operating Conditions

The Airflow Monitor and equipment have been designed and tested in accordance with the safety requirements of the International Electrotechnical Commission (IEC). The Airflow Monitor conforms to IEC61010-1 (Safety Requirements for electrical equipment for measurement, control and laboratory use) as it applies to IEC Class 1 (earthed) appliances, and therefore meets the requirements of EC directive 73/23/EEC.

If possible, avoid any adjustment, maintenance or repair to the eqipment whilst covers are open or it is operative. However, if any adjustment, maintenance or repair is necessary while the covers are open, this must be done by a skilled person who is aware of the hazards involved.

Whenever circumstances arise that mean an Airflow Monitor may be unsafe, make it inoperative. In particular, an Airflow Monitor may be unsafe if it:

· Shows visible damage.

· Fails to perform correctly.

· Has been subjected to severe transport stresses.

· Has been subjected to prolonged storage in unfavorable conditions.

1.5   Environmental Conditions

The Airflow Monitor should only be used under the following conditions:

· Indoors.

· In ambient temperatures between 5°C and 40°C.

· With relative humidity below 80% for temperatures up to 31°C, decreasing linearly to 50% relative humidity at 40°C.

· Electrical supply fluctuations not exceeding +10% of the nominal voltage.

⚠️ WARNING	**The protection provided by the equipment may be impaired if the environmental conditions do not lie within these parameters.**

1.6 Electrical Safety

The Airflow Monitor and associated equipment are designed to protect the user from potential electrical hazards. This section describes some recommended electrical safety practices.

⚠️ **WARNING**	**Lethal voltages are present at certain points within the equipment.**
	When the equipment is connected to mains power, removing the equipment covers is likely to expose live parts.
	Even when the power switch is off, high voltages can still be present – capacitors within the equipment may still be charged even if the equipment has been disconnected from all live voltage sources.

The Airflow Monitor and associated equipment must be correctly connected to a suitable electrical supply. The supply must have a correctly installed protective conductor (earth or ground) and must be installed and checked by a qualified electrician before initial power up.

⚠️ **WARNING**	**Any interruption of the protective conductor inside or outside the Airflow Monitor System, or disconnection of the protective conductor terminal is likely to make the equipment dangerous.**
	Intentional interruption of the protective conductor is prohibited.

⚠️ **WARNING**	**If the mains power cord has to be replaced, ensure that the replacement cord is appropriately rated and approved for the intended use.**

⚠️ **WARNING**	**To prevent potential personal injury and damage to the equipment, switch OFF all components in the system and disconnect them from the mains power supply before altering, or making any new electrical connections.**

When working with the Airflow Monitor System:

· Connect the equipment to a correctly installed mains power outlet that has a protective conductor connection.

· Do not operate the equipment with any covers or internal parts removed.

· Disconnect the equipment from all live voltage sources before opening it to make any adjustments, replacements, maintenance or repair. If the opened equipment must be operated for further adjustment, maintenance or repair, this must only be done by a supplier's Service Engineer.

If it is possible that the equipment is no longer electrically safe for use, make the equipment inoperative and secure it against any unauthorised or unintentional operation.

The electrical safety of the equipment is likely to be impaired if:

· It has any signs of visible damage.

· If it has been subjected to prolonged storage in unfavourable conditions.

· If it has been subjected to severe stress during transportation.

1.7   Electrical Protection

Observe the following electrical protection precautions:

- Insulation: Class I rating for external circuits. Only connect equipment that meets the requirements of IEC 61010-1, IEC 60950 or equivalent standards.
- Installation Category: The equipment is able to withstand transient over-voltages typically present on the mains supply. The normal level of transient over-voltages is impulse withstand (overvoltage) Category II of IEC 60364-4-443.
- Pollution Degree 2: Normally only non-conductive pollution occurs. Occasionally, however, temporary conductivity caused by condensation must be expected.

1.8   EMC Compliance

EC Directive
The Airflow Monitor System is designed and tested to meet the requirements of the EC directive 89/336/EEC and 93/68/EEC and complies with the EMC standard EN61326 (EMC standard for electrical equipment for measurement, control and laboratory use) and EN55011 (ISM) Class A (RF emissions).

FCC Rules and Regulations
The Airflow Monitor System is classified as a digital device used exclusively as industrial, commercial or medical test equipment. It is exempt from the technical standards specified in Part 15 of the FCC Rules and Regulations based on Section 15.103 (c).

1.9   Warning Labels

Warning labels attached to the equipment draw attention to specific hazards - refer to this guide and other documentation provided with the equipment for more details concerning potential hazards and any precautions or other actions that must be taken.

2. OVERVIEW OF THE AIRFLOW MONITOR

2 OVERVIEW OF THE AIRFLOW CONTROLLER

2.1 Operator Display Panel

	Airflow bar graph or Alarm Time Line
	Velocity display m/sec or fpm or Plain Text "Air Safe / Air Fail"
	LED indicators
	Function and up/down buttons for Menu Configuration and Calibration. ENTER – also used as Mute button for audible alarm

Note:
Access to the Calibration and Configuration menus is password protected and is factory set. To access and or change the password contact the supplier for the engineers password and enter the Passwords in the Main Menu or alternatively use a Laptop connected to the Com port and use the Upload/Download software provided.

2.2 Display Features

The Airflow Monitor display has the following features:

The digital display is a backlit, full colour high resolution graphic unit with a visual display area of approx 45 x 34mm. The display operates through the software allowing the generation of figures, wording and icons. The display background colour can be provided as either Blue or Black.

The display shows the fume cupboard face velocity in **m/sec** or **fpm** when enabled or the alternative with no velocity reading but showing **AIR FAIL / AIR SAFE** as continuous display. All of the above are configurable via the alarm key pad.

The displayed face velocity colour will change when in an alarm condition:-

Air Safe = White / Low or High Air Alarm = Red / Warning Air Alarm = Amber.

An **'event time line'** segmented into 60 x 1 minute segments will scroll across the display (when enabled). This takes the form of a graphical scale ranged over 0-1.00 m/sec that will progress from the right hand side to the left hand side of the screen – representing the airflow value at each segment. The segment colour will change if the value is in the range of an airflow alarm:-

Air Safe = White / Low or High Air Alarm = Red / Warning Air Alarm = Amber.

The alternative to the event time line is a dynamic **'bar graph'** representing the airflow velocity.

The display shows an up or down **arrow** Icon in the bottom right hand corner of the screen when an input function is set to Hi / Lo (2 speed operation). The Up arrow indicates High speed and the Down arrow indicates Low speed.

The display shows a **Horn** icon (with line through it) when the audible alarm is in the Muted condition

The display backlight will dim to a fixed low level when certain functions are active to save energy:-

Fan Off - display backlight reduces until Fan On is selected.
Backlight will resume to normal level whilst Set Up or Diagnostics menus are accessed.

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.

2.3   Displayed Alarms and Events

Sash High   will be displayed when the Sash alarm is enabled and the sash is raised above the max safe working opening. Sash High will alternate on/off with the velocity reading.

Ext Alarm   will be displayed when the external alarm input is activated (when enabled) Ext Alarm will alternate on/off with the velocity reading

Air Fail   will be displayed if the airflow is less than the Low air alarm point. Air Fail will alternate on/off with the velocity reading

High Air   will be displayed if the airflow is more than the High air alarm point. High Air will alternate on/off with the velocity reading

Set-back   will be displayed if the night set-back function is activated. Setback will alternate on/off with the velocity reading and the display backlight will dim.

Alm Dis   will be displayed if the alarm disable function is activated (when enabled) Alarm Disable will alternate on/off with the velocity reading

Close Sash   will be displayed if the sash is raised and the operator is not present (when enabled) Close Sash will alternate on/off with the velocity reading

Emergency   will be displayed if the Emergency input is activated. Emergency will alternate on/off with the velocity reading

Up/Down Arrow   will be displayed if Hi/Lo 2 Speed operation is enabled.

OFF   will be displayed if pushbutton 1 is set to Fan On/Off and hide airflow is enabled if the Fan is switched off. The display backlight will dim in a Fan off condition.

Start Up   will be displayed if pushbutton 1 is set to Fan On/Off and the start up timer is enabled xxx seconds if the Fan is switched on. The remaining start up time is displayed.

2.4   Additional Alarms and Events

Mains Fail -   will be displayed if the power fails to the monitor (when enabled)
*Note – this is an optional extra feature that requires an additional battery unit

Low Temp -   will be displayed if the fume cupboard temperature drops below the low temp alarm point (when enabled). This display will alternate on/off with the velocity reading.
*Note – this is an optional extra feature that requires an additional temperature sensor

High Temp -   will be displayed if the fume cupboard temperature rises above the high temp alarm point (when enabled) *Note – this is an optional extra feature that requires an additional temperature sensor

2.5   LED Indicators

The alarm unit has three LED indicators:

RED – Alarm

Amber – Caution

Green – Safe

The RED Alarm LED will be permanently illuminated if pushbutton 1 is set to Fan On/Off and is switched off.

2.6   Audible Alarm Sounder

The AFA1000/1 has an audible sounder with local or remote mute facility. The audible alarm can be permanently disabled in the cal config menu.

The audible alarm is muted if Fan Off is selected on pushbutton 1 or when the Mute, Setback or Alarm Disable input functions are active.

The display will show a Mute Icon in the bottom left hand side of the screen whenever the audible alarm is muted or disabled.

If an Input is set to the Mute function the keypad mute Enter button is disabled and the audible alarm is only mutable using the selected Mute input.

2.7 Pushbuttons

a. Enter

The alarm has an Enter button -- this is multi-functional as follows:-
Press **Enter** momentarily when alarm is sounding will mute the alarm.
Press **Enter** for 5 secs will gain access to **Calibration** and **Configuration** menus (both menus password protected).

b. +& -

The alarm has + / - buttons that can be used to scroll through the calibration and configuration menu or to select options or values.

2.8   Diagnostics Menu

The AFA1000/1 has a diagnostics menu that shows current Input and Output status, Coms data and also includes an Alarm Test function.

To access the diagnostics menu press the '+' and '-' buttons together whilst in the run screen.

The diagnostics sub menu will appear showing the following options-

a. Alarm Test
b. Coms data
c. I/O Status
d. Done

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. Sash Position sensor Input Voltage (0-5VDC)
Off = Input Open
On = Input Closed
Not Used = Input not assigned

Output Data:-

Output 1 - Off / On
Output 2 - Off / On
Output 3 - Off / On

Output Off = Output Open or not assigned
Output On = Output Closed

Sensor Data:-

Airflow 00.0 %
Temperature °C

Airflow % = Output of airflow sensor in %, 100% = no airflow
Temperature = Temperature in °C or °F - (when enabled)

Done - returns to Diagnostics menu.

d. Done - when selected the controller returns to the run screen.

2.9   External Connections

The AFA1000/1 has the following Inputs:-

Input 1

Volt free input configurable for normally closed, normally open relays or Analogue 0-5VDC Input
This input can be configured as:-

Digital Input Functions (Closed or Open volt free contact):-

Alarm disable	Night set-back
External alarm	Emergency
Sash High	High / Low
Sash Warning	Mains Fail
Fan Stop	Mute

Analogue Input Functions:-

Temperature

Input 2

Volt free input configurable for normally closed, normally open relays or Analogue 0-5VDC Input
This input can be configured as:-

Digital Input Functions (Closed or Open volt free contact):-

Alarm disable	Night set-back
External alarm	Emergency
Sash High	High / Low
Sash Warning	Mains Fail
Fan Stop	Mute

Analogue Input Functions:-

Temperature

Input 3

Volt free input configurable for normally closed, normally open relays or Analogue 0-5VDC Input
This input can be configured as:-

Digital Input Functions (Closed or Open volt free contact):-

Alarm disable	Night set-back
External alarm	Emergency
Sash High	High / Low
Sash Warning	Mains Fail
Fan Stop	Mute

Analogue Input Functions:-

Temperature

The AFA1000/1 has the following Outputs:-

Relay Output 1
Volt free relay output configurable as normally closed or normally open relays.

Relay Output 2
Volt free relay output configurable as normally closed or normally open relays.

Relay Output 3
Volt free relay output configurable as normally closed or normally open relays.

Analogue Output 1
0-10VDC retransmission of face velocity over 0-1.00m/sec e.g. 0.50m/sec = 5VDC.

Com Port
RS 485 to enable connection to Laptop or PC for full diagnostics, logging or setting up and for communications to building computer system (BMS)

See section 8 for other specific information on Modbus RTU and BACnet options and settings.

Power supply
Low voltage DC power supply from Mains power adaptor.

Optional Inputs

Temperature Sensor

Bespoke Temperature sensor for connection into inputs 1, 2 or 3 to give temperature display with high and low temperature alarms.

PIR Occupancy Sensor

Auxiliary PIR used for Close Sash alarm based on Fume Cupboard occupancy.

Mains Fail battery unit

Auxiliary plug in battery unit for Mains Fail alarm.

See **Menu Block Diagram** document for other specific operations and indications.

3. FUNCTIONS & OPERATION

3 FUNCTIONS & OPERATION

3.1 Airflow Functions

The AFA1000/1 MK3 airflow display can be set up using the pushbutton menus to display airflow in units of m/sec or fpm and can also be set to show plain text "Air Safe" & "Air Fail" only.

The AFA1000/1 has 3 programmable airflow alarms.

Safe airflow

· Airflow reading above warning level (e.g. > 0.45 m/sec)
· Green Safe LED on

Warning airflow

· Airflow reads between warning level and air fail level (e.g. > 0.4 m/sec and < 0.45 m/sec)
· Amber Warning LED on

Low airflow

· Airflow reads below alarm level for longer than the warning to low air delay time
· Air Fail toggles on / off with display
· Red Alarm LED on (Flashing)
· Audible alarm sounds -- can be muted via Enter pushbutton
· Low air relay operates (if configured)

Reset: -- when airflow rises 0.02 m/sec above Low air level for longer than the low air to warning air delay time the Low air alarm resets automatically

High airflow

If configured:
· Airflow reading above high level (e.g. > 1.50 m/sec)
· High Air toggles on / off with display
· Red Alarm LED on (Solid)
· High air relay operates (if configured)

Audible Alarm Mute

When the audible alarm is muted via the Enter button - an Icon (horn with forward slash) is shown on the display.

The audible alarm can be permanently disabled in the pushbutton menu.

3.2   Input Functions

The AFA1000/1 MK3 has 3 programmable Inputs that can be set to analogue
(0-5VDC), digital open or digital closed operation.

Analogue input functions

Temperature

- Any Input set to Analogue - Temperature
- Temperature is displayed alongside airflow velocity in °C or °F

- **Low Temp** toggles on / off with display if temperature < Low Temp Alarm point
- Red Alarm LED on (Flashing)
- Audible alarm sounds -- can be muted via Enter pushbutton
- Low Temp relay operates (if configured)

- **High Temp** toggles on / off with display if temperature > High Temp Alarm point
- Red Alarm LED on (Flashing)
- Audible alarm sounds -- can be muted via Enter pushbutton
- High Temp relay operates (if configured)

Digital input functions

Alarm disable

- When input configured as Alarm disable is activated
- Alarm disabled is displayed
- Red LED on (Flashing)
- Audible alarm muted
- Mute Icon shown on display

Night set-back

- When input configured as Night set-back is activated
- Night Set-back Icon displayed
- Audible alarm muted
- Mute Icon shown on display
- Low Air alarm muted if set to Maintain low air
- Reduced Low Air & Warning alarms active if set to Reduce low air

External alarm

· When input configured as External alarm is activated
· Red LED on (Flashing) – (if configured)
· External Alarm toggles on /off with display -- (if configured)
· Audible alarm sounds – can be muted via Enter pushbutton
· External alarm relay operates (if configured)

Emergency

· When input configured as Emergency is activated
· Red LED on (Flashing) – (if configured)
· Emergency toggles on /off with display -- (if configured)
· Audible alarm sounds – can be muted via Enter pushbutton
· Emergency alarm relay operates (if configured)

Sash High

· When input configured as Sash High is activated
· Amber LED on Solid (Flashing when alarm muted)
· Sash High toggles on / off with display if sash height > calibrated position
· Audible alarm sounds -- can be muted via Enter pushbutton
· Sash High relay operates (if configured)
· Alarm re-activates after time delay if repeat time enabled

High / Low

· When input configured as High/Low is activated
· Display Icon shows Up (High) or Down (Low) arrows
· High / Low relay operates (if configured)

This function is designed for two speed fan operation or two position damper operation switched via a micro switch or proximity switch activated at a given position on the sash.

Close Sash

· When the input configured as Close Sash is activated
· Red LED on
· Close Sash – toggles on / off with velocity display
· Audible alarm sounds (after pre-set time)
· Audible can be muted via Enter pushbutton -- this silences the alarm if configured.

Reset when Sash lowered to closed position and input de-activated or operator is present

Mains Fail   (Optional extra feature)

· When the input configured as Mains Fail is activated
· Red LED on
· Mains Fail is displayed
· Audible alarm sounds
· Audible can be muted via Enter pushbutton -- this silences the alarm if configured.

Fan Stop

· When the input configured as Fan Stop is activated
· Off is displayed
· Red LED on (Solid)
· Audible alarm muted
· When the input configured as Fan Stop is de-activated
· Start Up Timer is displayed
· Audible alarm and relays inhibited until Start up time has elapsed

Note - Used if the AFA1000 is a Slave unit with a common fan (Remote master On/Off signal is used)

Mute

· When the input configured as Mute and is activated
· Red LED on (Solid)
· Audible alarm muted
· Mute Icon shown on display

Note - The Mute function disables the pushbutton mute so that any audible alarm can only be muted using the input e.g. remote key switch.
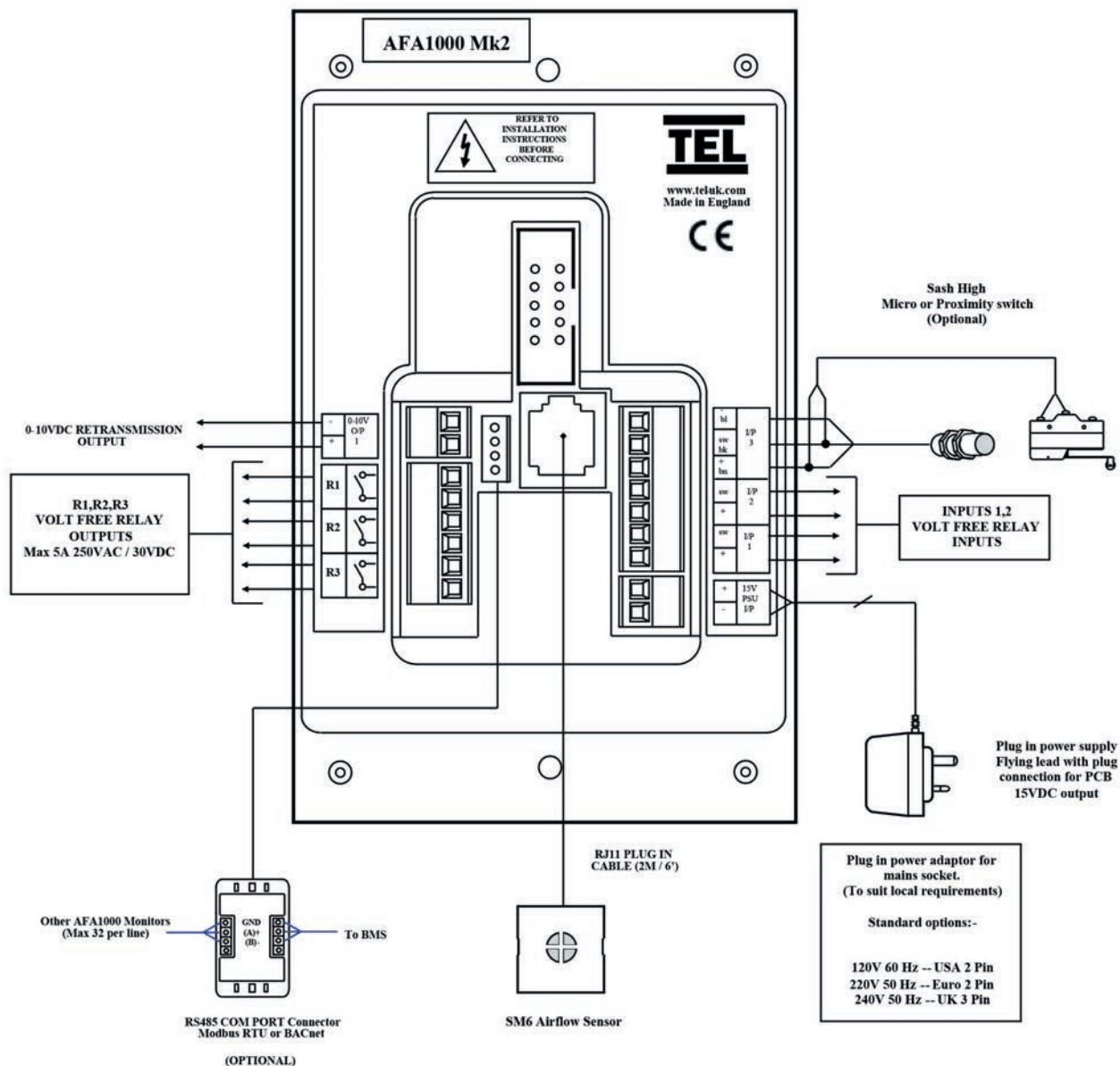
4. COMPONENTS

4   COMPONENTS

4.1   Airflow Monitor Components

1 – AFA1000/1/MK3 Airflow Monitor
1 – Airflow Sensor c/w 2M RJ45 Sensor Cable
1 – Plug in type low voltage power supply with 5M Cable

4.2   Auxiliary Components

The following auxiliary components are available for the AFA1000/1/MK3 airflow monitor:-

Sash High Proximity Switch - Used for Sash High Alarm

Sash High Micro Switch - Used for Sash High Alarm

Personnel Sensor - Passive Infra Red sensor - Used for Close Sash Alarm

Mains Fail Battery Unit - Used for Mains Fail Alarm

Temperature Sensor - Used for Temperature display and alarms.

5. INSTALLATION

5 INSTALLATION

5.1 Installation of standard components

The following section outlines the installation of the various components of the Airflow monitor system.

As the size and format of individual Fume Cupboards varies considerably, specific instructions are not possible, though the principles outlined below should remain valid in all cases.

The AFA1000/1 monitor can be mounted on either side of the Fume Cupboard; consideration should be made for the cable lengths when fitting the airflow sensor.

1. Fit the AFA1000/1 airflow monitor to the Fume Cupboard using the cut-out details provided with the unit --- see page 26. Ensure that the monitor fits into the cut out before securing with the fixing screws.

Separate mounting boxes and adaptor plates are available for retro-fitting to older Fume Cupboards.

2. Fit the Plug in supply to the top of the Fume Cupboard ensuring that the location allows the 5M low voltage cable to reach the AFA1000/1 airflow monitor terminals.

3. Fit the airflow sensor to the Fume Cupboard using the cut out and installation details provided --- see page 32. When possible ensure that the Airflow sensor is mounted on the same side of the Fume Cupboard as the AFA1000/1 so that the standard 2M sensor cable will reach the sensor and monitor.

4. Connect the 'telephone style' airflow sensor plug-in cable to the sensor and the back of the AFA1000/1 unit --- see typical connection diagram on page 26.

Longer Sensor Cables are available on request.

5.2   Typical Installation diagram

a. Typical Double wall style Fume Cupboard
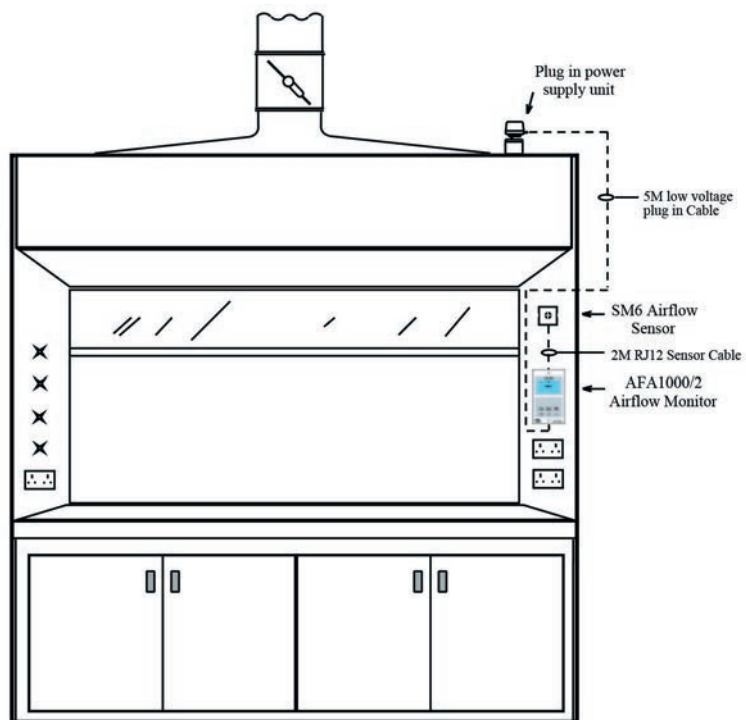
b. Typical Euro Single Wall style Fume Cupboard

5.3   Dimensions and Cut Out details

NOT TO SCALE
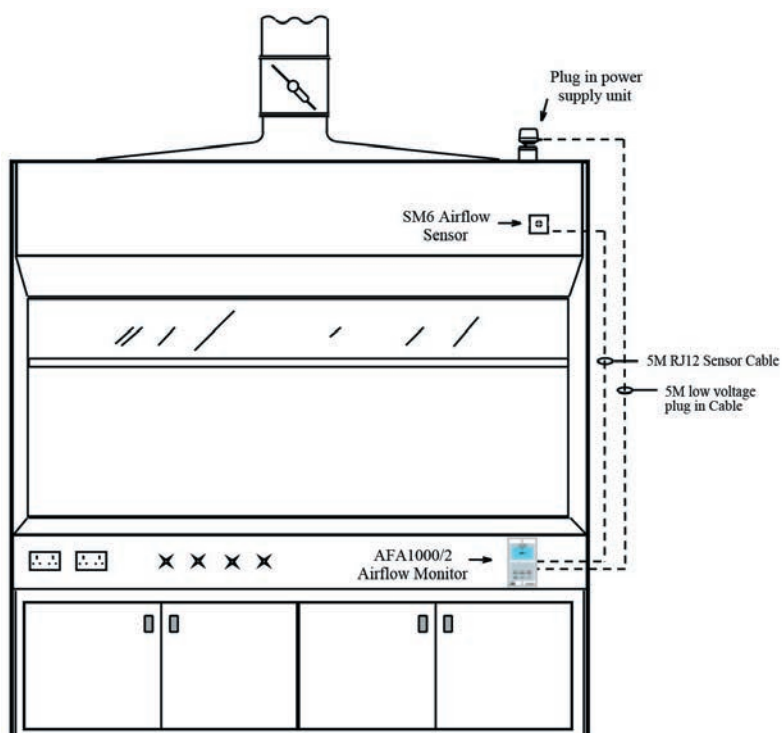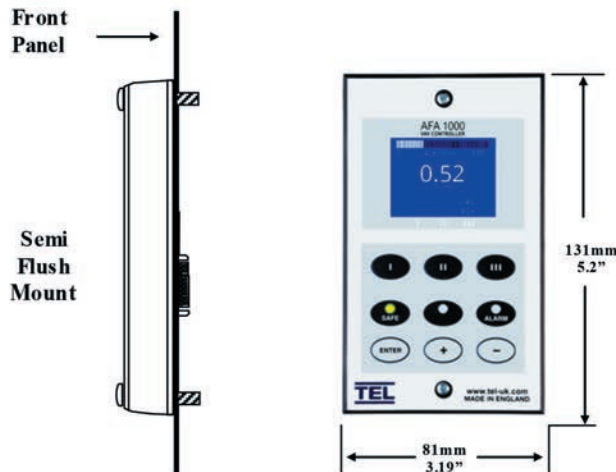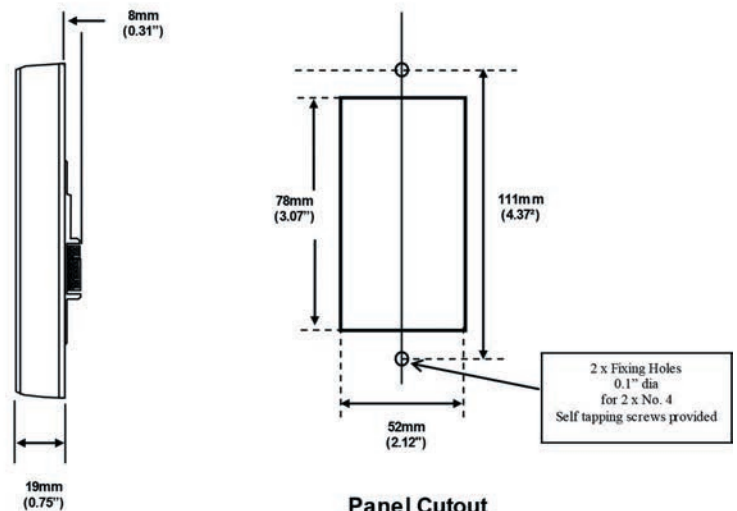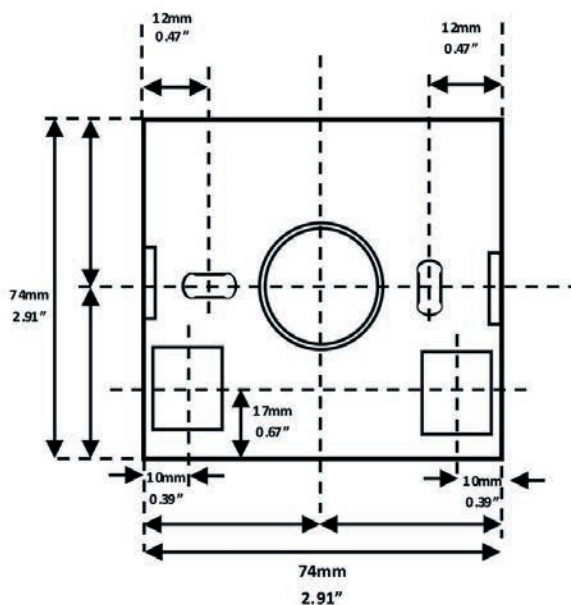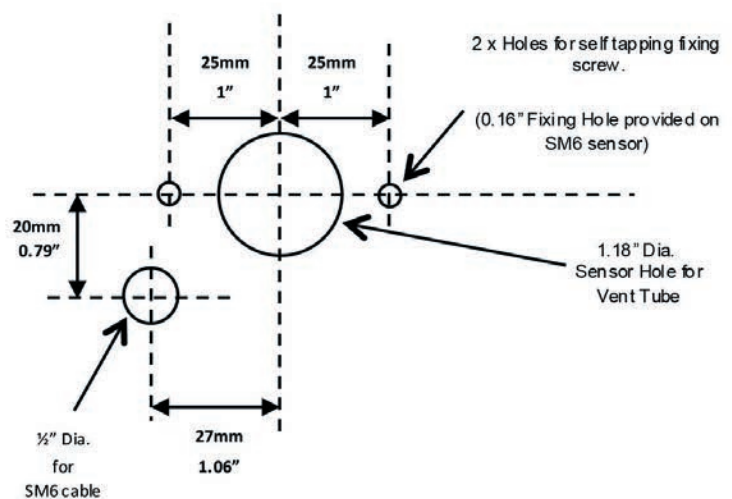

**AFA1000/1/MK3
Dimensions**

**Panel Cutout
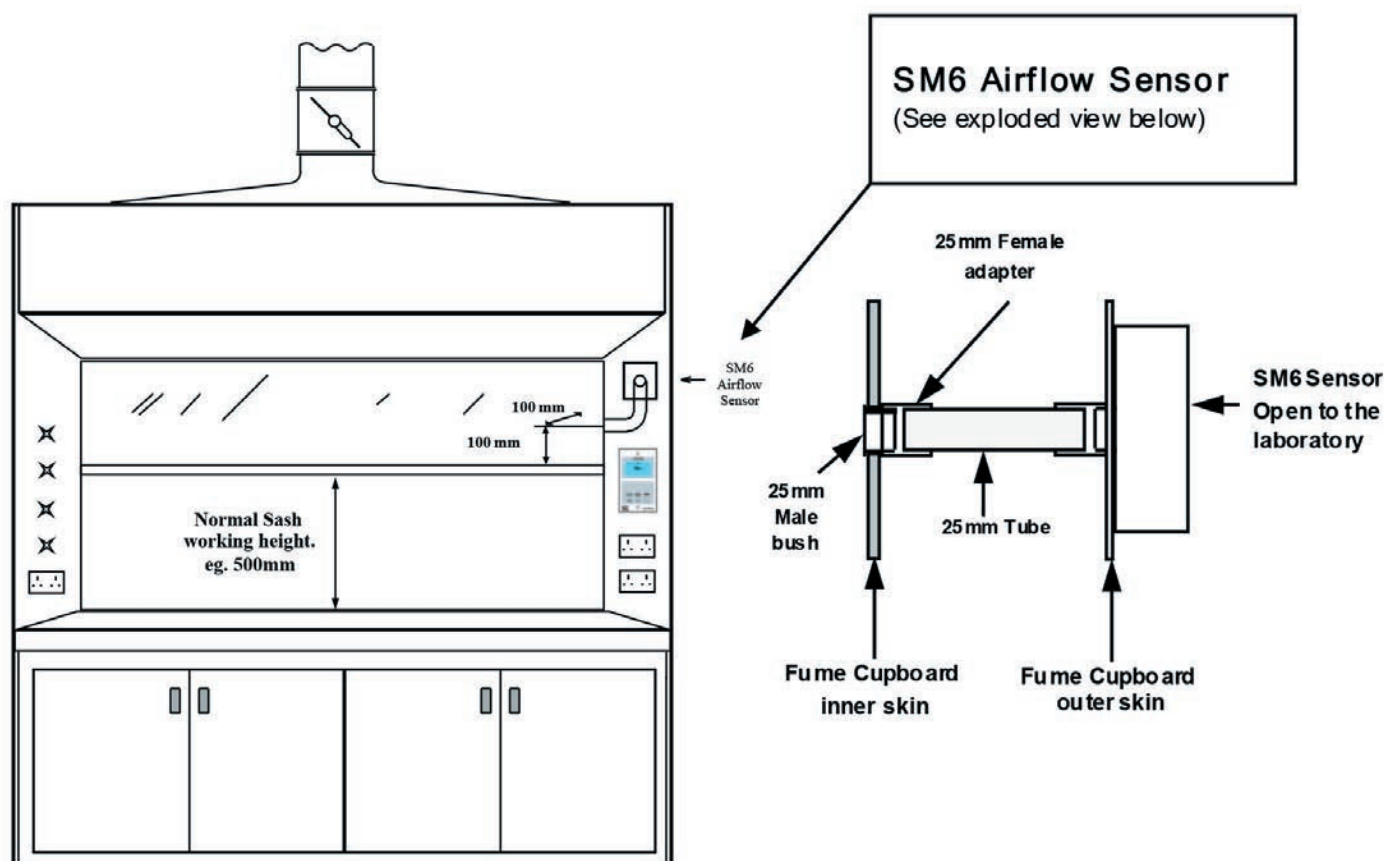Dimensions
Panel Cut out
Dimensions**

**SM6 Sensor
Dimensions
(Rear view)**

**SM6 Sensor Panel
Cutout Dimensions
(Front View)**

5.4   SM6 Airflow sensor installation

It is very important to position the SM6 airflow sensor in the correct position to give long term stable reading of the face velocity. Please read the INSTALLATION NOTES below and if in doubt contact us for further advice.

INSTALLATION NOTES :-

1. The SM6 sensor must be positioned where it can " see " the room pressure of the laboratory.The back connection spigot of the sensor is designed to accept a 25mm OD tube which should be connected to the inner chamber of the fume cupboard. (This tube and fittings is known as the " vent kit ") The **ideal position** for the end of the 25mm tube for most fume cupboards is 100mm back from the sash glass and 100mm higher than the normal sash opening height through the inner side wall.

2. If possible mount the sensor on the front of the fume cupboard and use a short length of tube. Tube lengths of more than 1M or smaller diameter will restrict the airflow through the sensor. This will lead to too much sensitivity being required to calibrate the unit which can lead to some instability of the reading or incorrect readings at low velocities..

3. For fume cupboards with a single skin side wall or a double skin with a small gap between them it may not be possible to achieve the ideal sensing position using a flexible tube. With a single skin side wall it is possible to fix the sensor on the outside of the fume cupboard and connect directly to the inner chamber in the ideal position. This method can only be used for up to two fume cupboards when they are positioned side by side (using the two outer walls). An alternative method is to mount the sensor

on the front of the fume cupboard and connect using a short flexible tube to a rigid wall tube attached to the inner side wall. The open end of this rigid wall tube should be positioned in the 'ideal position' ie. 100mm back from the sash and 100mm higher than the normal sash opening. Fume cupboards with a high internal height can present a difficulty because the tube length to reach the ideal position may be longer than 1M. In this case it is better to use a tube no longer than 1M which may result in a sensing position higher than the ideal. When fitting a sensor to a 'narrow wall' fume cupboard for the first time it may be necessary to try various combinations of rigid and flexible tube to find the best combination and position.

4. The sensor should not be mounted in a position were it is subject to draughts from the laboratory air input or ventilation system.

6. CONFIGURATION & CALIBRATION

6   CONFIGURATION & CALIBRATION

6.1   Configuration

The Airflow Monitor can be configured via a Laptop or PC using a variety of 'set up' programs each designed for a particular application with a combination of inputs, outputs and push buttons.

This configuration can be changed via the key pad using the menu system if required or re-configured by re-connection of the laptop or PC.

This allows the fume cupboard manufacturer to stock standard units and configure the monitors to suit the application.

The configuration of the various functions and the calibration of the monitor face velocity display is menu driven. Access to the menu will be via password (4 digit number) and will be two level. The first level will be for calibration of the unit and the second level will be for 'engineers' to set up the configuration of the alarm.

> **NOTE: If you enter the Calibration or Configure Menu by accident:**
> **Press the + & - buttons at the same time to escape back to the main menu.**

The menus and sub–menus are in 'plain language' and incorporate brief instructions where appropriate.

See **Menu Block Diagram** operation document.

6.2   Start Up

When unit is powered up the following sequence of events occur:

1. The 12V DC power is applied to the airflow sensor and a delay on timer is initiated.
2. The alarm then performs a self test on the display and all indicators etc (approx 5 sec)
3. At the end of the delay period the unit performs one of two options:

    a. If the monitor calibration has been previously completed – the unit goes to normal operating mode (Run)

    b. If the unit has not been calibrated the unit displays 'Unit requires Set up   -- press Enter to access Set up menu ' The set up menu allows calibration or configuration via the password protection

Note - Ensure the extract fan us running before starting the calibration

6.3   Calibration

1.   Press Enter from the "Requires set up" screen or if the monitor is in the Run screen Press and Hold the Enter button for 5 seconds until the Main Menu is displayed.

2.   Using the + / - buttons select SET UP, then select CALIBRATION, then enter the password (the factory default password is 0-0-0-0), press Enter to continue.

3.   With the sash open to the normal operating height again measure the face velocity using a calibrated instrument. Using the + / -buttons enter the measured face velocity then press Enter, the monitor will then sample the airflow for 5 seconds.

4.   If the airflow sample is unstable the monitor will display "Deviations too High", follow the instructions to repeat the sample or quit the calibration.

5.   If the sample is accepted, lower the sash by half and measure the face velocity using a calibrated instrument. Using the + / - buttons enter the measured face velocity and press Enter, the monitor will then sample the airflow for 5 seconds.

6.   If the calibration is successful the monitor will return the Main Menu, select RUN to go to normal operating mode and check the velocity reading is accurate and stable.

7.   If the airflow sample is unstable the monitor will display "Deviations too High", follow the instructions to repeat the sample or quit the calibration.

8.   The monitor will display "Increase higher airflow sample" if the second sample value is too close to the first value entered, close the sash a little and repeat the higher sample. The minimum difference between the samples that the monitor will accept is 0.3m/sec (60fpm).

9.   The monitor will display "Sensor diff too low" if the monitor doesn't detect any difference in the sensor output between the 2 airflow samples, check that the sensor hose is connected and repeat the calibration.

10.   If the calibration is stable and accurate select RUN from the Main Menu to go to normal operating mode.

See Calibration Notes for hints on successful calibration.

6.4   Calibration Notes

1.   When using a standard Fume Cupboard with Vertical Sliding sashes open the sash to the normal max safe working height for the Low Air sample.

2.   For the Higher Air sample close the sash to approx 50% of the opening used for the Lower Air sample. If the Higher air sample value is too close to the Lower Air sample the alarm will detect this and ask you to repeat with a higher value.(The minimum difference between the Low & High air samples is set to 0.3 m/sec)To do this close the sash a little more and repeat the sample. Avoid closing the sash below 150mm.

3.   The face velocity readings on the open sash may vary at different points on the measuring grid by up to 0.1 m/sec. This is quite acceptable in terms of the fume cupboard performance so long as no individual point is below the designated Low Air alarm point .The figure entered for the calibration point can be taken as the average value of all the measuring grid readings or could be taken as the individual lowest point on the grid. For most fume cupboards this low point is on the bottom row in the centre and is a convenient position to measure and for future reference when checking the alarm during annual maintenance.

4.   Take time when measuring the face velocities for the calibration procedure to allow for the velocities across the open sash to stabilize. If the velocities are changing or are turbulent during the sampling period the alarm will detect this and ask you to repeat the sample.

5.   When using a Fume Cupboard with Horizontal Sliding sashes open the sashes to the normal max safe working opening for the Low Air sample.

6.   When calibrating or re-calibrating the alarm it is important to ensure that the 'Vent kit' is connected to the SM6 sensor on the fume cupboard. If the vent kit is not connected the sensor will not 'see' a change in the airflow during the calibration procedure and will show "Sensor Difference too low - Check sensor". This only applies during the calibration mode. If in normal running after successful calibration the vent kit becomes disconnected the air flow across the sensor will fall and the alarm will go into the AIR FAIL condition.

If the airflow display is unstable following the calibration due to environmental turbulence or sensor position and cannot be rectified then it is possible to adjust the sensitivity of the displayed value using the Display Smoothing parameter in the cal config menu. The monitor will display the velocity value as a rolling average over time and is adjustable over 1 to 100 seconds.

7. AUXILIARY FEATURES & CONNECTIONS

7 AUXILIARY FEATURES & CONNECTIONS

7.1 Optional Input function - Temperature Sensor

The AFA1000/1/MK3 can be fitted with a temperature sensor to display the fume cupboard temperature and give high and low temperature alarms. The temperature display can be hidden from view or shown alongside the airflow velocity.

High and Low temperature alarms can be set with relay outputs.

Typical connection diagram
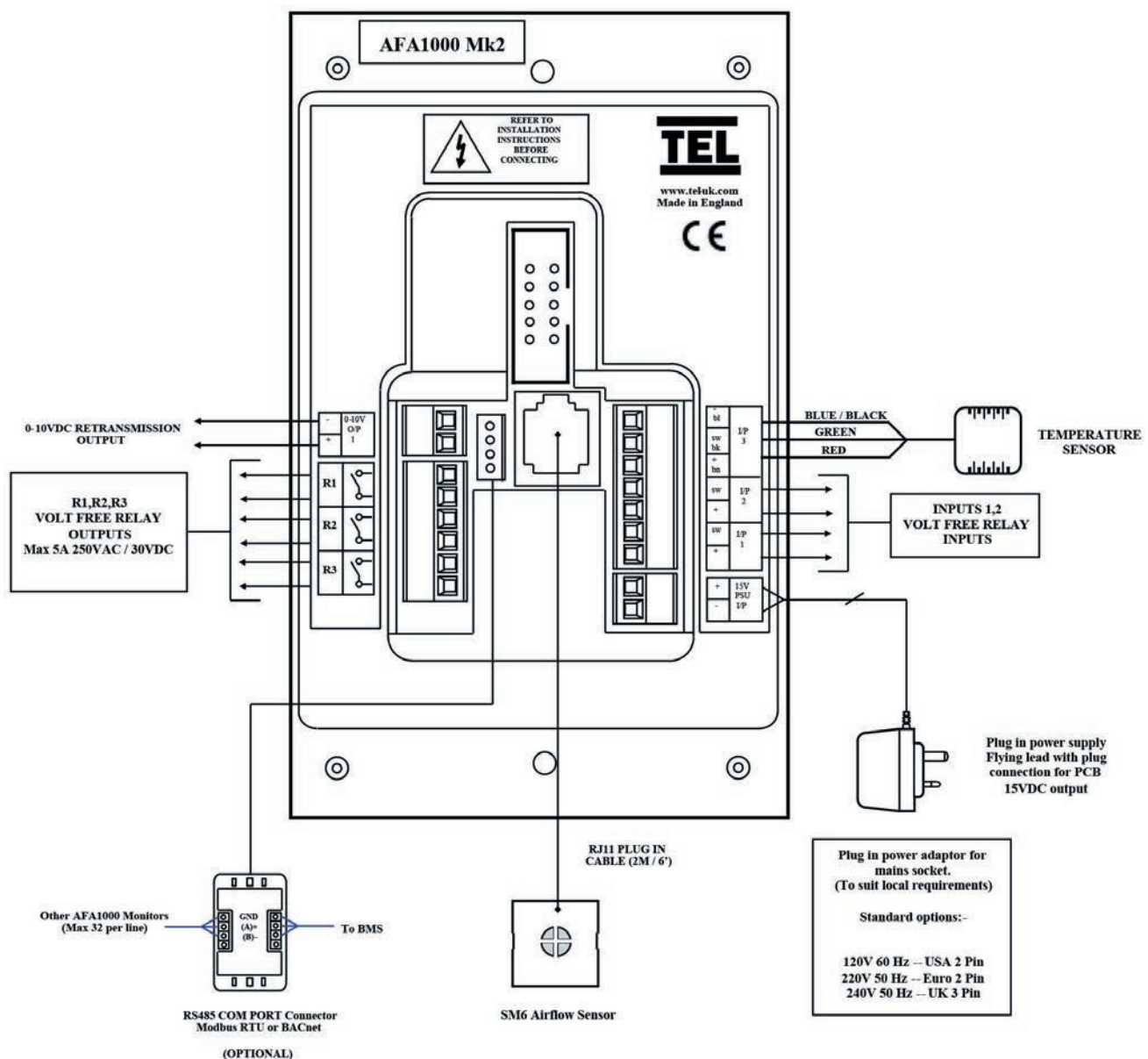
To Setup the Temperature input using the pushbutton menus:-

1. Press Enter from the "Requires set up" screen or if the monitor is in the Run screen Press and Hold the Enter button for 5 seconds until the Main Menu is displayed.

2. Using the + / - buttons select SET UP, and then select CONFIGURE, then enter the password (the factory default password is 0-0-0-0), press Enter to continue.

3. Using the + / - buttons select INPUT 3, and then press Enter, then using the +/- buttons select ANALOGUE and press Enter, then using the +/- buttons select TEMPERATURE and press Enter to continue.

4. Using the + / - buttons select the TEMPERATURE menu and press Enter, this will introduce a sub menu for the TEMPERATURE settings:-

	Parameter	Description	Range
A	Temp Units	Display Units	°C or °F
B	Low Temp Alarm	Sets the Low temperature alarm point	0.0 to High Alarm value
C	High Temp Alarm	Sets the High temperature alarm point	100 to Low Alarm value
D	Show Temp	Turns the Temperature display On/Off	Yes/No
E	Offset	Allows the measured value to be offset	-5.0 °C to +5.0 °c

Note - the temperature sensor is accurate to <0.5 °C, the offset parameter can be used if the displayed value needs to be changed to match a 3rd party instrument or other equipment etc.

5. Using the + / - buttons select the TEMP UNITS parameter and press Enter, then using the +/- buttons set to °C or °F and press Enter to continue.

6. Using the + / - buttons select the LOW TEMP ALARM parameter and press Enter, then using the +/- buttons adjust the value to the required alarm point and press Enter to continue.

7. Using the + / - buttons select the HIGH TEMP ALARM parameter and press Enter, then using the +/- buttons adjust the value to the required alarm point and press Enter to continue.

8. Using the + / - buttons select the SHOW TEMP parameter and press Enter, then using the +/- buttons set to ON or OFF and press Enter to continue.

9. Using the + / - buttons select the OFFSET parameter and press Enter, then using the +/- buttons adjust the value to the required display offset and press Enter to continue, then select DONE and press Enter to continue.

10. In the CONFIGURE MENU Using the + / - buttons select the LOW TEMP RELAY parameter and press Enter, then using the +/- buttons select the required RELAY OUTPUT and press Enter to continue.

11. In the CONFIGURE MENU Using the + / - buttons select the HIGH TEMP RELAY parameter and press Enter, then using the +/- buttons select the required RELAY OUTPUT and press Enter to continue, then select DONE and RUN.

Testing.

Once the Temperature sensor function has been set up the measured Temperature can be displayed in the diagnostics menu I/O Status - Sensor data screen described in section 2.8

7.2 Optional Input function - Close Sash Alarm

A Close Sash alarm can be set up on the monitor to inform the user that the sash has been left open when the Fume Cupboard is unoccupied. The alarm can be set with a time delay before activation to allow the user to briefly leave and return to the Fume Cupboard and can also be set with a repeat alarm if the sash is left open for prolonged periods of time.

The alarm function uses a PIR occupancy sensor and is connected in series with a micro switch input to detect the sash position.

Typical connection diagram with micro switch
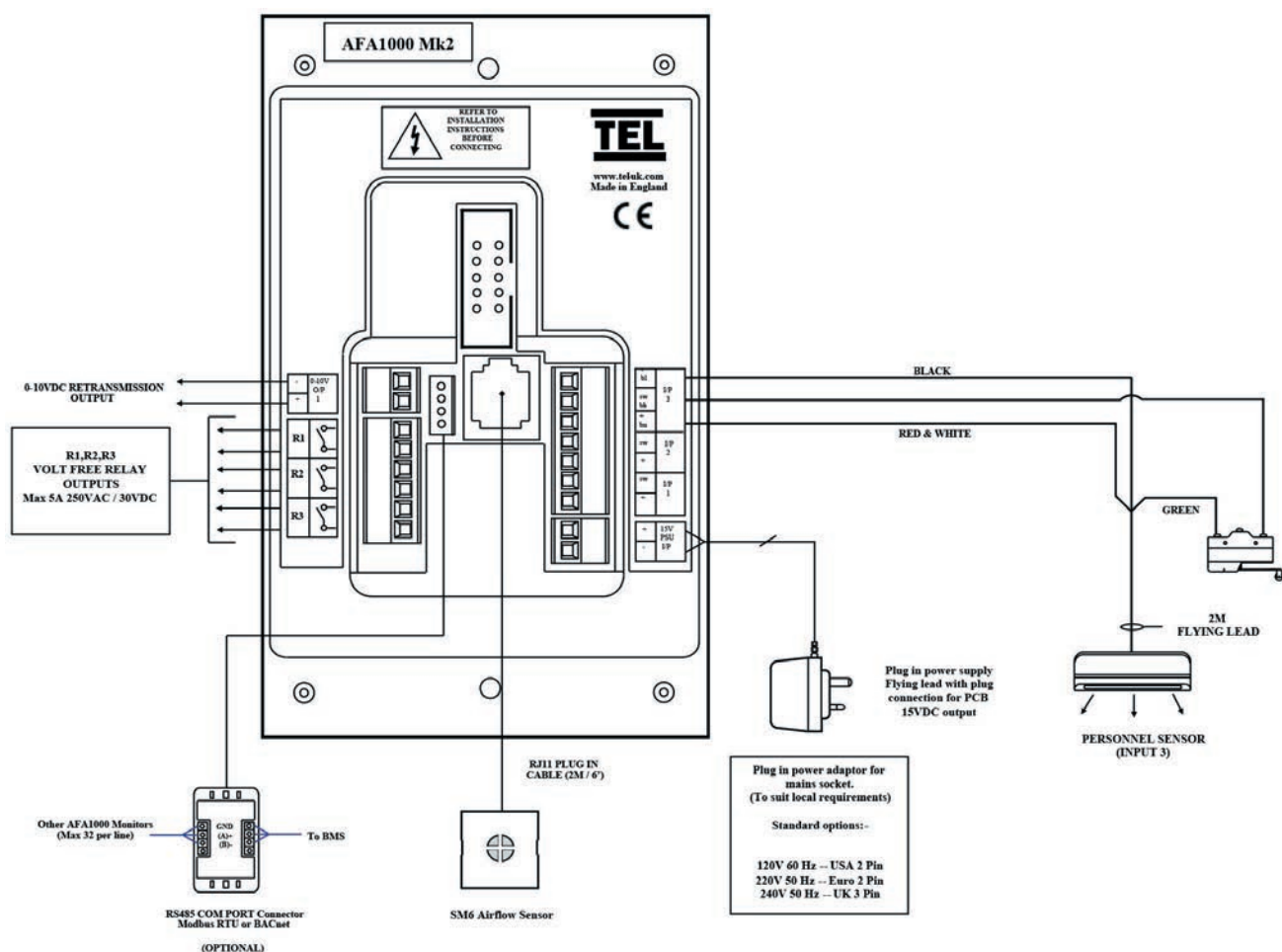
The micro switch connections will depend on the switch activation. The output of the PIR is wired in series with the switch so the output should be active (switch contact closed) when the sash is open:-

	Switch Mounting	Switch Connections	Notes
A	Switch closes when sash is open	C & NO	Refer to micro switch for switch connection details
B	Switch closes when sash is closed	C & NC	

To Setup the CLOSE SASH ALARM with a Sash Micro Switch using the pushbutton menus:-

1. Press Enter from the "Requires set up" screen or if the monitor is in the Run screen Press and Hold the Enter button for 5 seconds until the Main Menu is displayed..

2. Using the + / - buttons select SET UP, and then select CONFIGURE, then enter the password (the factory default password is 0-0-0-0), press Enter to continue.

3. Using the + / - buttons select INPUT 3, and then press Enter, then using the +/- buttons select CLOSED CONTACT and press Enter, then using the +/- buttons select SASH WARNING and press Enter to continue.

4. Using the + / - buttons select the SASH WARNING TIMER parameter and then press Enter, then using the +/- buttons set the required SASH WARNING time delay and press Enter, then using the +/- buttons set the SASH WARNING repeat timer to ENABLED or DISABLED as required and press Enter to continue, if set to ENABLED then using the +/- buttons set the SASH WARNING alarm repeat time as required and press Enter to continue, the select DONE and press Enter to continue.

e.g. Sash closed switch height set to 100mm. Sash warning delay set to 1 minute, Sash warning repeat timer set to 5 minutes, if the sash is > 100mm the CLOSE SASH alarm will activate once the fume cupboard is unoccupied for 1 minute, once muted the alarm will re sound after 5 minutes. The alarm will reset if the fume cupboard is then occupied or the sash is =<100mm.

8. RS485 COMS OUTPUT

8 RS485 COMS OUTPUT

8.1 Overview and connections

The AFA1000 series has on board RS485 coms with 3 protocols:-

Protocol	Description
TEL	Protocol for connection to TEL Configure Manager PC software and room controls
Modbus	Modbus RTU protocol
BACnet	BACnet MS/TP protocol (To connect to BACnet IP a 3rd party router is required)

See separate coms registers for further technical, compliance and register information:-

AFA1000/1 Modbus Registers
AFA1000/1 BACnet Registers

Typical connection diagram

8.2   Configuration settings

Note - when changing Protocols the AFA1000 should be power cycled once re-configured to ensure the changed take effect.

The TEL protocol has fixed parameters so cannot be adjusted in the field, to select the TEL protocol using the pushbutton menus:-

1.   Press Enter from the "Requires set up" screen or if the monitor is in the Run screen Press and Hold the Enter button for 5 seconds until the Main Menu is displayed.

2.   Using the + / - buttons select SET UP, and then select CONFIGURE, then enter the password (the factory default password is 0-0-0-0), press Enter to continue.

3.   Using the + / - buttons select PROTOCOL and press Enter, then using the +/- buttons select TEL and then press Enter to continue, then select DONE to return to the CONFIG MENU, then select DONE and RUN.

To Setup the AFA1000 with MODBUS protocol using the pushbutton menus:-

1.   Press Enter from the "Requires set up" screen or if the monitor is in the Run screen Press and Hold the Enter button for 5 seconds until the Main Menu is displayed.

2.   Using the + / - buttons select SET UP, and then select CONFIGURE, then enter the password (the factory default password is 0-0-0-0), press Enter to continue.

3.   Using the + / - buttons select PROTOCOL, and press Enter, then using the +/- buttons select MODBUS and then press Enter to return to the CONFIG MENU.

4.   Using the + / - buttons select MODBUS SETTINGS and then press Enter, a sub menu will appear with the following parameters:-

	Parameter	Description	Range	Default
A	Slave ID	Set the slave ID for the unit	1-255	1
B	Baud Rate	Set the network Baud Rate	1200/2400/4800/9600/1440/19200/38400/57600	9600
C	Parity	Set the required parity	None/Even/Odd	None

5.   Using the + / - buttons select the SLAVE ID parameter and then press Enter, then using the +/- buttons select the required ID and press Enter to continue.

6.   Using the + / - buttons select the BAUD RATE parameter and then press Enter, then using the +/- buttons select the required rate and press Enter to continue.

7.   Using the + / - buttons select the PARITY parameter and then press Enter, then using the +/- buttons select the required rate and press Enter to continue then select DONE to return to the CONFIG MENU, then select DONE and RUN.

To Setup the AFA1000 with BACnet protocol using the pushbutton menus:-

1. Press Enter from the "Requires set up" screen or if the monitor is in the Run screen Press and Hold the Enter button for 5 seconds until the Main Menu is displayed.

2. Using the + / - buttons select SET UP, and then select CONFIGURE, then enter the password (the factory default password is 0-0-0-0), press Enter to continue.

3. Using the + / - buttons select PROTOCOL, and press Enter, then using the +/- buttons select BACnet and then press Enter to return to the CONFIG MENU.

4. Using the + / - buttons select BACnet SETTINGS and then press Enter, a sub menu will appear with the following parameters:-

	Parameter	Description	Range	Default
A	Device Instance	Set the slave ID for the unit	0000000 to 4194303	0000000
B	Station ID	Set the network ID	0-127	1
C	Baud Rate	Set the required Baud Rate	1200/2400/4800/9600/1440/ 19200/38400/57600	38400
D	Parity	Set the required Parity	None/Even/Odd	None
E	Max Masters	Set the max masters (max devices on the network)	0-127	1

5. Using the + / - buttons select the DEVICE INSTANCE parameter and then press Enter, then using the +/- buttons select the required Instance and press Enter to continue.

6. Using the + / - buttons select the STATION ID parameter and then press Enter, then using the +/- buttons select the required ID and press Enter to continue.

7. Using the + / - buttons select the BAUD RATE parameter and then press Enter, then using the +/- buttons select the required rate and press Enter to continue.

8. Using the + / - buttons select the PARITY parameter and then press Enter, then using the +/- buttons select the required rate and press Enter to continue.

9. Using the + / - buttons select the MAX MASTERS parameter and then press Enter, then using the +/- buttons select the required number of Masters and press Enter to continue, then select DONE to return to the CONFIG MENU, then select DONE and RUN.

8.3 Testing and troubleshooting

The AFA1000 diagnostics menu can be used to check the coms settings and operation once the AFA1000 coms parameter settings have been set up.

From the run screen press the + & - buttons together to access the diagnostics screen.

The diagnostics sub menu will appear showing the following options-

a. Alarm Test
b. Coms data
c. I/O Status
d. Done

Using the +/- buttons to scroll select **Coms data** and press Enter.

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.

BACnet protocol troubleshooting guide

	Protocol	Fault	Remedy
A	BACnet	Device not present on Network	Ensure the AFA1000 is in Run mode or Diagnostics screen, the coms are interrupted when the AFA1000 is in the pushbutton menus.
			Power cycle the AFA1000, this is required if the Protocol has been changed.
			Ensure Max Masters is set to the number of devices on the network, if the value set is larger than the actual number of devices the coms will be slowed so may cause time out issues.
			Ensure the network is BACnet MS/TP not BACnet IP (a separate router is required for IP).
			Using the diagnostics menu check the coms settings are correct (see below).
		Diagnostics menu	
		Tx & Rx = 0	AFA1000 is not connected to the network (initial set up).
		Tx & Rx >0 but fixed values	AFA1000 has lost connection to the network.
		Rx is counting but Tx is a fixed value	AFA1000 is connected to the network but the Master (BMS) is offline or not polling the AFA1000.

Modbus protocol troubleshooting guide

	Protocol	Fault	Remedy
B	Modbus	Device not present on Network	Ensure the AFA1000 is in Run mode or Diagnostics screen, the coms are interrupted when the AFA1000 is in the pushbutton menus.
			Power cycle the AFA1000, this is required if the Protocol has been changed.
			Ensure the network is Modbus RTU.
			Using the diagnostics menu check the coms settings are correct (see below).
		Diagnostics menu	
		Tx & Rx = 0	AFA1000 is not connected to the network (initial set up).
		Tx & Rx >0 but fixed values	AFA1000 has lost connection to the network.
		Rx is counting but Tx is a fixed value	AFA1000 is connected to the network but the Master (BMS) is offline or not polling the AFA1000.

8.4   Config Manager

TEL software package CONFIG MANAGER is available for uploading and downloading parameter configuration files to the AFA1000. The config manager software is Windows based software that runs on a PC or Laptop and requires a RS232/485 converter and TEL coms adaptor to communicate with the RS485 coms port on the AFA1000.

The software is free to download and the coms adaptor is available to buy from TEL.

Most 3rd party RS232/485 converters will work with the AFA1000, the recommended converter is the following 1 port isolated converter part number:- EasySYNC ES-U-2101-M which is also available to buy from directly from TEL.

Recommended minimum PC requirements:-

Windows XP or later, 2GHz processor, 3.00GB Ram, 1MB free storage space.

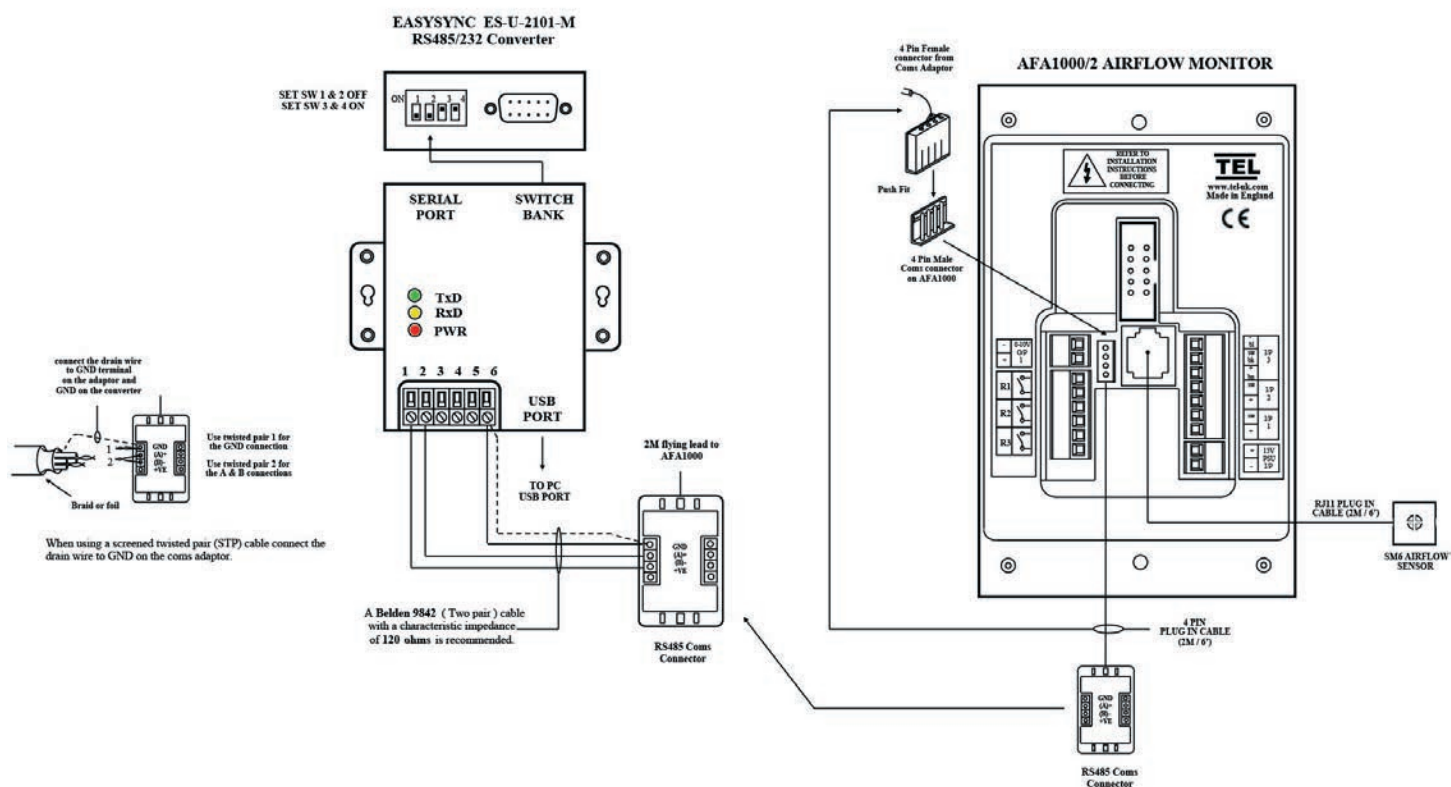Config Manager uses the TEL protocol on the AFA1000.

See separate Config Manager manual for further information.

Connection Diagram with RS232/485 converter

9. WARRANTY

9 WARRANTY

Seller warrants that this product, under normal use and service as described in the operator's manual shall be free from defects in workmanship and material for a period of twelve (12) months, or the length of time specified in the operator's manual, from the date of shipment to the customer. This limited warranty is subject to the following exclusion :-

a. Batteries and certain other components when indicated in specifications are warranted for a period of 90 days from the date of shipment to the customer.

b. With respect to any repair services rendered, Seller warrants that the parts repaired or replaced will be free from defects in workmanship and material, under normal use, for a period of 90 days from the date of shipment to the customer.

c. Seller does not provide any warranty on finished goods manufactured by others. Only the original manufacturer's warranty applies.

d. Unless specifically authorized in a separate writing by Seller, Seller makes no warranty with respect to, and shall have no liability in connection with, any goods which are incorporated into other products or equipment by the Buyer. All goods returned under warranty shall be at the Buyer's risk of loss, Seller's factory prepaid, and will be returned at Seller's risk of loss, Buyer's factory prepaid.

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TEL