

AFA4000/1 Airflow monitor

Installation and operating manual

Issue 1





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1. Introduction

The TEL AFA4000 is a system for controlling and monitoring airflow in industrial and educational fume cupboards and biological safety cabinets for user safety. The AFA4000 airflow monitor and controller is available with optional Auto Sash integration. Using the Auto Sash with the AFA4000 controller means you will no longer need a separate Auto Sash keypad.

The AFA4000 user interface is full colour, intuitive and is easy to navigate. It features a simple two-step calibration process with on-screen prompts to guide end users. The unrivalled reliability of the AFA4000 means that once calibrated, you will not need to recalibrate in the future. The AFA4000 has in-built communications as standard and it can be used with either Modbus or BACnet protocol.

Featuring an innovative hot wire sensor, the AFA4000 has no inherent drift meaning that the sensor will provide stable readings over many years of operation ensuring reliability and safety.

The AFA4000 has full alarm diagnostics and test functionality, a sixty-minute timeline of environmental conditions and field-upgradable software, with password protected menus and diagnostic menus to aid installation and commissioning.

This manual covers the AFA4000/1 and AFA4000/1/AS airflow monitors.



1.1 Features

- Full colour 3.5" LCD Display for continuous velocity reading in m/sec
- Auto Sash integration
- BACnet and Modbus on board
- Velocity bar graph or fault time line over the last 60 minutes
- Visual & audible alarms
- Three digital inputs and three digital outputs
- Diagnostics Menu
- Bespoke overlay designs, with a choice of two, coloured cases
- Bespoke software options tailored to customer requirements
- Touch sensitive buttons



2. Safety

2.1 Safety practices

This guide is a supplement to the safety codes of the user's country. Not every safety procedure that should be followed is covered by this guide. Maintaining a safe laboratory environment is the responsibility of the user.

Review product documentation prior to use and follow instructions carefully.

If the Airflow Monitor or Auto Sash Controller are not used or operated in accordance with this manual, the protection provided by the devices may be impaired.

2.2 Precautions

- Ensure the equipment voltage corresponds to the voltage available at the installation position.
- Do not remove equipment panels without shutting down the equipment and disconnecting the power supply.

2.3 Warnings

2.3.1 Warning notices

WARNINGS must be followed in order to avoid personal injury.

2.3.2 Warning labels

WARNINGS appear as follows:



Switch off the mains voltage and remove the mains cord before maintenance.

Always follow the instructions given by warning labels on the equipment. For further information refer to this guide and other documentation provided.



2.4 Operating conditions

2.4.1 General operation

The Airflow Monitor and associated equipment have been designed and tested in accordance with the International Electrotechnical Commissions (IEC) safety requirements. 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 2014/30/EU.

Adjustment, maintenance or repair of the equipment whilst covers are open or the equipment is in operation is only to be done by skilled persons who are aware of the potential hazards.

Make unsafe equipment inoperative.

Examples of unsafe equipment:

- Appears damaged
- Fails to perform correctly
- Has undergone transport stresses
- Has been stored incorrectly

2.4.2 Environmental conditions

Ensure the equipment is used under the following conditions:

- Indoors
- Temperature, 5°C to 40°C
- Relative humidity below 80% for temperatures up to 31°C, decreasing linearly to 50% at 40°C
- Electrical supply fluctuations not to exceed +10% of nominal voltage



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



2.5 Electrical safety



Lethal voltages are present at certain points within the equipment. When the equipment is connected to mains power, removing the equipment's covers is likely to expose live parts.

Even when the power switch is off, high voltage can still be present. Capacitors within the equipment may still be charged even if the equipment has been disconnected from all live voltage sources.

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



Any interruption of the protective conductor inside or outside the Auto-Sash Controller System, or disconnection of the protective conductor terminal is likely to make the equipment dangerous.

Never interrupt the protective conductor.



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



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 and/or the Auto Sash Controller System:

- Do not operate equipment with any covers or internal parts removed.
- Disconnect the equipment from live voltage sources before adjustments, replacements, maintenance or repairs are carried out. If the equipment must be operated during adjustment, maintenance or repair, only a supplier's Service Engineer is to carry out the procedure.



- Ensure equipment that is not electrically safe is made inoperative. Secure the equipment against unauthorised or unintentional operation. Examples of electrically unsafe equipment conditions are as follows:
 - Appears damaged
 - Has undergone transport stresses
 - Has been stored incorrectly

2.6 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 can 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.	
External circuits:	External circuits which are connected to the Auto Sash controller, except mains connection, shall be insulated by double or reinforced insulation from the mains.	



2.7 EMC compliance

2.7.1 EC Directive

The Airflow Monitor and Auto Sash Controller Systems are designed and tested to meet the requirements of the EC directive 2014/30/EU 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).

2.7.2 FCC Rules and Regulations

The Airflow Monitor System and Auto Sash Controller Systems are classified as digital devices used exclusively as industrial, commercial or medical test equipment. They are exempt from the technical standards specified in Part 15 of the FCC Rules and Regulations based on Section 15.103 (c).



3. Overview: Airflow Monitor

3.1 Display

3.1.1 Operator display panel



Figure 1: Operator display panel

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 engineer's 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.



3.1.2 Display features

The airflow monitor displays the following features:

- The digital display is a backlit, full colour high resolution graphic unit with a visual display area of approximately 45 x 34 mm. The display operates through the software allowing the generation of figures, words and icons. You can choose either blue or black for the background colour of the display.
- Using the alarm keypad, you can configure the display to show the fume cupboard velocity in m/sec or fpm. Alternatively, you can configure the display to show AIR FAIL / AIR SAFE continuously.

The colour of the velocity on the display screen changes when in an alarm condition, to the following:

- Air Safe = White
- Low/ High Air Alarm = Red
- Warning Air Alarm = Amber

An **'event time line'** segmented into 60 x 1 minute segments scroll across the display (when enabled). The event time line is displayed as a graphical scale ranging over 0-1.00 m/sec that progresses across the screen, representing the airflow value at each segment.

The segment colour changes, as above, if the value is in the range of an airflow alarm.

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

The display shows an up and down arrow icon, $\widehat{\mathbf{m}}$, 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 a line across it) when the audible alarm is muted.
- The display backlight dims to save energy when the following functions are in use:
 - Fan Off activated- display backlight dims until Fan On is selected.
 Backlight brightens to normal level when you access the Set Up or Diagnostics menus.



• **Setback** activated- display backlight dims until the Setback is deactivated. Backlight brightens to normal level when you access the Set Up or Diagnostics menus.

3.2 Alarms and events

Message	Displayed when
Sash high	The Sash alarm is activated, and the sash is raised above the
	maximum safe working opening. Sash high alternates on/off with
	the velocity reading.
External alarm	The external alarm input is activated. External alarm alternates
	on/off with the velocity reading.
Alarm fail	The airflow is less than the low air alarm point. Air fail alternates
	on/off with the velocity reading.
High alarm	The airflow is more than the high air alarm point. High Air
	alternates on/off with the velocity reading.
Setback	The night setback function is activated. Setback alternates on/off
	with the velocity reading. The display backlight dims.
Alarm disabled	The alarm disable function is activated. Alarm disable alternates
	on/off with the velocity reading.
Close sash	The sash is raised and the operator is not present (when activated).
	Close sash alternates on/off with the velocity reading.
Emergency	The emergency input is activated. Emergency alternates on/off with
	the velocity reading.
Up / down arrow	The Hi/Lo 2 Speed operation is enabled.

Message	Displayed when
Mains fail	The power fails to connect to the monitor, when activated.
	Note: This is an optional extra feature that requires an additional battery unit.



Message	Displayed when		
Low temperature	The cupboard temperature drops below the low temperature alarm		
	point, when activated. The display alternates on/off with the		
	velocity reading.		
	Note: This is an optional extra feature that requires an additional		
	temperature sensor.		
High temperature	The fume cupboard temperature rises above the high temperature		
	alarm point, when activated.		
	Note: This is an optional extra feature that requires an additional		
	temperature sensor.		



3.3 Controls and indicators

3.3.1 LED indicators

The alarm unit has three LED indicators:

Red- Alarm

Amber- Caution

Green- Safe

3.3.2 Audible alarm sounder

The AFA4000/1 has an audible sounder with local or remote mute facilities. You can permanently disable the alarm in the calibration and configuration menus.

You can mute the alarm by activating the Setback or Alarm Disable functions.

When the audible alarm is muted/ disabled, the mute icon displays at the bottom left side of the screen.

When an input is set to the mute function the keypad **Mute** button is disabled and you can only mute the alarm by using the selected mute input.

3.3.3 Pushbuttons

- $\uparrow I \downarrow$ Use the \uparrow and \downarrow buttons to scroll through the calibration and configuration menus or to select options and values.



3.4 Operator display panel menu navigation

To scroll through menu items, press the \uparrow and \downarrow arrows, then press **Mute** to select an option.

3.4.1 Main menu

To display the *Main Menu*, from the *Run Screen*, press and hold the **Mute** button for 5 seconds until the *Main Menu* is displayed.

Menu item	Option	Instructions
Run	Run screen	See Operation section
Set up Monitor	Monitor setup menu	See Monitor setup menu section
Set up Auto Sash Note: This option is only available if the Auto Sash is	Auto Sash Configuration menu	See Auto Sash Configuration menu section
connected.		

3.4.2 Monitor setup menu

Option	Instructions
Monitor config menu	See section 8.
Calibration	See section 7.
Monitor passwords menu	Select the password to set:
	Admin
	Calibration
	Configure
	Enter and re-enter the
	new password, then press
	the Mute button.
	Select Done to return to
	the Main menu.
	Option Monitor config menu Calibration Monitor passwords menu



Menu item		Option	Instructions
Done		Return to Main menu	
Note:	Menu items marked	* are password protected.	To enter the password, use \uparrow / \downarrow

to change each digit of the password, then press **Mute**.

3.4.3 Auto Sash Configuration menu

Note: This option is only available if the Auto Sash is connected.

Menu item	Option	Instructions
TEL Sash Closer	Shows the firmware (F/W) and Hardware (H/W) versions	Read-only information
Setup Menu *	Auto Sash setup menu	See section 8.2.1.
Engineering Menu *	Auto Sash engineering menu	See section 8.2.2.
Exit	Return to Main menu	

Note: Menu items marked * are password protected. To enter the password, use \uparrow / \downarrow to change each digit of the password, then press **Mute**.



3.5 External connections

3.5.1 Inputs

The AFA4000/1 has the following inputs:

3.5.1.1 Input 1, Input2, Input 3

These are volt-free inputs configurable for:

- Normally closed relays
- Normally open relays or
- Analogue 0 5 Vdc input

The inputs can be configured as:

Digital input functions (closed or	Alarm disabled	Night set-back
open volt free contact):	External alarm	Emergency
	Sash high	High / Low
	Sash warning	Mains fail
	Fan stop	Mute
	Fire Alarm	
Analogue input functions:	Temperature	

3.5.2 Outputs

The AFA4000/1 has the following outputs:

3.5.2.1 Relay outputs 1, 2, 3

These are volt-free inputs configurable for:

- Normally closed relays or
- Normally open relays

3.5.2.2 Analogue output 1

0 - 10 Vdc re-transmission of face velocity over 0 - 1.00 m/sec, for example 0.50 m/sec = 5 Vdc.



3.5.3 Communications

3.5.3.1 Com port

This enables connection to a laptop or PC for configuration and for communications to building management or automation systems (BMS/BAS).

For specific information on Modbus RTU options and settings, see section 8.1.1.3.

For specific information on BACnet options and settings, see section 8.1.1.4.

3.5.4 *Power supply*

Low voltage DC power supply from the mains power adaptor.

- 3.5.5 Optional inputs
- 3.5.5.1 Temperature sensor

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

3.5.5.2 PIR occupancy sensor

Auxiliary PIR used for close sash alarm based on the fume cupboard occupancy.

3.5.5.3 Mains fail battery unit

Auxiliary plug-in battery unit has a mains fail alarm.



3.6 Functions

3.6.1 Airflow functions

The AFA4000/1 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 AFA4000/1 has 4 programmable airflow alarms:

Safe airflow	 Airflow reading above warning level (for example, > 0.45 m/sec).
	Green Safe LED on.
Warning airflow	 Airflow reads between warning level and air fail level (for example, > 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 by pressing the
	Mute 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 (for example > 1.50 m/sec)
	 High Air toggles on / off with display.
	Red Alarm LED on (Solid).
	 High air relay operates (when configured).



3.6.2 Audible alarm mute

When the audible alarm is muted via the **Mute** button, an icon ($\stackrel{\ensuremath{\square}}{\hookrightarrow}$) displays.

The audible alarm can be permanently disabled by selecting **Not Enabled** in the *Cal Config menu* (*Setup Monitor > Configure > Cal Config Menu > Audible Alarm*).

3.6.3 Input functions

The AFA4000/1 has 3 programmable inputs that can be set to:

- Analogue (0 5 Vdc)
- Digital open or
- Digital closed operation

3.6.3.1 Analogue input functions

Function	Description
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 is less
	than the Low Temp Alarm point
	Red Alarm LED on (Flashing)
	 Audible alarm sounds - can be muted by pressing the Mute
	pushbutton
	 Low Temp relay operates (when configured)
	High Temp toggles on / off with display if temperature is
	higher than the High Temp Alarm point
	Red Alarm LED on (Flashing)
	 Audible alarm sounds - can be muted by pressing the Mute
	pushbutton
	High Temp relay operates (if configured)



3.6.3.2 Digital input functions

Function	Description	
Alarm disable	When input configured as Alarm is disabled:	
	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.	
	Reduce 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) – (when configured). 	
	• External Alarm toggles on / off with display - (when	
	configured).	
	Audible alarm sounds. Can be muted by pressing the Mute	
	pushbutton.	
	• External Alarm relay operates (when 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 by pressing the Mute	
	pushbutton	
	 Sash High relay operates (when configured) 	
	Alarm re-activates after time delay when repeat time enabled	
High / Low	When input configured as High/Low is activated:	
	• Display Icon shows \uparrow (High) or \downarrow (Low)	



Function	Description
	High / Low relay operates (when configured)
	 This function is designed for two speed fan operation or two
	position damper operation switched using a micro switch or
	proximity switch activated at a given position on the sash.
Sash Warning	When the input configured as Sash Warning is activated:
	• Red LED on.
	 Sash Warning - toggles on/off with velocity display.
	 Audible alarm sounds (after pre-set time).
	Audible can be muted by pressing the Mute pushbutton. This
	silences the alarm (when configured).
	Alarm re-activates after time delay when repeat time enabled
	 Reset when the sash is lowered to closed position and the
	input is de-activated or an operator is present.
Mains Fail	When the input configured as Mains Fail is activated:
(Optional extra	Red LED on
feature)	Mains Fail is displayed
	Audible alarm sounds
	Audible can be muted by pressing the Mute 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 AFA4000 is a Slave unit with a common fan.
	Remote master On/Off signal is used
Mute	When the input configured as Mute is activated:



Function	Description	
	Red LED on (Solid).	
	Audible alarm muted.	
	Mute Icon shown on display.	
Note: The Mute function any audible alarm co example remote key	Note: The Mute function disables the pushbutton mute so that any audible alarm can only be muted using the input, for example remote key switch.	



3.7 Components

3.7.1 Airflow monitor components

- 1 AFA4000/1 Airflow Monitor
- 1 Airflow Sensor c/w 2 metre RJ45 Sensor Cable
- 1 Plug in type low voltage power supply with 5 metre Cable



AFA4000 AIRFLOW MONITOR

Figure 2: AFA4000/1 airflow monitor



3.7.2 Auxiliary components

The following auxiliary components are available for the AFA4000/1 airflow monitor:

Component	Function
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



4. Overview: Auto Sash Controller

The Auto Sash Controller automates the opening and closing of the fume hood sash. Automation of the sash movement provides an increased level of safety to the controlled environment. A sash cannot be accidentally left open and can respond to safety critical inputs from external sources, such as fire alarms and ventilation system failures.

The Auto Sash Controller facilitates cost savings. When linked to ventilation controls, the automatic closing of an unattended fume hood allows extractor fan speeds and electricity consumption to be reduced.

4.1 Features

Auto-Close The sash automatically closes when the fume hood is unattended. • Auto-Open The sash automatically opens when the user returns. Sash Lock The sash is programmed to lock at a designated position. **Manual Sash** To open/close the sash manually. **Open/Close** To open/close the sash using the Keypad Pushbuttons. Keypad Pushbutton **Open/Close** Footswitch To open / close the sash using an optional, third party supplied, footswitch. Tilt Switch To disable the Auto Sash Control Unit using a, third party supplied, tilt switch. • Building Management The sash automatically closes when a signal is received System (BMS) Inputs from the BMS. Building Management The Auto Sash Controller sends signals to the BMS System (BMS) Outputs regarding the current status of the fume hood.

The Auto Sash Controller has the following features:



4.2 Auto Sash control options

To open / close the fume hood sash the Auto Sash Controller is fitted with:

- A Tiptronic open/close control via the Sash Position Sensor.
- A Sash Low micro-switch
- A Sash Low proximity switch

4.2.1 Auto Sash Controller with Tiptronic open / close control

Tiptronic Open / Close control is the default control setup. It functions via a Sash Position Sensor (sprung potentiometer) with a draw wire (1.2m long) attached to either the sash or the counterweight. The Auto Sash Controller can then be calibrated to give three methods of operation:

Method A - Close only	The bottom position is calibrated.
	• The sash automatically drives to the bottom position,
	when the user is not present.
	• Press the \downarrow pushbutton to drive the sash to the
	bottom position, when the user is present.
	 The ↑ pushbutton is disabled.
Method B - 2 Positions	• The bottom and mid-positions are calibrated.
	The sash automatically drives to the bottom position,
	when the user is not present.
	• Press the \downarrow pushbutton to drive the sash to the
	bottom position, when the user is present.
	• Press the \uparrow pushbutton to drive the sash to the mid-
	position, when the user is present.
	When the Tiptronic feature is enabled, manually tip
	the sash upwards and the sash will drive to the mid-
	position.
	 Manually tip the sash downwards and the sash will
	drive to the bottom position.



	When the Auto Open feature is enabled, the sash
	automatically drives to the mid-position when the
	user is present.
	 There is a time delay following user detection.
	When the Auto Lock feature is enabled and a Sash
	Lock position has been calibrated, the Auto Close
	feature is disabled and the sash locks in its current
	position when the sash is raised to the Sash Lock
	position or higher. This facilitates loading the Fume
	Cupboard.
Method C – 3 Positions	• The bottom, mid and top positions are calibrated.
	• The sash automatically drives to the bottom position,
	when the user is not present.
	• Press the Down pushbutton to drive the sash to the
	bottom position, when the user is present.
	 Press the Up pushbutton to drive the sash to the
	next calibrated position, when the user is present.
	When the Tiptronic feature is enabled, manually tip
	the sash upwards and the sash will drive to the next
	calibrated position.
	 Manually tip the sash downwards and the sash will
	drive to the bottom position.
	• When the Auto Open feature is enabled, the user is
	present and the sash is lower than the mid position,
	the sash automatically drives to the mid-position.
	 There is a time delay following user detection.
	When the Auto Lock feature is enabled and a Sash
	Lock position has been calibrated, the Auto Close
	feature is disabled and the sash locks in its current
	position when the sash is raised to the Sash Lock
	position or higher. This facilitates loading the Fume
	Cupboard.



4.2.2 Auto Sash Controller with Sash Low micro-switch

A Sash Low Micro-Switch can be specified for fitting by TEL or by the fume hood manufacturer. The switch can be arranged to be open / closed when the sash is closed, depending on fitting. The wiring arrangement must be modified for installation and the operational requirements of the fume hood.

The following functionality is available:

- The sash automatically drives to the bottom position, when the user is not present.
- Press the **Down** pushbutton to drive the sash to the bottom position, when the user is present.
- The **Up** pushbutton is disabled.

4.2.3 Auto Sash Controller with Sash Low proximity switch

A Sash Low Proximity Switch can be specified for fitting by TEL or the fume hood manufacturer. The switch can be arranged to be open/closed when the sash is closed, depending on fitting. The wiring arrangement must be modified for installation and the operational requirements of the fume hood.

The following functionality is available:

- The sash automatically drives to the bottom position, when the user is not present.
- Press the **Down** pushbutton to drive the sash to the bottom position, when the user is present.
- The **Up** pushbutton is disabled.



4.3 Control system components

The Auto Sash Control System comprises of a control unit and additional components.



Figure 3: Typical location of main components

Note: This example installation is fitted with a pulley and wire sash drive.



4.3.1 Auto sash control unit

The Auto Sash Control Unit processes inputs from sensors, switches associated with the sash control function and output signals relevant to the motor drive(s) and the alarm panel.



Figure 4: Auto Sash Control Unit - single and dual controller enclosure



4.3.2 Personnel sensor



Green LED Figure 5: Detection area clear





The Personnel Sensor is a Passive Infra-Red (PIR) occupancy detector which detects the presence / absence of the fume hood user.

Note: If the user is detected, the sash will not automatically close. The Sash can be opened / closed manually or using the **Up** / **Down** pushbuttons.

On power up, the Personnel Sensor 'learns' the reflection characteristics of the environment within its field of view and stores this information as reference background data. The sensor then 're-learns' the background every three minutes. A stationary object, such as a stool, that is left in the field becomes part of the background and is 'ignored' by the sensor. When the user is not present at the fume hood, the sash will close automatically. This follows a pre-set delay time, if the Sash Light Curtain is not broken and the sash is open.



4.3.3 Keypad/alarm panel



Figure 7: UK / EU keypad

Figure 8: US keypad

The Keypad/Alarm Panel provides a visual indication of the status of the Auto Sash, this includes fault conditions which are displayed on a Liquid Crystal Display (LCD).

4.3.4 Sash light curtain

The Sash Light Curtain is a safety device designed to detect whether the opening below the sash is clear of obstructions before the sash is automatically closed.

- When an obstruction is detected, the sash drive is disabled and the alarm is activated.
- The Sash Light Curtain comprises an infra-red transmitter mounted on one side of the fume hood and an infra-red receiver mounted on the opposite side of the fume hood's inner chamber.
- The infra-red transmitter has multiple, closely spaced, Light Emitting Diodes (LEDs) to facilitate the detection of small objects.



• Objects are detected when infra-red light from the transmitter is not detected by the receiver due to an obstruction in its path.



Figure 9: Sash Light Curtain Transmitter and Receiver

A separate Sash Light Curtain Control Box includes a sensitivity potentiometer that allows the beam sensitivity adjusted to sense glass or other objects that are partially transparent to infra-red light.



Figure 10: Sash Light Curtain Control Box

4.3.5 Under Sash sensor

The Under Sash Sensor is an alternative to the Sash Light Curtain which detects whether the opening below the sash is clear from obstructions before the sash is closed.

A sensor on one side of the fume hood detects the reflection of a beam of light from a self-adhesive strip of retro-reflective tape mounted on the opposite inside wall of the fume hood.


The sensor incorporates a potentiometer, it allows the beam sensitivity to be adjusted to sense glass objects.

4.3.6 Sash Low switch

When a Tiptronic control is not in use, a Sash Low switch is used to signal to the Auto Sash Control Unit that the fume hood sash is closed.

The switch can be either a mechanical roller lever type micro-switch or an inductive proximity switch.





Roller Lever Micro-Switch



Figure 11: Typical Sash Low switches

4.3.7 Sash position sensor

The Sash Position Sensor comprises of a flexible cable, a spring-loaded spool and a potentiometer. It is used, in conjunction with the Tiptronic control option, to detect and measure vertical sash movement and the position of the fume hood sash.

During the initial on-screen calibration set up the sash controller detects the sensor direction of travel and then provides position information of the sash to the Auto Sash Control Unit, to enable calibration of the sash open / closed positions.









Sensor Potentiometer

Sash Position Sensor

Sensor Cable

Figure 12: Sash Position Sensor

4.3.8 Tilt switch

The Tilt Switch is an optional, third party supplied component, which is fitted to the fume hood top panel. It operates to isolate the Auto Sash controls, when the top panel is open to facilitate the servicing of the fume hood.



Figure 13: Typical third-party tilt switch



4.3.9 Foot switch

The Foot Switch is an optional, third party supplied component, which can be positioned on the floor in front of the fume hood and used to open the sash.



Figure 14: Typical third party foot switch

4.3.10 Sash drive unit

The Sash Drive Unit is a geared electric motor and clutch assembly used to drive the sash.

Three types of drive are available, none of which preclude manual opening / closing:

- Rack and pinion drive
- Chain and sprocket drive
- Pulley and wire drive







Chain and sprocket drive

Rack and pinion drive Figure 15: Example drives

Pulley and wire drive



5. Installation: Airflow Monitor

This section outlines the installation of the various components of the airflow monitor system. The size and format of individual fume cupboards varies considerably, so specific instructions are not possible, however the principles outlined are valid for all cases.

5.1 Location

The AFA4000/1 monitor can be mounted on either side of the fume cupboard. However, when deciding on the location for the airflow monitor and sensor, consider the cable lengths required:

- The 5 metre low-voltage cable must reach from the terminals on the back of the AFA4000/1 airflow monitor to the connections on top of the fume cupboard.
- The standard 2 metre 'telephone style' sensor cable must reach from the back of the AFA4000/1 airflow monitor to the airflow sensor. When possible ensure that the airflow sensor is mounted on the same side of the fume cupboard as the AFA4000/1.

Note: Longer sensor cables are available on request.



5.1.1 SM7 airflow sensor installation notes

It is very important to position the SM7 airflow sensor in the correct position to give a long-term stable reading of the face velocity.





Please read the notes below and if in doubt contact us for further advice.

- The SM7 sensor must be positioned where it can sense the room pressure of the laboratory. The back-connection spigot of the sensor is designed to accept a tube with outside diameter of 25 mm, which should be connected to the inner chamber of the fume cupboard. This tube and fittings are known as the 'vent kit'. The ideal position for the end of the 25 mm diameter tube, for most fume cupboards, is 100 mm back from the sash glass and 100 mm 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 1 m 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 instability of the readings or incorrect readings at low velocities.

3. For fume cupboards with a single-skin side-wall, or 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 it using a short flexible tube to a rigid wall tube attached to the inner side-wall. Position the open end of this rigid wall tube in the 'ideal position' for example, 100 mm back from the sash, and 100 mm higher than the normal sash opening. Fume cupboards with a large internal height can present a difficulty because the tube length to reach the ideal position may be longer than 1m. Where possible, use a tube of 1 metre or less, 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 where it is subject to draughts from the laboratory air input or ventilation system.

5.2 Installation

5.2.1 AFA4000/1

 Use the cut-out details provided with the unit (Figure 17) to cut-out and drill the holes in the fume cupboard for the AFA4000/1 mounting bracket.
 Make sure that the AFA4000 fits into the cut-out before proceeding.





Figure 17: AFA4000 cut-out template

- Note: Print to A4. Do not scale or print to fit page.
- Note: Separate mounting boxes and adaptor plates are available for retro-fitting to older fume cupboards.





Figure 18: AFA4000 installation

2. Use 4 fixing screws to secure the mounting bracket to the front panel of the fume cupboard (A in Figure 18).

Make sure the 4 fixing screws are fully recessed into the counter-sunk fixing holes (B in Figure 18).

- 3. Place the AFA4000 onto the top of the mounting bracket and click it into place (C in Figure 18).
- 4. Push the bottom of the AFA4000 onto the mounting bracket (D in Figure 18).
- 5. Secure the AFA4000 to the mounting bracket using the fixing screw in the bottom face of the monitor (E in Figure 18).



5.2.2 SM7 airflow sensor

1. Use the cut-out details provided with the sensor (Figure 19) to cut-out and drill the holes in the fume cupboard for the SM7 sensor.

Make sure that the sensor fits into the cut-out before proceeding.





Note: Print to A4. Do not scale or print to fit page.

5.3 Connections

- 1. Connect the power supply cable into the back of the AFA4000/1 (H in Figure 20) and to the connection on top of the fume cupboard.
- 2. Connect the 'telephone style' airflow sensor plug-in cable to the sensor and the back of the AFA4000/1 unit (J in Figure 20).





Figure 20: AFA4000/1 monitor connections

А	0-10 V velocity re-transmission	G	Relay output 3 (used if relay interface
	output, 0-10 Vdc over 0-1.00 m/sec /		is not fitted)
	0-200 fpm		
В	Input 1 – digital or analogue	Н	15 Vdc power supply (used if relay
			interface is not fitted)
С	Input 2 – digital or analogue	I	Auto sash RJ45 connection (only used
			on AFA4000/1 – as model)
D	Input 3 – digital or analogue	J	Airflow sensor RJ12 connection
Е	Relay output 1 (used if relay interface	К	14-way ribbon cable connection to
	is not fitted)		relay interface
F	Relay output 2 (used if relay interface	L	RS485 comms port connection
	is not fitted)		







Figure 21: AFA4000/1 typical connection diagram





Figure 22: AFA4000/1/AS typical connection diagram



5.4 Dimensions



Figure 23: AFA4000/1 dimensions









5.5 Start up

5.5.1 AFA4000/1

The AFA4000/1 must be field-calibrated once the room air supply and exhaust is proportionally balanced.

When the unit is powered up, the following sequence of events occurs:

The alarm performs a self-test of its functions and audible alarm which takes approximately 3 seconds. At the end of the delay, the unit will do one of two things:

When the Airflow monitor has been calibrated, the unit enters normal operating mode. The monitor displays airflow velocity, LEDs and the audible alarm is enabled.

If the Airflow monitor has not been calibrated, the unit displays the message *Requires set up, press Mute to continue*.

Follow the instructions in the *Calibration* section (section 7.1).

5.5.2 AFA4000/1/AS

The AFA4000/1/AS must be field-calibrated once the room air supply and exhaust is proportionally balanced.

When the unit is powered up, the following sequence of events occurs:

- 1. The alarm performs a self-test of its functions and audible alarm which takes approximately 3 seconds.
- 2. At the end of the delay, the unit will do one of five things:
 - When the Airflow monitor has been calibrated, the unit enters normal operating mode. The monitor displays airflow velocity, LEDs and the audible alarm is enabled.
 - When the Airflow monitor has not been calibrated, the unit displays the message Requires set up, press **Mute** to continue.
 - When the Auto Sash Controller has been calibrated, the unit enters normal operating mode. The Controller displays status and alarms in the status window.
 - When the Auto Sash Controller is connected and has not been calibrated, the status window displays the message Auto Sash Not Configured.



• When the Auto Sash Controller is disconnected, the Auto sash controller status and menus are not displayed.



6. Installation: Auto Sash Controller

As the size and format of individual fume hoods vary, the installation instructions that follow are general. The principles outlined should remain valid in all cases.

Note: Before starting installation, ensure that the sash is free to move in its runners. Use silicon spray on the sash runners or adjust the sash runner's alignment when the sash does not move freely.

6.1 Auto Sash Control Unit

6.1.1 Mounting the unit

The Auto Sash Control Unit can be mounted as follows:

• Screwed flat to the outside of the fume hood roof - horizontal mounting

Note: For horizontal mounting, the control box should always be mounted with the lid / front panel facing upwards.

• Screwed to the outside wall of fume hood wall - vertical mounting



Figure 25: Auto Sash Control Unit Lid/Front Panel



Figure 26: Rear of Auto Sash Control Unit





Figure 27: Auto Sash Control Unit Connectors, Single and Dual Fume Hoods

Once the Auto Sash Control Unit has been positioned, mark its position using the fixing holes in the rear of the housing as a template. Then, attach the Auto Sash Control Unit using screws.

6.1.2 Wiring in the Auto Sash Control Unit

For fume hoods with an inner and outer sidewall, route all cables through the sidewall and into the service void.

For fume hoods with a single wall, route all cables up the outside of the sidewall, using suitable trunking or fixing pads and ties.

When wiring in the Auto Sash Control Unit, observe the following:

- Keep cables clear of moving parts.
- Use grommets wherever cables pass through sidewalls to prevent abrasion of the cable insulation and / or sidewall. Where a cable is supplied with a DIN connector, the grommet should have a minimum internal diameter of 17mm (0.67").
- Do not overstress cables by bending, for example when passing at 90° through a sidewall.





Figure 28: Sash Control System – general layout, wiring schematic and illustration (inset)



Cable Specifications			
Mains cable	3-core, 0.7mm ² , 2m long		
Light Curtain cable	4-core, 0.5mm ² , 2m long		
Keypad cable	RJ45, 3 m long		
Sash Position Sensor cable	4-core, 0.2mm ² , 2.5m long		
Personnel Sensor cable	5-core, 0.2mm ² , 3m long		
Motor cable	2-core, 0.5mm ² , 2m long		

6.2 Auto Sash keypad / alarm panel

Alternative Auto Sash Keypad / Alarm Panels can be supplied for US and EU markets. Both types should be mounted on the front of the fume hood, ensuring there is adequate clearance behind for the cables connecting the keypad to the Auto Sash Control Unit.

6.2.1 Fitting the Auto Sash keypad / alarm panel

1. Fit the Auto Sash Keypad to the fume hood using either a single gang socket for UK applications (Figure 29) or using a cut-out to the (Version 2) dimensions (Figure 30).



Figure 29: Version 1 - UK Single Gang Keypad Fits in Standard Single Gang Socket





Figure 30: Version 2 US Single Gang Keypad – (requires cut out in front panel)

2. Connect the Keypad / Alarm Panel to the Auto Sash Control Unit. See the wiring schematic in section 6.10 and Figure 31.



Figure 31: Keypad/Alarm Panel Rear View

6.3 Auto Sash motor drive unit

A Motor Drive Unit is used to automatically raise and lower the fume hood sash.

Three types of drives are available:

- Rack and pinion motor drive.
- Chain and sprocket motor drive.
- Wire and pulley motor drive.

The optimal choice of sash drive type depends on whether:



- The installation is part of a new build or retro-fit.
- The size and configuration of the fume hood.
- The fume hoods location.

None of these options preclude manual operation of the sash.

6.3.1 Rack and pinion motor drive

The Rack and Pinion Motor Drive uses a rack fitted directly onto the sash frame and a motor drive assembly fitted to a framework above the fume hood.

This drive system is ideal for retro-fit installations where there is no access to the sash wires or counterweights and / or where the sash is fitted to a metal framework, for example combination type sash fume hoods.

6.3.1.1 Installing the rack and pinion drive

- 1. Raise the sash to the fully open position.
- Offer up the motor assembly and rack to ensure that there is a clearance of at least
 1.2 m (47.24") above the top of the sash.

Note: The rack is supplied in 1m (39.37") lengths

3. The motor drive assembly should be fitted to a rigid framework and positioned centrally above the sash. To ensure that the T-bar fixing clears the bottom of the motor assembly, there should be at least 50 mm between the top of the sash and the bottom of the motor drive assembly, when the sash is fully opened.





Side view

Front view

Figure 32: Rack and pinion sash drive motor assembly

Note: Ensure that the rack is long enough to protrude through the top of the motor assembly, when the sash is fully closed.

- 4. When the motor drive assembly is fixed to the fume hood the T-bar should be fixed to the rack and offered up with the sash frame.
- 5. Ensure that the rack is free to move over the full sash opening before marking up and fixing the T-bar to the sash frame.

Note: The rack must to run vertically at 90° to the horizontal axis of the sash frame.





Figure 33: Front view of rack and pinion sash drive

- 6. When fitting a sash low switch instead of a sash position sensor, the rack will need to be cut to the correct length to enable the switch to operate. Close the sash fully and mark the rack just below the position of the proximity low switch at the top of the motor assembly to ensure that the rack is clear of the switch when the sash is closed.
- Connect the Sash Drive to the Auto Sash Control Unit using the cables provided (with red and black connectors). See the wiring schematic in section 6.10 and Figure 31.
 Note: It is important to observe the correct polarity when making electrical connections.
- 8. Connect the clutch assembly to the Auto Sash Control Unit using the cables provided (with blue and yellow connectors).





Figure 34: Side views of a rack and pinion drive typical installation

6.3.2 Chain and sprocket drives

Two types of chain and sprocket drives are available:

• Shaft Drive



• Counterweight Drive

6.3.2.1 Chain and sprocket shaft drives

In the Shaft Drive arrangement, the motor drive utilises a taper bore sprocket and a roller chain to drive a shaft running between the counterweight pulleys.

The motor assembly is supplied fitted to an adjustable bracket so that the correct chain tension can be set.

The Shaft Drive arrangement can accommodate one or two sash wires.



Figure 35: Typical chain and sprocket shaft drive installation

6.3.2.2 Installing the chain and sprocket shaft drive

- Fit the taper bore sprocket to the shaft and ensure that the sprocket is securely fitted. Where possible positioned the motor drive and sprocket centrally on the shaft. The motor assembly should be fitted to a rigid framework to support the motor.
- 2. Loosely fit the chain before fixing the motor plate to ensure the chain is correctly tensioned and aligned.



6.3.2.3 Chain and sprocket counterweight drive

In the Counterweight Drive arrangement, the chain and sprocket drive system is used to directly lift the sash counterweight. This is achieved by fitting a roller chain to the counterweight and utilising a separate counterweight and freewheeling sprocket to maintain the correct chain tension.





6.3.3 Installing the chain and sprocket counterweight drive

- 1. When the motor, chain and freewheeling sprocket has been fitted, manually open / close the sash, to ensure that the motor drive is free running and that the chain is not too slack or too tight.
- 2. Fit the motor so that the drive sprocket is in line with the counterweight pulley.
- 3. Fit one end of the chain to the counterweight or sash wire near to the counterweight.
- 4. Fit the freewheeling sprocket in line with the drive sprocket.
- 5. Loosely fit the chain over the freewheeling pulley and determine the best position for the chain counterweight.



- 6. Fit the chain counterweight, using a counterweight guide if necessary.
- 7. When the motor, chain and counterweight are fitted manually open / close the sash to ensure the motor drive, chain and counterweight are free running.

6.3.4 Wire and pulley drive

With the Wire and Pulley Drive, the pulley motor drives the sash wire and can accept both single and dual sash wire systems. The motor assembly is fitted in line with the sash wires and uses two guide pulleys and a drive pulley.

The pulley drive is ideal for new fume hoods but can be retro-fitted if a longer replacement sash wire can be fitted.



Figure 37: Typical wire and pulley drive installation

6.3.4.1 Installing the wire and pulley drive

The motor assembly can be fitted horizontally or vertically on either side of the fume hood, as follows:

- 1. Fit the motor assembly so that the guide pulleys are in line with the sash wire.
- 2. Run the sash wire over the first guide pulley, around the drive pulley and then over the final guide pulley.

When the motor drive has been installed, open / close the sash to ensure that the sash can travel freely.



6.4 Sash light curtain

The Sash Light Curtain consists of three main components and associated wiring:

- Sash Light Curtain Control Box
- LED Transmitter
- LED Receiver

The Sash Light Curtain Control Box is connected to the main Auto Sash Control Unit.

6.4.1 Installing the sash light curtain control box

1. Fix the Sash Light Curtain Control Box onto the top of the fume hood, using the tabs attached to the control box and the screws provided. Ensure that there is access to the terminals to connect the wiring.



Figure 38: Sash Light Curtain Control Box

2. Use the pre-assembled cables and connectors supplied to connect the Light Curtain Control Box to the Auto Sash Control Unit. See the wiring schematic in section 6.10 and Figure 31.



6.4.2 Installing the sash light curtain transmitter and receiver

- 1. Find a suitable position near to the back of the sash track. Ensure that the sash handle does not protrude into the light beam and that there are no other obstructions on either side wall.
- 2. Carefully remove the front plastic covers from the right-hand side of the light curtain receiver and the left-hand side of the light curtain transmitter cases.



Figure 39: Light curtain receiver plastic cover

3. Position the light curtain transmitter and receiver on opposite sidewalls. Ensure that the back of the sash handle does not penetrate the light beam path.

The sash light curtain transmitter and receiver should be fitted so that their cable entry / exit points are at the top.

Ensure that the light beam path is free from other obstructions.





Figure 40: Mounting transmitter / receiver

6.4.3 Aligning the light curtain transmitter and receiver

Mount the light curtain receiver and transmitter at the same height on opposing sides of the fume hood opening. A small error in alignment is acceptable. The allowable error is dependent on the spacing between the transmitter and receiver.

Figure 41 illustrates the maximum allowable transmitter to receiver misalignment / displacement for a 0 to 3 m (0 to 118.11") range of fume hood widths. For a typical fume hood width of 1 to 2 m (39.37 to 78.740"), the maximum allowable misalignment / displacement ranges from approximately 20 to 40 mm (0.79 to 1.58").





Figure 41: Maximum allowable displacement for a range of fume hood widths

1. The area protected by the light beams should cover the open area under the sash, typically 500 mm (20") from its base.

The light curtain transmitter and receiver can be positioned above the bottom of the sash in the fume hood if they are free from obstructions.

Where possible, make sure the light path is aligned flush to the bottom of the sash base.

Note: There is a 123 mm (4.84") gap from the top of the light curtain transmitter to the first LED down and a 22 mm (0.87") gap from the bottom of the transmitter to the first LED up.





Figure 42: Light curtain vertical range

- 2. When the light curtain transmitter and receiver have been positioned, mark the sidewall using the fixing holes in the transmitter and receiver as templates.
- 3. Drill the holes for the fixing screws. Use the 2 mm (0.08") drill bit provided and fix the transmitter and receiver.



Figure 43: Transmitter / Receiver fixing holes



4. On a fume hood with an inner and outer sidewall the light curtain transmitter and receiver cables run through the sidewall into the service void and up to the Sash Light Curtain Control Box on top of the fume hood.

On a fume hood with a single wall drill the hole in the top soffit panel and run the cables up the sidewalls using suitable trunking or fixing pads and ties.

Drill a 17mm (0.67") hole to clear the cable DIN connector.

When using a grommet drill a suitable hole in the sidewall to accept the grommet.





- Note: The hole's centre should be a minimum of 35 mm (1.38") from the top of the light beam path, so that the cable is not stressed when it bends 90° through the inner sidewall.
- 5. Pass the cables through the sidewall and connect to the Sash Light Curtain Control Box on the top of the fume hood.
- 6. Connect the light curtain transmitter and receiver to the Sash Light Curtain Control Box using the plug-in RJ45 cables provided.





Figure 45: Light Curtain Vertical Range Safety Curtain Transmitter and Receiver Wiring Schematic

- Use the pre-assembled cables provided to connect the output from the Safety Curtain Control Box to the Auto Sash Control Unit. See the wiring schematic in section 6.10 and Figure 31.
- 8. Fix the light curtain transmitter and receiver to the sidewall using their fixing holes and re-attach the plastic covers.



6.5 Installing and aligning the Under Sash sensor

The Under Sash Sensor consists of two components:

- Sash Sensor
- Retro-reflective Tape Strip
- 1. Fit the sensor so that its lens is clear of obstructions and below the bottom of the sash handle.



Figure 46: Under sash sensor mounting



Figure 47: Under sash sensor dimensions

Use a suitable bracket so that the sensor position can be adjusted to the required position.

2. Fix the 5 m cable, which is attached to the sensor, to the sash wire using cable ties. Attach the 5 m cable to the sash counterweight to keep the cable taught as the sash opens or closes.

Encase the cable from the sash counterweight to the sash controller box can in plastic sheathing to guide the cable slack and stop it from snagging.


When it is not possible to fix the cable to the sash wire, use small diameter trunking to attach the cable to the sash.

Use a roller bearing or pulley where the cable runs over a metal surface.



Figure 48: Typical under sash sensor retro-installation

3. Fix the retro-reflective tape strip to the inside of the fume hood, on the opposite side to the sensor.

Position the centre of the retro-reflective tape strip in line with the centre of the sensor. A small offset between the sensor and retro-reflective tape strip is acceptable. The maximum offset values are shown in Figure 49.





Sensor Detection Area (Fume Cupboard Width)

Figure 49: Maximum under sash sensor offset

For example, on a 1000 mm wide Fume Hood the sensor can detect the retroreflective strip up to \pm 20 mm either side of the Under Sash Sensor's centreline.

4. Connect to the Auto Sash Control Unit. See the wiring schematic in section 6.10 and Figure 31.

6.6 Tilt switch

Tilt Switches are provided in a variety of forms, the installation instructions that follow are therefore general.

- Ensure that the Tilt Switch is installed in the correct orientation 'open' when the front panel is closed and 'closed' when the front panel is open.
- Connect the Tilt Switch to the Auto Sash Control Unit. See the wiring schematic in section 6.10 and Figure 31.
- Link out / connect the relevant terminals on the Auto Sash Control Unit when not using a Tilt Switch. See the wiring schematic in section 6.10 and Figure 31.





Figure 50: Tilt switch wiring schematic

6.7 Sash Low switch

Two types of Sash Low switch can be used:

- Micro-Switch
- Proximity Switch

Switches signal the sash as being open when the switch is open or closed, depending on the installation requirements.

6.7.1 Installing the Sash Low mcro-switch

The Sash Low Micro-Switch is a change-over type switch. When the sash is closed the switch makes or breaks the circuit depending on which terminals are used on the switch for each type of activation. Typically, the switch would be fitted so that the lever engages (pushes in) when the sash is open.

Connect the Sash Low Micro-Switch to the Auto Sash Control Unit (Figure 51 See the wiring schematic in section 6.10 and Figure 31.

If the switch is installed so that the lever pushes in when the sash is **closed**, connect the wiring to the Auto Sash Control Unit to terminals C and NO on the switch.

If the switch is installed so that the lever pushes in when the sash is **open**, connect the wiring to the Auto Sash Control Unit to terminals C and NC on the switch.





Figure 51: Sash low micro-switch wiring schematic

6.7.2 Installing the Sash Low proximity switch

The Sash Low Proximity Switch is an inductive switch that operates when it comes within range of a metal plate attached to the sash, i.e. when the sash is closed.

The type of switch selected makes or breaks the circuit when the sash is closed. Typically, the switch would be fitted so that the switch is closed when the sash is open.

Connect the Sash Low Proximity Switch to the Auto Sash Control Unit (Figure 52). See the wiring schematic in section 6.10 and Figure 31.



Figure 52: Sash low proximity switch wiring schedule





Figure 53: Sash Low Proximity Switch Dimensions

Note: When the Auto Sash control is being retro-fitted, fix the bracket to allow for over-travel of the sash.

6.8 Sash position sensor

The sash position sensor is fitted with a mounting bracket which can be fitted in four different orientations to enable the sensor draw wire to be correctly aligned.

1. Offer up the sensor to determine the best fixing position on the fume hood framework.

Where possible, ensure the sensor draw wire runs straight out of the sensor housing, in line with the cable housing extension. Where the wire runs at an angle to the sensor, ensure the angle is as small as possible to prevent the wire from rubbing on any part of the sensor body, including the cable housing extension.





Figure 54: Sash position sensor

2. Mark the fixing holes on the framework and attach the sensor.

The fixing bracket has two 0.37 mm (0.015") diameter fixing holes.

Note: Ensure that the sensor is in a position that does not over extend the draw wire. The sensor draw wire full stroke is 1270 mm (50") maximum.

- 3. Attach the draw wire to either:
 - The sash using a suitably sized screw, the draw wire has a 9.53 mm (0.38") diameter fixing ring with a 4.85 mm (0.18") diameter fixing hole in its centre.
 - The sash cable using a cable tie, ensuring that the fixing ring does not run over the pulleys.
 - The counterweight using a cable (Figure 55).





Figure 55: Sash position sensor draw wire attached by cable tie

When the sensor is fitted, manually open / close the sash to ensure that the sensor is installed correctly.

6.9 Personnel sensor

The Personnel Sensor is supplied as a single transmitter / receiver unit.

6.9.1 Installing the personnel sensor

 Use the mounting template illustrated in Figure 56 and the fixing screws provided to mount the Personnel Sensor. Mount the sensor centrally to the front of the fume hood and above the fume hood sash, use the fixing holes in the back of the sensor. See the table in Figure 56 for the correct mounting hole dimensions and locations.







А	Cable Entry	10 x 20 mm (5 mm diameter cable provided)
В	Fixing Hole	5 mm diameter maximum
С	Spare Hole	10 x 20 mm
D	Spare Hole	10 x 20 mm
E	Fixing Hole	5 mm diameter maximum
F	Spare Fixing Hole	5 mm diameter maximum

Figure 56: Personnel sensor mounting details

The Personnel Sensor should be positioned so that it points straight down, with the horizontal axis of the sensor parallel to the horizontal axis of the fume hood (Figure 57).

Note: Do not mount the sensor higher than 250 0mm (98") from the laboratory floor.





Personnel Sensor beam width approximately 1000mm (39.37") wide when sensor is located at a height of 2000mm (78.74")

Figure 57: Vertical positioning of Personnel Sensor

- 2. Fit the connection cable to the sensor cable inside the sensor housing.
- 3. Plug the 4-way terminal block into the Auto Sash Control Unit (Figure 58). See the wiring schematic in section 6.10 and Figure 31.



Figure 58: Personnel sensor 4-way terminal block



6.9.2 Adjusting the personnel sensor beam width

Adjust the width of the Personnel Sensor's beam to suit different fume hood widths. To adjust the beam width:

1. Access the two potentiometers under the sensor's front cover (Figure 59).



Figure 59: Personnel sensor beam width adjustment potentiometers

2. Adjust the width of the Personnel Sensor beam using the two potentiometers. This is to achieve the best field coverage in front of the fume hood for the hood's width (Figure 60).





Figure 60: Adjusting personnel sensor beam width

6.9.3 Adjusting the beam depth

Adjust the sensor by tilting the bottom of the sensor towards or away from the front wall of the fume hood (Figure 61). This is to ensure that the sensors beam is at optimum angle from the fume hood, to achieve the best field of coverage for the height of the fume hood.

The body of the Personnel Sensor can be tilted from 0° to 5° in three increments to achieve this.





The body of the sensor can be adjusted from 0° to 5° in 3 steps

Figure 61: Adjusting the personnel sensor beam angle away from the fume hood



6.9.4 Personnel sensor dip switch settings

The following Personnel Sensor functions and parameters are controlled by Dip switches, located within the Sash Light Curtain Control Box (Figure 62) (See section 7.4.7).



Figure 62: Personnel Sensor Dip Switch Settings

Switches	Setting	Description
1&2	Presence timer	Select the time delay before the Personnel Sensor
		object is detected.
		2, 15, 60 or 180 second delays are selected by setting associated switches 1 and 2 to
		combinations of ON/OFF (Figure 62).
		detected during the time period.
3 & 4	Pattern depth	Set the distance of the detection field away from the sensor.



Switches	Setting	Description
5&6	Frequency	Select one of four different sensor frequencies (H;
		MH; M and L) if two or more sensor beam paths
		overlap.
7	Monitor mode	Select the Monitor Mode. Set the switch to
		'Normal'.
		Note: The 'Snow' setting is only applicable to
		outdoor applications and therefore is not
		used.
8	Self-Diagnostics	Setting switch 8 to 'ON' will start a self-diagnostic
		test when the sensor is switched on. If the test
		detects a fault the LED will continually flash red
		and green.



6.10 Auto Sash System Control Box - general wiring diagram





6.11 Start up

Make sure the Auto Sash Controller is installed before attempting to calibrate the controller.

When the unit is powered up, the following events occur:

The alarm performs a self-test of its functions, LEDs and audible alarm, which takes approximately 3 seconds. All inputs and outputs are deactivated during the self-test.

At the end of the delay, the unit will do one of two things:

- When the controller has been calibrated, it enters normal operating mode and displays the current status or alarm condition.
- When the controller has not been calibrated, the monitor displays the messages:
- Sash drive inhibited, if the tilt switch input is open
- Auto Sash Not Configured, if the tilt switch is closed



7. Calibration

7.1 AFA4000/1 Airflow Monitor

The airflow monitor must be calibrated when it is first installed, or when required during use.

1. From the *Run Screen* press and hold the **Mute** button for 5 seconds until the *Main Menu* is displayed.

Note: When you go from the main menu to the run screen, a note briefly appears saying 'calibration required'.

- 2. Use the \uparrow / \downarrow buttons to select **Set Up Monitor**, then **Calibration**.
- 3. Enter the password (the factory default password is 0-0-0-0) and press **Mute** to continue.
- With the sash open to the normal operating height measure the face velocity using a calibrated anemometer. Use the ↑ / ↓ buttons to enter the measured face velocity then press **Mute**. The monitor samples the airflow for 5 seconds.
- If the sample is accepted, lower the sash by half and measure the face velocity using a calibrated instrument. Use the ↑ / ↓ buttons to enter the measured face velocity and press Mute. The monitor samples the airflow for 5 seconds.
- 6. If the calibration is successful, the monitor returns to the *Main Menu*. Select **Run** to go to normal operating mode and check the velocity reading is accurate and stable.
- 7. If the calibration is stable and accurate, press and hold the **Mute** button for 5 seconds until the *Main Menu* is displayed.
- 8. Select **Run** to go to normal operating mode.

7.1.1 Possible messages

Message	Reason	Actions
Deviations too high	Airflow sample is unstable.	Follow the instructions to
		repeat the sample or quit the
		calibration.



Message	Reason	Actions
Increase higher airflow	Second sample value is too	Close the sash slightly and
sample	close to the first sample	repeat the higher sample. The
	value.	minimum difference between
		the samples that the controller
		will accept is 0.3m/sec
		(60fpm).
Sensor diff too low	The monitor does not detect	Check that the sensor hose is
	any difference in the sensor	connected and repeat the
	output between the 2	calibration.
	airflow samples.	

7.1.2 Calibration notes

- Make sure the sensor hose is connected correctly at the side wall and rear of the sensor.
- Make sure the extraction fan is running and the fume cupboard is balanced before calibrating the monitor.
- Take extra time, at least 15 to 20 seconds, to wait for the airflow to settle before capturing the airflow samples. This will minimize the chance of a calibration error due to turbulence or fluctuations.
- Avoid movement in front of the fume cupboard whilst calibrating the monitor.
- The Low and High air samples must be at least 0.3 m/sec (60 fpm) apart to calibrate the monitor. This is to avoid inaccuracy in the calibration due to insufficient difference between the samples. The minimum difference can be changed in the Low High diff parameter in the Cal Config menu.
- Do not use fully open and fully closed sash positions for the calibration points. The recommended positions are normal operating height (for example, 500 mm 20") for the first sample and approximately half the sash opening (for example, 250 mm 10") for the second sample.



7.2 Auto Sash Controller 1, 2 or 3 position.

This section describes the calibration of the Auto Sash Controller from the AFA4000/1/AS.

Note: Refer to section 7.4 to calibrate the Auto Sash Controller from the Auto Sash keypad

- 1. From the *Run Screen* press and hold the **Mute** button for 5 seconds until the *Main Menu* is displayed.
 - *Note:* When you go from the main menu to the run screen, a note briefly appears saying 'calibration required'.
- 2. Use the ↑ / ↓ buttons to select **Set Up Auto Sash**. The display shows the message *TEL SASH CLOSER*.
- 3. Press the **Mute** button to display the current Hardware and Software version, for example, *1. HW2.0 FW1.1*.
- 4. Press the \downarrow button to scroll down and select **Setup Menu** and press **Mute**.
- 5. Enter the password (the factory default password is 1-0-0-1) and press **Mute** to continue.
- 6. In the Setup menu the controller displays System Profile.
- 7. Use the \downarrow button to scroll through the menu, select **Sash 1 Settings** and press **Mute**.
- 8. In the *S1 Settings menu*, the display will show *1*. *S1 Enabled* and on-screen instructions.
- 9. Set the sash to the centre opening, for example, 250 mm.
- 10. Press the ↓ button to find which arrow represents the sash closing and press **Mute**. This step shows the controller which direction the motor needs to drive to close the sash.
- 11. Close the sash and press **Mute**. This step sets the sash position sensor output, 0 V position.
- 12. Fully open the sash and press **Mute**. This step sets the sash position sensor output, 10 V position.
- 13. Set the sash to the lower position, for example, close and press Mute.
- 14. Set the positions as required:



For 1 position operation:	When only the lower position is required (for example, close only), press \uparrow / \downarrow together to quit.
For 2 position operation:	Set the sash to the normal working height (for example, 500 mm) and press Mute .
	Press \uparrow / \downarrow together to quit, when only 2 positions (lower and middle) are required.
For 3 position operation:	Set the sash to the full opening height (for example, 750 mm) and press Mute .
	The lower, middle and top positions are now calibrated. Press Mute to quit calibration mode.

15. Use the ↓ button and select **Back to Set up menu**, then press **Mute**.
16. Use the ↓ button and select **Exit and Save Changes**, then press **Mute**.
17. The controller now enters *Run* mode.

7.2.1 Calibration notes

The sash may slightly over-run past the calibration points, when the sash motor drive is set to a fast speed. When calibrating the sash positions, allow a margin for the sash to over-travel past the calibration height.

For example, before calibrating the lower position, fully close the sash and then open it by 5 mm, or before calibrating the middle position, open the sash to the normal height and then lower it by 5 mm.



7.3 Sash lock function

This section describes the calibration of the Auto Sash Controller from the AFA4000/1/AS.

Note: Refer to section 7.4 to calibrate the Auto Sash Controller from the Auto Sash keypad.

- 1. From the *Run Screen* press and hold the **Mute** button for 5 seconds until the *Main Menu* is displayed.
 - Note: When you go from the main menu to the run screen, a note briefly appears saying 'calibration required'.
- 2. Use the ↑ / ↓ buttons to select **Set Up Auto Sash**. The display shows the message *TEL SASH CLOSER*.
- 3. Press the **Mute** button to display the current Hardware and Software version, for example, *1. HW2.0 FW1.1*.
- 4. Press the \downarrow button to scroll down and select **Setup Menu** and press **Mute**.
- 5. Enter the password (the factory default password is 1-0-0-1) and press **Mute**.
- 6. In the Setup menu the controller will display the message System Profile.
- Use the ↓ button to scroll through the menu and select Sash 1 Settings, then press Mute.
- 8. In the S1 Settings menu the display will show 1. S1 Enabled.
- 9. Use the ↓ button to scroll through the menu and select **11. S1 Auto Lock**. Press **Mute**.
- 10. Set to **Enabled** and press **Mute**.
- 11. Use the ↓ button to scroll through the menu and select **11b. S1 Lock Alarm**. Press **Mute**.
- 12. Use the \uparrow / \downarrow buttons to set the required alarm delay time. Press **Mute**.
- 13. Use the ↓ button to scroll through the menu and select **11c. S1 Lock Pos Calibration**. Press **Mute**.
- 14. The display will show on-screen instructions.
- 15. Open the sash to the Lock position and press Mute.

When the selected position is too low, for example, it is lower than the calibrated Lower, Middle or Top positions, the message *Bad position - try again* displays.



If the chosen position is OK, the lock position will be set.
16. Use the ↓ button and select **Back to Set up menu**. Press **Mute**.
17. Use the ↓ button and select **Exit and Save Changes**. Press **Mute**.
The controller now enters Run mode.

7.4 Auto Sash Controller – stand-alone

This section refers to when the Auto Sash Controller is used without the AF4000/1/AS Airflow Monitor.

Before starting up the Auto Sash Controller, ensure that all Auto Sash Control System components have been correctly installed and connected.

- Note: Check that the fume hood sash and associated motor drives, pulleys, operating cables, racks and chains move freely over their entire operating ranges.
- Note: Check that all cables are secured away from moving components and are not overstressed or damaged.
- Note: Check the security of all electrical connections.



7.4.1 Starting up the Auto Sash Control Unit

Press the **Power Up/Menu Entry** button to start the Auto Sash Controller (Figure 63 and Figure 64).





Figure 63: UK / EU keypad



1. Switch on the Auto Sash Control Unit.

When powering up, the Auto Sash Control Unit performs a self-test of its functions, LEDs and the audible alarm. This self-test takes approximately 3 seconds. During the self-test period, all inputs and outputs are de-activated.

- At the end of the self-test, the Auto Sash Control Unit will do one of two things: If the Auto Sash Control Unit has previously been calibrated:
 - The Auto Sash Controller enters the Normal Operating Mode and displays its current status or alarm condition.

If the Auto Sash Control Unit has not been calibrated:

- When the Tilt Switch input is open, the display shows 'Sash Drive Inhibited'.
- When the Tilt Switch input is closed, the display shows 'Auto Sash Not Configured'.

7.4.2 Calibrating the Auto Sash Control Unit for Tiptronic operation using the Auto Sash keypad

The Auto Sash Control Unit must have each of its required stationary positions defined for Tiptronic functionality:



1. Press and hold the **Enter** button for approximately 5 seconds or until the main menu appears.

The LCD display will show the current hardware and software versions. For example, *1*. *HW2.0 FW1.1*.

- 2. Press ↓ and select *2*. *Setup*.
- 3. Press Enter.
- 4. Enter the Password using the ↑ arrow and **Enter** button, the factory default is 100
 1. In the Set-Up menu, the controller will display *Keypad Tones*.
- 5. Press \downarrow and select Sash 1 Settings.
- 6. Press Enter.
 - In the S1 (Sash 1) Settings menu, the display will show 1. S1 Enabled.
- 7. Press ↓ and select 8. S1 Calibration.
- 8. Press Enter.

The display will show on screen instructions. For example:

"Manually move sash to centre and then press the Up/Down keys to find sash down direction. Press Cancel to abort Calibration"

- 9. Move the sash to the middle of the sash opening.
- 10. Press ↑/↓ buttons to determine which arrow activates sash closing.
- 11. Press the \uparrow/\downarrow button which closes the sash, press **Enter**.

This instructs the controller which direction the motor needs to turn to close the sash.

- 12. Move the sash to the lowest position required, press Enter.
- 13. Either:
 - Press Mute, if this is the only pre-set position required, or
 - Set the sash to the normal working height, for example 500 mm.
- 14. Press **Enter**, for two position operation.
- 15. Either:
 - Press **Mute**, if only two pre-set positions ('lowest' and 'normal') are required.
 - Set the sash to the full opening height.
- 16. Press **Enter**, for three position operation.
 - The lowest, normal and fully open positions are now calibrated.
- 17. Press **Enter**, to exit Calibration mode.



- 18. Press ↓ button, select *Back to Set up* menu.
- 19. Press Enter.
- 20. Press ↓ button, select *Exit and Save Changes*.
- 21. Press Enter.

The Controller will now enter Run mode.

Note: When the Auto Sash motor drive is set to a high speed, allow a margin for the sash to over-run when calibrating the sash position. See the instructions above. Allow a 5 mm (0.197") margin at the highest and lowest point.

7.4.3 Calibrating the sash lock function

To define the required Sash Lock position:

- 1. Press and hold the **Enter** button for 5 seconds until the *Main Menu* is displayed.
- 2. The current Hardware and Software versions are displayed, for example *1. HW2.0 FW1.1*
- 3. Press ↓ button, select *2*. *Setup* and press **Enter**.
- 4. Enter the Password using the ↑ arrow and **Enter** button, the factory default is 1 0 0
 1. In the Set-Up menu, the controller will display *Keypad Tones*.
- 5. Press ↓ button, select *Sash 1 Settings* and press **Enter**. The controller will display *1. S1 Enabled*.
- 6. Press ↓ button, select *11*. *S1* Auto Lock and press **Enter**.
- 7. Set to *Enabled* and press **Enter**.
- 8. Press ↓ button, select *11b. S1 Lock Alarm* and press **Enter**.
- 9. Press \uparrow/\downarrow buttons to set the required alarm delay time and press **Enter**.
- 10. Press ↓ button, select *11c*. *S1 Lock Pos Calibration* and press **Enter**.

Instructions will be displayed, for example: Lock the sash then move the sash to the lowest lock position. Enter to accept. Cancel to abort

11. Open the sash to the Lock position and press Enter.

If the position chosen is too low, lower than the calibrated Bottom, Middle or Top positions, *Bad position - try again* will be displayed.

If the chosen position is acceptable, the lock position will be set.

- 12. Press ↓ button, select *Back to Set up menu* and press **Enter**.
- 13. Press ↓ button, select *Exit and Save Changes* and press **Enter**.



The Auto Sash Controller will now go to RUN mode.

7.4.4 Calibrating the safety light curtain

To adjust the range and sensitivity of the Safety Light Curtain:

- 1. Ensure the area between the Safety Light Curtain transmitter and receiver is free from obstructions.
- 2. Ensure the light beam paths are not broken and the Personnel Sensor is disabled so that the sash does not Auto-Close whilst the Safety Light Curtain is being calibrated.
 - Note: If it is not possible to disable the Personnel Sensor, remove the motor / clutch connector from the Auto Sash Control Unit. This activates the Sash Control Alarm after the selected time delay and the reset button must be pressed once the Safety Light Curtain has been calibrated.
- 3. Remove the cover from the Safety Light Curtain Control Box.





Figure 65: Safety Light Curtain Control Box with lid removed

- 4. Power up the Auto Sash Control Unit.
- 5. Check that the Safety Light Curtain Transmitter and Receiver are connected correctly and are operational.

The red Power On LED will now be visible on the receiver (Figure 66).





Figure 66: Red Power On LED

6. Ensure that Switch 1 (sw1), see Figure 54, is set to the correct range:

Fume Hood Size	Sash Beam Range	sw1 Setting
0 to 10' (up to 3000mm)	Short	Off
10' to 16' (3000 to	Long	On
5000mm)		

- 7. Ensure that Switch 2 (sw2) (Figure 65) is set to **Off** (Operation Mode).
- 8. Ensure that Switch 3 (*sw3*) is set to **On** (Normal Operation).
- 9. Set Switch 4 (*sw4*) to **On**. A buzzer will then sound when the beam is broken, this aids the setting up of the beam.

The signal LED indicates beam status:

- Green if the detection area is clear.
- Red if the area is not clear.
- 10. Turn the gain potentiometer anti-clockwise, to the minimum. The transmitter and receiver can no longer sense each other.
- 11. Slowly adjust the gain potentiometer (Figure 65) clockwise (to maximum) until the transmitter and receiver can sense each other, for example, the receiver can detect the beam sent from the transmitter.
- 12. Set *sw3* to **Off** to store the settings.
- 13. Turn the gain potentiometer approximately 5 degrees clockwise to ensure sufficient gain.
- 14. Use a glass object to test whether it breaks the beam. Do this across the entire open face of the fume hood.



If the glass object does not break the beam, adjust the gain potentiometer counterclockwise until inserting the glass object breaks the beam.

15. If required, set *sw4* to **Off** to disable the buzzer.

If the sash light beams intermittently sense the glass object, ensure *sw1* is set to Off (short range) and repeat steps 5 to 14 above.

If the beam is broken when the path is clear and adjusting the Gain Potentiometer does not resolve this situation, either:

Switch *sw2* **On** (Diagnostic mode). After approximately 15 seconds the *RX ERR* and *TX ERR* LEDs (Figure 65) will indicate if there is a faulty beam:

- RXERR Red LED **On** Faulty receiver
- TXERR Red LED **On** Faulty transmitter

Or:

Clean or replace the faulty component and set *sw2* to **Off** (Operation mode).

7.4.5 Tilt switch

No user calibration of the Tilt Switch is possible. When using a Tilt Switch, ensure that the top panel of the fume hood is closed before switching on the Auto Sash Control Unit.

7.4.6 Sash position sensor

No user calibration of the Sash Position Sensor is possible. The sensor provides sash position data to the Auto Sash Controller, relative to its starting position.

7.4.7 Personnel sensor

The sensor is self-calibrating and does not need adjusting.

For optimum performance, ensure the detection field in front of the fume hood is clear from objects and personnel when powering up the Auto Sash Control Unit.

The sensor will be fully operational approximately 10 seconds after the sensor is powered up.

The LED on the sensor will be green if the detection area is clear and red if it is not clear.



To test that the sensor is operational, listen to whether the internal relay clicks when standing in front of the fume hood and when walking away.

7.4.8 Sash low switch

No user calibration of the Sash Low Switch is possible.



8. Configuration

The AFA4000/1 and AFA4000/1/AS Airflow Monitors can be configured to suit the individual application. This allows the fume cupboard manufacturer to stock standard units and configure the monitors.

See the **Operator display panel menu** section (section 3.4) for instructions on how to navigate the menus.

8.1 AFA4000/1 configuration menus

To configure the AFA4000/1 Airflow Monitor, navigate to **Main Menu** > **Set up Monitor** > **Configure** to display the Monitor Set up Menu.

Press the \downarrow button to scroll down the menu list and press **Mute** to select the required option.

Note: The Configure menu is password protected. The default password is 0 0 0 0.



8.1.1 Monitor config menu

Note: A pop-up dialog box will show if a relay is already allocated to another option.

Menu item	Option	Instructions
Cal Config Menu	Cal config menu	See section 8.1.1.1.
Hours Counter	Hours counter menu	See section 8.1.1.2.
Input (1, 2 or 3)	Input activation	Select the activation type:Closed contactOpen contactAnalog
	Input function	Select the function:• Night Setback• Mains Fail• Alarm Disable• Sash Warning• None• High/Low• Temperature• Sash High• Fire Alarm• Emergency• Mute• Ext. Alarm• Fan Stop
Relay Output (1, 2 or 3)	Relay activation	Select the activation type:Closed contactOpen contact
Auto Dim Screen	Auto dim screen	Set the time to auto dim the screen.
Low Air Timer	Low air repeat time	Enable or disable the timer.
Low Air Relay	Low air relay Allow inhibit	 Select the required relay: None Output 1 – Output 3 Enable or disable the inhibit screen



Menu item	Option	Instructions
High Air Relay	High air relay	Select the required relay:
		None
		Output 1 – Output 3
Alarm Disable	Alarm disable relay	Select the required relay:
Relay		None
		• Output 1 – Output 3
Sash High	Repeat timer	Enable or disable the timer.
	Sash high time	If the timer is enabled, set the time.
	Sash high relay	Select the required relay:
		• None
		Output 1 – Output 3
High Low Relay	High/low relay	Select the required relay:
		None
		Output 1 – Output 3
Night Set Back	Night set-back	Select from:
		Maintain Low Air
		Reduce Low Air
	Night set-back alarm	If Reduce Low Air is selected, set the
		low limit for the air flow.
	Night set-back relay	Select the required relay:
		None
		Output 1 – Output 3
Night Set Back	Night set-back mute	Enable or disable the night set-back
Mute		mute.



Menu item	Option	Instructions	
External Alarm	LED on/off screen	Enable or disable the LED.	
	Display on / off	Enable or disable the display.	
	External alarm relay	Select the required relay:	
		None	
		• Output 1 – Output 3	
Fire Alarm	Fire alarm relay	Select the required relay:	
		None	
		• Output 1 – Output 3	
Protocol	Protocol	Select the required protocol:	
		• Modbus • None	
		• TEL • BACNet	
		Note: The TEL protocol is used to	
		connected to TEL Config Manager	
		software and the TEL AFA5000 Room	
		Space Controller, the Modbus Slave ID is	
		used when set to TEL protocol.	
Modbus Settings	MODBUS settings	See section 8.1.1.3.	
	menu		
BACNet settings	BACNet settings menu	See section 8.1.1.4.	
Sensor Error	Buzzer on / off	Enable or disable the buzzer.	
Options	Sensor error relay	Select the required relay:	
		None	
		Output 1 – Output 3	
Sash Warning	Sash warning time	Set the time.	
Timer	Sash warn rpt alarm	Enable or disable the alarm.	



Menu item	Option	Instructions
Sash Warning Timer (cont.)	Sash warn rpt time	If the alarm is enabled, set the repeat time.
Factory Settings	Enter password	Use \uparrow / \downarrow to enter password, then press Mute.
	Restore factory setting	Press Mute to restore the factory settings. Press ↓ to return to the Monitor config menu (section 8.1.1).
Done	Return to Monitor setup menu.	

8.1.1.1 Cal config menu

Note: Use \uparrow / \downarrow to increase or decrease parameter values, then press **Mute** to save the new value.

Menu item	Instructions	
Display Units	Select the required display units:	
	• m/sec	
	• fpm	
Low Air Alarm	Set the low air flow alarm threshold.	
Low Air Cutoff	Enable or disable the low air cut-off.	
	If enabled, set the low air flow threshold.	
Warning Air	Set the air flow warning threshold.	
Warning Air Reset	Set the air flow warning reset level.	
High Air Alarm	Enable or disable the high air alarm.	
	If enabled, set the high air flow threshold.	
Lower Air Fluctuation	Set the lower air fluctuation level (%).	
Higher Air Fluctuation	Set the higher air fluctuation level (%).	



Menu item	Instructions
Low/High Air	Set the low / high air difference value.
Difference	
Warning to Alarm	Set the warning to alarm time.
Time	
Alarm to Warning	Set the alarm to warning time.
Time	
Show Airflow	Select Enable to display the airflow value in the display or
	Disable to display only the status.
Show	Select the required display:
Timeline/bargraph	• timeline
	• bargraph
Show Alarm Limits	Select whether to display the alarm limits on the bargraph, by
	selecting Enable or not, by selecting Disable .
Audible Alarm	Select Enable to sound the audible alarm or Disable not to
	sound it.
Sensor Difference	Set the sensor difference (%).
Display Smoothing	Set the sensor difference (seconds).
Keyboard Click	Enable or disable the keyboard click.
Done	Return to the Monitor config menu (section 8.1.1).


8.1.1.2 Hours counter menu

Menu item	Instructions
Enable Counter	Enable or disable the hours counter.
Max Hours	Set the maximum hours for the hours counter. (0 – 5000 hours).
Show Alarm	Select whether to display the alarm, by selecting Enable or not, by selecting Disable .
Reset Counter	Select Yes to reset the counter.
Done	Return to the Monitor config menu (section 8.1.1).

8.1.1.3 MODBUS settings menu

Menu item	Instructions	
Slave ID	Set the Slave ID.	
Baudrate	Set the Baudrate:	
	• 1200 • 14400	
	• 2400 • 19200	
	• 4800 • 38400	
	• 9600 • 57600	
Parity	Set the parity:	
	None	
	• Odd	
	• Even	
Done	Return to the Monitor config menu (section 8.1.1).	



8.1.1.4 BACNet settings menu

Menu item	Instructions	
Device Instance	Use the \uparrow / \downarrow buttons to set the value for a digit, then press	
	Mute to go to the next digit.	
Station ID	Set the Station ID.	
Baudrate	Set the Baudrate:	
	• 1200 • 14400	
	• 2400 • 19200	
	• 4800 • 38400	
	• 9600 • 57600	
Parity	Set the parity:	
	None	
	• Odd	
	• Even	
Max Masters	Set the maximum number of AFA4000 devices on the	
	network.	
Done	Return to the Monitor config menu (section 8.1.1).	



8.2 AFA4000/1/AS configuration menus

Note: The Auto Sash menus are only available when the Auto Sash is connected.

To configure the AFA4000/1/AS Airflow Monitor, navigate to **Main Menu** > **Set up Auto Sash** > **Setup Menu** to display the Menu options.

Press the \downarrow button to scroll down the menu list and press **Mute** to select the required option.

8.2.1 Auto Sash setup menu

Note: The Setup menu is password protected. The default password is 1 0 0 1.

Note: Select the option **Back to Setup Menu** to return to the next option in the Auto Sash setup menu.

To change options in the Auto Sash setup menu:

- 1. Press **Mute** to enter edit mode. The '>' symbol next to the parameter is underlined.
- 2. Press the \uparrow / \downarrow buttons to scroll through the options.
- 3. Press **Mute** to select the option. The '>' symbol underline disappears.
- 4. Press the \downarrow button to scroll down to the next menu option.

Menu item	Option	Instructions
System Profile		Select the required system profile:
		• Bench type
		• Walk in
Keypad Settings	Audible Alarm	Choose the setting:
	Obstruction	• On
-		• Off
	Audible Alarm Sash	Choose the setting:
	Fault	• On
		• Off
	Audible Alarm Sash	Choose the setting:
	Lock	• On



Menu item	Option	Instructions
		• Off
Sash 1 settings	Enable / disable	Choose the setting to permanently enable or disable the S1 drive via the menu or keypad:
		 On (via menu) Off User (via keypad)
	Auto Close	Enable or disable Auto Close.
	Close Delay	Set the time delay before the sash closes. (0 – 3600 seconds)
	Close Alarm	Set the time before the alarm activates and the sash closes. ($0 - 10$ seconds)
	Auto Open	This displays when the Auto Sash is calibrated.
		Enable or disable Auto Open:
		Enabled
		Disabled
		Auto Close Only
	Open Delay	This displays when Auto Open is enabled.
		Set the time delay before the sash
		opens. <i>(0 – 3600 seconds)</i>

Menu item	Option	Instructions
Sash 1 settings (cont.)	Open Alarm	This displays when Auto Open is enabled.
		Set the time before the alarm activates and the sash opens. ($0 - 10$ seconds)



Menu item	Option	Instructions
	Motor Voltage	Set the motor voltage, using the password-protected Auto Sash engineering menu (section 8.2.2)
	Motor Speed Open	Set the motor drive speed – sash opening. (0 – 100%)
	Motor Speed Close	Set the motor drive speed – sash closing. <i>(0 – 100%)</i>
	Clutch Off Delay	Set a run-on time for the clutch to remain energized once the motor stops driving, to aid braking.
	Tilt Switch	 Set the input activation for the tilt switch: Normally Open (N/O) Contact Normally Closed (N/C) Contact Disabled
	Light Curtain	 Set the input activation for the light curtain: Normally Open (N/O) Contact Normally Closed (N/C) Contact Disabled

Menu item	Option	Instructions
Sash 1 settings	Light Curtain Test	Activate the sensor test, if the Fail-Safe
(cont.)		 Pulse High
		Pulse Low
		• Disabled



Menu item	Option	Instructions
	Auto Clear Obst Alarm	Select whether the system auto resets the Obstruction Alarm, if Obstruction is removed.
	Personnel	 Set the input activation for the personnel sensor: Normally Open (N/O) Contact Normally Closed (N/C) Contact Disabled
	Personnel Power Cycle	Follow the on-screen instructions to manually calibrate the personnel sensor, using the menu.
	Calibration	Follow the on-screen instructions to manually calibrate the sash position sensor and motor direction.
	Close Threshold	Set the height that the Auto Sash will accept as closed if the sash is stopped during travel. <i>(0 – 100mm)</i>
	Tiptronic	Select Enable to open or Disable to close the Tiptronic touch sash.
	Min TipTime	Set the tiptronic touch sensitivity minimum time. (100 – 300 ms)
Sash 1 settings (cont.)	Max TipTime	Set the Tiptronic touch sensitivity maximum time. <i>(500 – 1500 ms)</i>
	Note: TipTime is the tin manual movement movement is detec automatically drive	ne threshold for the Auto Sash to detect t, to allow manual operation. When ted outside of the set times the sash will e to the calibrated position.



Menu item	Option	Instructions
	For example, when the TipTime range is set to 100 ms (min) and 1000 ms (max), and the Auto Sash detects movement for more than 1000 ms, it will go into manual mode to allow the sash to be moved manually.	
	Auto Lock	Enable or disable the Auto Lock function.
	Lock Alarm	This displays when Auto Lock is enabled.
		Set the alarm delay time, the time before the alarm activates when the sash remains locked. <i>(1 to 30 mins)</i>
	Lock Position Calibration	Follow the on-screen instructions to calibrate the lock position.
	Sensitivity	Set the sensitivity from 0 – 6, where 6 is the least sensitive. This allows the sash travel to stutter for 1 second before the Sash Fault alarm is triggered.
BMS Input Settings	Fire Alarm	 Set the Fire Alarm BMS input: Disabled Input 1 – 4 open Input 1 – 4 closed
BMS Input Settings (cont.)	Open Sash	 Set the Open Sash BMS input: Disabled Input 1 – 4 open Input 1 – 4 closed
	Close Sash	 Set the Close Sash BMS input: Disabled Input 1 – 4 open



Menu item	Option	Instructions
		• Input 1 – 4 closed
	EV Open Sash	Set the EV Open Sash BMS input:
		• Disabled
		 Input 1 – 4 open
		• Input 1 – 4 closed
	EV Close Sash	Set the EV Close Sash BMS input:
		Disabled
		• Input 1 – 4 open
		• Input 1 – 4 closed
	Foot SW Open	Set the Foot SW Open BMS input:
		Disabled
		• Input 1 – 4 open
		• Input 1 – 4 closed
	Foot SW Close	Set the Foot SW Close BMS input:
		Disabled
		 Input 1 – 4 open
		• Input 1 – 4 closed

Menu item	Option	Instructions
BMS Output	Alarm Sounder	Enable / disable the alarm sounder.
Settings	Analog Volts	 Select the required analogue voltage output: 0 - 10V 1 - 10V 0 - 5V



Menu item	Option	Instructions
		• 1 – 5V
	Analog Current	Select the required analogue current
		output:
		• 0 – 20mA
		• 4 – 20mA
	Relays 1 to 4:	Select the required settings for the
	RLY1, RLY2, RLY3, RLY4	relay:
		Note: Each of the four relays have the same setting options.
		Always Open
		Always Closed
		Open on Sash Alarm
		Close on Sash Alarm
		Open on Obstruction
		Close on Obstruction
		Open on Personnel
		Close on Personnel
		Open on Sash Open
		Close on Sash Open
		Open on Sash Locked
		Close on Sash Locked
Exit and Abandon		Return to Main menu without saving
Changes		any changes.
Exit and Save		Return to Main menu saving all changes
Changes		made.

8.2.2 Auto Sash engineering menu

Note: The Engineering menu is password protected. The default password is 1 2 1 2.



The Engineering menu is used by TEL Ltd engineers to test the Auto Sash Controller inputs and outputs.

To change options in the Engineering menu:

- 1 Press **Mute** to select the Engineering menu item.
- 2 The '>' symbol next to the first option is underlined.
- Press the \uparrow / \downarrow buttons to scroll through the editable parameters for that option. The current editable parameter is underlined, for example, > *TLP POS F R* shows that the POS parameter will be selected when **Mute** is pressed.
- 4 Press **Mute** to select the parameter. Adjust the parameter as described in the table below.
- 5 Repeat this process until all the required parameters have been adjusted. Press the ↑
 /↓ buttons until the '>' symbol is underlined again.
- 6 Press **Mute** to scroll down to the next option.
- Note: To exit the current parameter list at any time, press the \uparrow / \downarrow buttons together to return to the Engineering menu.
- *Note:* Select the option **Back to Engineering Menu** to return to the next option in the Auto Sash engineering menu.



Menu item	Option	Instruc	ctions
Input / Output	> TLP POS F R	Sash 1	position.
Diagnostics	S1 X-X 0.0	An acti	ve output is shown with an X
		beneat	h it. In the example shown here,
		the tilt	switch (T) and personnel sensor
		(P) are	active and the light curtain (L) is
		inactive	e as shown by the X-X on the
		second	l row.
		Parame	eters are:
		Т	Tilt switch
		L	Light curtain
		Р	Personnel sensor
		POS	Sash position. When in use,
			the value goes from 0 (sash
			closed) to 100% (sash fully
			open) to show the position of
			the sash.
		F	When Mute is pressed, an X
			appears in the bottom row to
			indicate that the motor is
			driving forward.
		R	When Mute is pressed, an X
			appears in the bottom row to
			indicate that the motor is
			driving in reverse.



Menu item	Option	Instruct	ions
Input / Output	> TLP POS F R	Sash 2 p	osition.
Diagnostics (cont.)	S2 FAULT	This is ac Dual Aut	ctive for the second sash, if the construction controller is in use.
		The para Sash 1 p second s	The parameters are the same as for Sash 1 position, but they refer to the second sash.
	<u>></u> 11234 R1234 A	Inputs ar	nd outputs.
	BMS	11234	Inputs 1 - 4.
			An X displays under an input (I1234) if that input is active.
		R1234	Relay outputs 1 – 4.
			Press Mute to activate the selected relay. An X displays under the relevant relay.
		А	Alarm output.
			Press Mute to put 24 V onto this output. This is useful to power an external light or sounder when the alarm is triggered e.g. for a sash fault.

Menu item	Option	Instructions
Input / Output	<u>></u> 0-10V 0-20mA	Output test settings.
Diagnostics (cont.)	BMS 10V 20mA	Select a voltage or current for the outputs for testing. Editable parameters are:



Menu item	Option	Instructions
		 0-10V. Press Mute to scroll through the options: 0V 6V 2V 8V 4V 10V 0-20mA. Press Mute to scroll through the options: 0mA 12mA 4mA 16mA 8mA 20mA
Factory Tests	Test Main Board 1187A (harness)	Follow the on-screen instructions to carry out the test.
	Test PIM Module 1187B (harness)	Follow the on-screen instructions to carry out the test.
	Test Keypad 1186	Follow the on-screen instructions to carry out the test.
Technical Information	S1 Motor Volts	Current setting of the Sash 1 motor voltage.
	S1 Motor Dir	Current setting of the Sash 1 motor direction.
	S1 PIN Type	Current setting of the Sash 1 PIN type.
Technical Information	S1 String Type	Current setting of the Sash 1 String type.
(cont.)	S1 String Dir	Current setting of the Sash 1 String direction.
	S1 Top Position	Current setting of the Sash 1 top position.



Menu item	Option	Instructions
	S1 Mid Position	Current setting of the Sash 1 middle position.
	S1 Bot Position	Current setting of the Sash 1 lower position.
Change Password	Setup Menu Password	The current password is displayed.
for Setup Menu		 Press Mute to select Edit mode (the '>' symbol will be underlined). Use ↑ / ↓ to increase or decrease the password as required. Press Mute. Press the ↓ buttons to display the Exit options.
	Exit and Save Changes	Press Mute to save the password changes and to exit back to the Main Menu.
	Cancel Back to Engineering Menu	Press Mute to exit <u>without</u> saving the password changes.



8.3 Auto Sash Controller system menus

This section refers to when the Auto Sash Controller is used without the AF4000/1/AS Airflow Monitor.

The *System Menus* allow the user to define parameters affecting the operation of the Auto Sash Controller and associated systems.

The overall structure of the System Menus and routes to access individual menu items are illustrated in the flow chart on the next page:







8.3.1 Accessing System Menus

To access the *System Menus*, press and hold the **Enter** button for approximately 5 seconds or until the *Main/Setup menu* is displayed.

- 1. Navigate the *Main/Setup menu* using the ↑/↓ buttons, select the required menu and press **Enter**.
- 2. Navigate the chosen menu using \uparrow/\downarrow buttons.
- 3. Select from the following *System Menus*:
 - Keypad Tones
 - Sash 1 Settings
 - BMS Input Settings
 - BMS Output Settings
- 4. Select menu entry and press Enter.
- 5. Select a menu entry value / parameter using ↑/↓ buttons to display the required value/parameter, press **Enter**.
- 6. Press **Cancel** to exit the menu entry and return to the menu.
- 7. To return to the *Main / Setup menu* use ↑/↓ buttons and select *Back to Setup Menu*, press **Enter**.
- 8. Using \uparrow/\downarrow buttons select one of:
 - Exit and Abandon Changes
 - Exit and Save Changes



8.3.2 Navigating the system menus

8.3.2.1 Keypad tones

	Menu item	Option	Instructions
	Keypad tones		Enable or disable the keypad
			sounding when a key is pressed.
8.3.2.2	Sash 1 settings m	enu	
	Menu item	Option	Instructions
	Sash 1 settings	S1 Enabled	Choose the setting to permanently enable/disable the Auto Sash Controller motor drive:
			No to disable the drive.Yes to enable the drive.
		S1 Close Delay	Set the time delay before the sash closes. (0 – 3600 seconds)
		S1 Close Alarm	Set the time before the alarm activates before the sash closes. $(0 - 10)$ seconds)
		S1 Auto Open	Enable or disable Auto Open:EnabledDisabledAuto Close Only
		S1 Open Delay	Set the time delay before the sash opens. (0 – 3600 seconds)
		S1 Open Alarm	Set the time before the alarm activates before the sash opens. $(0 - 10$ seconds)



Menu item	Option	Instructions
Sash 1 settings	S1 Motor Speed	Set the motor drive speed.
(cont.)		(0 – 100%)
	S1 Tilt Switch	Set the input activation for the tilt switch:
		 Normally Open (N/O) Contact Normally Closed (N/C) Contact Disabled
	S1 Light Curtain	Set the input activation for the light curtain:
		 Normally Open (N/O) Contact Normally Closed (N/C) Contact Disabled
	S1 Personnel (Sensor)	Set the input activation for the personnel sensor:
		 Normally Open (N/O) Contact Normally Closed (N/C) Contact Disabled
	S1 Calibration	Calibrates sash position sensor and motor direction. See section 7.4.2.
-	S1 Tiptronic	Enable/disable the Tiptronic feature.

Menu item	Option	Instructions
Sash 1 settings	S1 Max Tiptime	Sets Tiptronic touch sensitivity.
(cont.)		(0 to 1500ms – 0 to 1.5 seconds)



Menu item	Option	Instructions
		Note: This is the minimum time the sash must travel to be operated manually. Manual movement for less than the specified time will cause the sash to Auto-Drive to the calibrated position.
	S1 Auto Lock	Enables / disables the Auto-Lock feature. See section 7.4.2.
	Lock Alarm	Sets the alarm delay time. This is the time before alarm activates if sash remains locked. <i>(1 to 30 minutes)</i>
	Lock Pos Calibration	Calibrates the Lock position. See section 7.4.3.

8.3.2.3 BMS input settings

 Bi is appar setting	5	
Menu item	Option	Instructions
BMS Input Settings	Fire Alarm	Set the Fire Alarm BMS input:
		Disabled
		Input 1 Open
		Input 1 Closed
	Open Sash	Set the Open Sash BMS input:
		• Disabled
		Input 1 Open
		Input 1 Closed
	Close Sash	Set the Close Sash BMS input:
		• Disabled
		Input 1 Open
		Input 1 Closed
	EV Open Sash	Set the EV Open Sash BMS input:



Menu item	Option	Instructions
		Disabled
		Input 1 Open
		Input 1 Closed
	EV Close Sash	Set the EV Close Sash BMS input:
		Disabled
		Input 1 Open
		Input 1 Closed
BMS Input Settings	Foot SW Open	Set the Foot SW Open BMS input:
(cont.)		Disabled
		Input 1 Open
		Input 1 Closed
	Foot SW Closed	Set the Foot SW Close BMS input:
		Disabled
		Input 1 Open
		Input 1 Closed



8.3.2.4 BMS output settings

Menu item	Option	Instructions
BMS Output Settings	Alarm Sounder	Enable / disable the remote alarm sounder.
	Analog Volts	 Select the required analogue output voltage for sash position indication: 0 - 10V 1 - 10V 0 - 5V 1 - 5V
	Analog Current	 Select the required analogue output current for sash position indication: 0 - 20mA 4 - 20mA
BMS Output Settings (cont.)	Relays 1 – 4 (RLY1, RLY2, RLY3, RLY4)	 Select the required settings for each of the four relays: Always Open Always Closed Open on Sash Alarm Close on Sash Alarm Open on Obstruction Detected Close on Obstruction Detected Close on User Detected Close on User Detected Open on Sash Open Close on Sash Locked Close on Sash Locked



9. Auxiliary features and connections

9.1 Optional input function - temperature sensor

The AFA4000/1 can be fitted with a temperature sensor. The sensor displays the fume cupboard temperature and can produces high and low temperature alarms. The temperature display can be hidden or shown with the airflow velocity display.

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



Figure 67: Typical connection diagram

Setting up the temperature input:



- 1. From the *Requires set up* screen, press **Mute**, or from the *Run Screen* press and hold the **Mute** button for 5 seconds until the *Main Menu* is displayed.
- 2. Use the \uparrow / \downarrow buttons to select **Set Up Monitor > Configure**.
- 3. Enter the password (the factory default password is 0-0-0-0) and press **Mute** to continue.
- 4. Use the \uparrow / \downarrow buttons to select **Input 3 > Analog > Temperature**.
- 5. Use the \uparrow / \downarrow buttons to select the **Temperature** menu.

	Parameter	Description	Range
А	Temperature Units	Display units	°C or °F
В	Low Temperature Alarm	Sets the Low Temperature Alarm point	0.0 to High Alarm value
С	High Temperature Alarm	Sets the High Temperature Alarm point	100.0 to Low Alarm value
D	Show Temperature	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.

- Use the ↑ / ↓ buttons to select **Temperature Units**, use the ↑ / ↓ buttons to select **Centigrade / Fahrenheit**.
- Use the ↑ / ↓ buttons to select Low Temperature Alarm, use the ↑ / ↓ buttons to set the alarm point.
- Use the ↑ / ↓ buttons to select High Temperature Alarm, use the ↑ / ↓ buttons to set alarm point.
- Use the ↑ / ↓ buttons to select Show Temperature, use the ↑ / ↓ buttons to select Enabled or Not Enabled



- 10. Use the \uparrow / \downarrow buttons to select **Offset**, use the \uparrow / \downarrow buttons to set the offset, then select **Done**.
- 11. In the **Monitor Config Menu** use the \uparrow / \downarrow buttons to select **Low Temperature Relay**, use the \uparrow / \downarrow buttons to set the relay output.
- 12. In the **Monitor Config Menu** use the \uparrow / \downarrow buttons to select **High Temperature Relay**, use the \uparrow / \downarrow buttons to set the relay output, select **Done > Run**.

9.1.1 Testing

Once the temperature sensor function has been configured the temperature will display in the diagnostics menu I/O Status.

The sensor data screen is described in section 13.2.

9.2 Optional input function – close sash alarm

A Close Sash alarm informs the user that the fume cupboard sash has been left open. The alarm can be set with a time delay before activation, this allow the user to briefly leave the fume cupboard sash open. The alarm can be set to repeat if the sash is left open for prolonged periods.

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





Figure 68: 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	Notes
		connections	
A	Switch closes when sash is	C & NO	Refer to the micro-switch for
	open		switch connection details.
В	Switch closes when sash is closed	C & NC	



To Setup the Close Sash Alarm with a sash micro-switch:

- 1. From the *Requires set up* screen, press **Mute**, or from the *Run Screen* press and hold the **Mute** button for 5 seconds until the *Main Menu* is displayed.
- 2. Use the \uparrow / \downarrow buttons to select **Set Up Monitor > Configure**.
- 3. Enter the password (the factory default password is 0-0-0-0) and press **Mute** to continue.
- 4. Use the \uparrow / \downarrow buttons to select Input 3 > Closed Contact > Sash Warning.
- Use the ↑ / ↓ buttons to select Sash Warning Time, then use the ↑ / ↓ buttons to set Sash Warning Time.
- 6. Use the ↑ / ↓ buttons to set the Sash Warn Rpt Time to Enabled / Disabled, if set to Enabled use the ↑ / ↓ buttons to set the Sash Warn Rpt Time, then Done.
 For example:

Sash closed switch height set to 100 mm, sash warning delay set to 1 minute, sash warning repeat timer set to 5 minutes, if the sash is > 100 mm 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 \leq 100 mm.



10. RS485 communications output

10.1 Overview and connections

The AFA4000 series has onboard RS485 comms with 3 protocols:

Protocol	Description	
TEL	Protocol for connections 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)	

For further technical, compliance and register information, see separate comms registers:

- AFA4000/1 Modbus registers
- AFA4000/1 BACNet registers





Figure 69 Typical connection diagram



10.2 Configuration settings

Note: When you change protocols, power cycle the AFA4000 to make sure that any changes you make take effect.

The TEL protocol has fixed parameters so cannot be adjusted in the field, select the TEL protocol.

- 1. From the *Requires set up* screen, press **Mute**, or from the *Run Screen* press and hold the **Mute** button for 5 seconds until the *Main Menu* is displayed.
- 2. Use the \uparrow / \downarrow buttons to select **Set Up Monitor > Configure**.
- 3. Enter the password (the factory default password is 0-0-0-0) and press **Mute** to continue.
- 4. Use the \uparrow / \downarrow buttons to select **Protocol**, then press **Mute**.
- 5. Use the \uparrow / \downarrow buttons to select **TEL** and press **Mute**.
- 6. Use the \uparrow / \downarrow buttons to select **Done** and press **Mute**.

To setup the AFA4000's MODBUS settings:

- 1. From the *Requires set up* screen, press **Mute**, or from the *Run Screen* press and hold the **Mute** button for 5 seconds until the *Main Menu* is displayed.
- 2. Use the \uparrow / \downarrow buttons to select **Set Up Monitor > Configure**.
- 3. Enter the password (the factory default password is 0-0-0-0) and press **Mute** to continue.
- 4. Use the \uparrow / \downarrow buttons to select **Protocol**, then press **Mute**.
- 5. Use the \uparrow / \downarrow buttons to select **Modbus**, then press **Mute**.
- 6. Use the \uparrow / \downarrow buttons to select **Modbus Settings** and press **Mute.**

	Parameter	Description	Range	Default
А	Slave ID	Set the slave ID	1-255	1
В	Baud rate	Set the network Baud	• 1200 • 9600 • 38400	9600
		Rate	• 2400 • 14400 • 57600	
			• 4800 • 19200	
С	Parity	Set the required parity	Non/ Even/ Odd	None

7. Use the \uparrow / \downarrow buttons to select **Slave ID**, then press **Mute**.



- 8. Enter the required ID and press **Mute**.
- 9. Use the \uparrow / \downarrow buttons to select **Baud rate**, then press **Mute.**
- 10. Enter the required rate and press **Mute**.
- 11. Use the \uparrow / \downarrow buttons to select **Parity**, then press **Mute.**
- 12. Enter the required rate and press **Mute**.
- 13. Use the \uparrow / \downarrow buttons to select **Done**, then press **Mute.**

To setup the AFA4000's BACNet settings:

- 1. From the *Requires set up* screen, press **Mute**, or from the *Run Screen* press and hold the **Mute** button for 5 seconds until the *Main Menu* is displayed.
- 2. Use the \uparrow / \downarrow buttons to select **Set Up Monitor > Configure**.
- 3. Enter the password (the factory default password is 0-0-0-0) and press **Mute** to continue.
- 4. Use the \uparrow / \downarrow buttons to select **Protocol**, then press **Mute**.
- 5. Use the \uparrow / \downarrow buttons to select **BACnet**, then press **Mute**.
- 6. Use the \uparrow / \downarrow buttons to select **BACNet Settings** and press **Mute.**

	Parameter	Description	Range	Default
Α	Device	Set the Slave ID for	0000000 to 4194303	0000000
	Instance	the unit		
В	Station ID	Set the network ID	0-127	1
С	Baud rate	Set the required Baud	• 1200 • 9600 • 38400	38400
		Rate	• 2400 • 14400 • 57600	
			• 4800 • 19200	
D	Parity	Set the required	Non/ Even/ Odd	None
		Parity		
Е	Max Masters	Set the max masters	0-127	1
		(max devices on the		
		network)		

- Use the ↑ / ↓ buttons to select **Device Instance**, then press **Mute**. Enter the required instance and press **Mute**.
- 8. Use the ↑ / ↓ buttons to select **Station ID**, then press **Mute.** Enter the required ID and press **Mute**.



- Use the ↑ / ↓ buttons to select **Baudrate**, then press **Mute**. Enter the required rate and press **Mute**.
- 10. Use the ↑ / ↓ buttons to select **Parity** then press **Mute.** Enter the required rate and press **Mute**.
- 11. Use the \uparrow / \downarrow buttons to select **Max Masters**, then press **Mute.** Enter the required rate and press **Mute**.

10.3 Config Manager

The TEL software package, Config Manager is used for uploading and downloading parameter configuration files to the AFA4000. The Config Manager software is Windows based and requires a RS232/485 converter and TEL comms adaptor to communicate with the RS485 comms port on the AFA4000.

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

Most 3rd party RS232/485 converters will work with the AFA4000, the recommended converter has the part number: - EasySYNC ES-U-2101-M.

The part number is also available to buy directly from TEL.

Recommended minimum PC requirements: -

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

Config Manager uses the TEL protocol on the AFA4000.

For further information, see the Config Manager manual.





Figure 70: Connection diagram with RS232/485 converter



11. Operation: Airflow Monitor

11.1 Run screen



Figure 71: Operator display panel showing the Run screen

The Run screen displays when the AFA4000/1 is switched on and shows the real-time status of the system.

The colour of the LED halo, text and status message is important:

Colour	ltem	Meaning
GREEN	LED halo, text and status message	Airflow velocity is safe
AMBER	LED halo and text	Airflow velocity is marginal
RED	LED halo, text status message	Airflow velocity is low



12. Operation: Auto Sash Controller

12.1 Control philosophy

When all components are installed, setup and calibrated correctly, the Auto Sash Controller closes the sash after a pre-set delay, provided that the area in front of the fume hood is clear.

The following additional protocols also apply:

- When the user returns to the fume hood during the delay period, the control timer will stop and reset once the user leaves the fume hood again.
- When the user returns to a fume hood that is closing, the drive will stop when it senses the user.
- When an obstruction is detected under the sash, the Auto Sash Controller will not open or close the sash and will give a visual alarm to indicate a fault condition.
- When an obstruction is detected whilst the sash is closing, the sash drive will stop and give a visual indication to demonstrate a fault condition. To reset the fault alarm, press the reset button.
- When the sash starts to close a timer is initiated. When the sash does not close within the specified time, the sash drive will stop and will give a visual alarm to indicate a fault condition.
- When a user is present in front of the fume hood, the sash can be operated by hand.

12.2 Modes of operation

The Auto Sash Controller has the following modes of operation:

- User Present
- User Not Detected
- Auto-Open (User Configurable)
- Building Management System (BMS) Inputs
- Sash Lock



12.2.1 User present

When the user is detected the sash can be moved in the following ways:

Manually	When the Tiptronic feature is enabled the sash can be manually moved, when it is kept moving for more than 1 second.
	Note: This is the minimum time for which the sash must travel to be operated manually. Movement for less than the specified time will lead to the sash auto- driving to the appropriate calibrated position.
Tiptronic	When the sash is manually moved for less than 1 second the sash will auto-drive to its calibrated position.
\uparrow / \downarrow pushbuttons	When pressed, the sash will auto drive to its calibrated position.
Footswitch (open and close options) (optional)	When operated, the sash will auto drive to its calibrated position.

12.2.2 User not detected

When the user is not detected, the sash will auto close to its calibrated position following a pre-set delay time unless:

- The sash beam is broken object detected in the sash opening.
- The controller does not detect sash movement when the motor is driving.

12.2.3 Auto-open

Auto-Open is a user configurable process. When enabled, the sash automatically opens when the user returns following a pre-set delay.

- If the sash is auto-closed, the sash will automatically open back to the same position the sash was in before it automatically closed.
- If the sash is closed by any other method, for example manually, tiptronically, pushbutton and BMS, the sash will open automatically and return to its calibrated position.


The sash will not open automatically if:

- The sash beam is broken object detected in the sash opening.
- The controller does not detect sash movement when the motor is driving.

12.2.3.1 AFA4000/1/AS only

When the Auto open feature is enabled in the menu and is switched on from the keypad, * (asterix) is displayed in the left-hand corner of the Status Window, for example * *User present*.

To enable Auto open, press and hold **Mute**. Then press and hold \uparrow for 1 second or until the * symbol displays.

To disable Auto open, press and hold **Mute.** Then press and hold ↑ for 1 second or until the * symbol disappears.

12.2.4 Building Management System (BMS) inputs

The sash can be set to operate with the following BMS inputs:

Input	Descrription
Open/Close	Single start or end of day operation from BMS input. The sash will only drive when the user is not present and the sash beam is clear.
EV (Emergency)	Note: EV audible alarm tone will sound when the EV input is
Open/Close	active.
	The sash will only drive if the user is not present and the sash beam is clear. In EV mode the sash can be manually moved when the user is detected. The sash will then auto drive closed/open again, when the EV input is still active and when the user is not detected.
Fire Alarm Close	Note: An audible alarm tone will sound whilst the fire alarm input is active.
	The sash will only drive when the user is not present and the
	sash beam is clear. In Fire Alarm mode, the sash can be
	manually moved if the user is detected. The sash will then



Input	Descrription
	auto drive closed / open again, when the EV input is still
	active and when the user is not detected.

12.2.5 Sash lock

The sash can be set to *Lock, Auto Sash* or *Drive Inhibited,* when the sash is set to a calibrated position (for example fully open). An audible and visual alarm will activate following a pre-set alarm delay period, to remind the user to lower the sash.

This function is used when the sash needs to remain in the open position for a prolonged time, to allow loading or setting up of equipment inside the fume cupboard.



12.3 Operation and alarm indication

12.3.1 RUN mode

In *RUN mode*, the display will show the current status:

Current status	Description
User present	When user is detected. The sash drive is inhibited, tiptronic
	and manual drives are enabled.
XX Seconds to close	When user is not detected, the sash will close following the
	countdown delay time.
Sash Closing	Displayed when the sash is driving closed, for example
	tiptronic, auto-close, footswitch or pushbutton.
Sash Closed	When the user is not detected and the sash has closed. The
	keypad backlight is dimmed.
XX Seconds to open	When the user is detected, the sash opens, following the
	countdown delay time. Auto-open is enabled.
Sash Opening	Displayed when the sash is driving open, for example auto-
	open, tiptronic, footswitch or pushbutton.
User Manual Move	Displayed when the sash is manually opened or closed.
Sash Inhibited	Displayed when the tilt switch input is open. The drive is
	inhibited until the tilt switch is closed.
Sash Disabled	Displayed when the sash drive has been disabled in the
	menu settings.
Sash Locked	Displayed when the sash is at or above the calibrated lock
	position.



12.3.2 Auto Sash settings

12.3.2.1 Stand alone

Auto-Open can be set to Disabled, Enabled or Enabled if Auto-Closed.

When the Auto-Open feature is enabled in the menu and is switched on from the keypad, an * displays in the left-hand corner of the screen. For example, * *User present*.

To enable Auto-Open, press and hold the **Mute** button for 5 seconds or until the * is displayed.

To disable Auto-Open, press and hold the **Mute** button for 5 seconds or until the * disappears.

Closing the sash manually or by using the pushbuttons, will inhibit the Auto-Open when the user returns to the fume hood.

12.3.2.2 AFA4000/1/AS

The Auto Sash can be set to be *Disabled*, *Enabled* or USR enabled (User enable / disable).

To User enable the Auto Sash, press and hold the **Mute** and ↑ buttons for 1 second.

To User disable the Auto Sash, press and hold the **Mute** and ↓ buttons for 1 second. *USR disabled* is displayed in the Status window.

Note: Auto open can be set to disabled / enabled / enabled if auto closed. When set to enabled and when auto closed, the sash will only Auto open when the sash has auto closed. Closing the sash manually or by using the pushbuttons will inhibit the auto open, when the user returns to the fume cupboard.

12.3.3 Alarm indications

Auto Sash alarm indications are described in section 13.3.

Note: If set to Enabled if Auto-Closed, the sash will only Auto-Open if the sash has Auto-Closed.



13. Troubleshooting

13.1 Fault finding

13.1.1 AFA4000/1

Problem	Check for
No LEDs, Screen blank	 Check the power supply is securely plugged into the monitor. Check the power supply is securely plugged into the mains power socket. Check that there is 15 Vdc power supply on the monitor terminals. If not, a wire could be broken or a cable sheath caught.
Sensor Error message	 Check the sensor cable is securely plugged into the sensor. Check the sensor cable is securely plugged into the monitor. Replace the sensor. When the Sensor Error message is still displayed, replace the sensor cable. When the Sensor Error message is still displayed, replace the monitor.
Audible alarm not	• Check for screen messages. When SETBACK is displayed
working	the monitor has been remotely muted.
	• Check to see if the alarm has been disabled in the Car config menu (section 8.1.1.1).
RS485 Comms not	• See Diagnostics menu , Comms Data (section 13.2).
connected	Check the correct Protocol, Slave ID, Baud Rate and Parity
	have been set.
	• Tx & $Rx = 0$. The AFA4000 is not connected to the
	network.



Problem	Check for
	 Tx & Rx >0 but fixed values. The AFA4000 has lost
	connection to the network.
	Rx is counting but Tx is a fixed value. The AFA4000 is
	connected to the network but the Master is offline or not
	polling the AFA4000.

13.1.2 RS485 comms

Problem	Check for
BACnet:	Ensure the AFA4000/1 is in Run mode or Diagnostics
Device not present on	screen. The comms are interrupted when the AFA4000 is
Network	in the pushbutton menus.
	• Power cycle the AFA4000. This is required when the
	protocol has been changed.
	Ensure Max Masters is set to the number of devices on
	the network. When the value set is larger than the actual
	number of devices the comms will be slowed and may
	cause time out issues.
	• Ensure the network is BACnet MS/TP not BACnet IP - a
	separate router is required for IP.
	• Check the comms settings are correct in the Diagnostics
	menu (section 13.2).
Modbus:	 Ensure the AFA4000/1 is in Run mode or Diagnostics
Device not present on	screen. The comms are interrupted when the AFA4000 is
Network	in the pushbutton menus.
	• Power cycle the AFA4000. This is required when the
	protocol has been changed.
	• Ensure the network is Modbus RTU.
	• Check the coms settings are correct in the Diagnostics
	menu (section 13.2).



13.1.3 Auto Sash

Problem	Check for
Sash does not auto	• Ensure that there is mains power to the control unit and
drive	that all the connections are correct.
	• Ensure that the Sash 1 Settings Menu entry S1 Enabled is
	set to Enabled.
	Ensure the Tilt Switch is connected or linked out, at the
	control box terminals.
Sash motor does not	Check the motor and clutch are connected.
drive	Check the sash position sensor or limit switch are
	connected.
Motor drives but clutch	• Ensure that the clutch is connected.
does not engage	
Sash does not drive to	Check the calibration is correct, re-calibrate the sash stop
the correct positions	positions.
Sash drive does not	Ensure that the Sash Low switch is connected and
stop when sash is	operational.
closed	
Sash drive is slow or	Adjust the Sash 1 Settings Menu entry S1 Motor Speed, 0 -
fast	100%.
Auto sash status and	• Check the RJ45 cable is connected at both ends.
menus not shown	Check the Auto Sash controller power supply is securely
	plugged into the mains power socket.
	• Power cycle the AFA4000 and check the version shown is
	AFA4000/E(S) S = Auto sash compatible.
Obstruction detected	• Check the Light curtains or Under sash sensors have been
Alarm always shown	calibrated.
	Check the Light curtain or Under sash sensor Input
	polarity is correct (block the beam, if the error resets then
	the input polarity is wrong).



Sash Fault Alarm	The controller does not detect that the sash position sensor
always shown	or limit switch is fitted, check the connections.
Fault LED is illuminated	Ensure that the area between the sash sensor transmitter and receiver is clear and that the sensors are aligned, power up again to reset.



13.2 Diagnostics menu

The AFA4000 Diagnostics Menu can be used to check the comms settings and operation, when the AFA4000 comms parameter settings have been configured.

Press the \uparrow/\downarrow buttons together from the Run screen to access the Diagnostics Menu. The menu contains the following Input and Output data:

Menu	Parameter/Action
Alarm Test	Sounds the Audible Alarm
Comms Data	Displays the following:
	 Protocol (None / TEL / Modbus / BACnet)
	Slave ID (for Modbus) or Device Instance (for BACnet)
	Baud Rate
	Parity
	• Tx – Number of Data Packets transmitted (increments when transmitting). The displayed value rolls over to zero when
	the maximum count is reached.
	 Rx – Number of Data Packets received (increments when receiving). The displayed value rolls over to zero when the maximum count is reached.
	• Tx & Rx = 0. AFA4000 is not connected to the network (initial set up).
•	 Tx & Rx >0, but fixed values. AFA4000 has lost connection to the network.
	• Rx is counting but Tx is a fixed value. AFA4000 is connected to the network but the Master (BMS) is offline or not polling the AFA4000.



Menu	Parameter/Action
I/O Status	Input Data. This displays the following:
	 Input 1 – On / Off or Analogue Voltage status
	 Input 2 – On / Off or Analogue Voltage status
	 Input 3 – On / Off or Analogue voltage status
	Output Data. This displays the following:
	 Relay 1 – On / Off status
	Relay 2 – On / Off status
	Relay 3 – On / Off status
	Sensor Data. This displays the following:
	• Airflow sensor status 0-100% (100% = 0 airflow, 0% = max
	flow)
	 Temperature °C or °F (Optional with additional
	Temperature sensor fitted)
Auto Sash Data (only	Position Status. The sash position is shown as % open
when Auto Sash is	when sash position sensor is used
connected)	Alarm On / Off status
	Moving On / Off status
	Sash Closed On / Off status
	Obstruction On / Off status
	 User On / Off status (User detected)
	Sash open On / Off status
	Sash Locked On / Off status



13.3 Auto sash alarm indications

In an alarm condition, originating from within the fume hood, the current alarm displays in the status window:

Alarm message	Description
Obstruction Detected	This is displayed when the sash beam is broken and when
	the sash starts to close.
	Remove the obstruction and press the Mute button to reset
	the alarm.
Sash Fault	This is displayed when the sash does not close or open when
	expected.
	Check the sash drive for faults and press Mute to reset the
	alarm.
Remove Sash Lock /	This is displayed when the sash is at or above the calibrated
Cancel to Reset	lock position for longer than the pre-set alarm time.
	Press Mute or lower the sash to reset the alarm.



When a BMS input is in an active condition, the current alarm displays in the status window:

Alarm message	Description
Fire Alarm	This is displayed along with the normal text, for example Fire
	Alarm or User present, when the fire alarm input is activated.
	The sash will drive closed when the user is not detected and
	the sash is clear. The sash can be operated manually when
	the user is detected (auto open, tiptronic & pushbuttons are
	disabled).
BMS open	This is displayed along with the normal text when the user is
	not detected and when the BMS Open input is activated. The
	sash will drive open when the user is not present and the
	sash is clear. The sash can be operated normally when the
	user is detected (auto open, tiptronic & pushbuttons are
	active).
BMS close	This is displayed when the BMS Close input is activated, the
	sash will drive closed when the user is not present and the
	sash is clear. The sash can be operated normally when the
	user is detected (auto open, tiptronic & pushbuttons are
	active).
Emergency (up)	This is displayed along with the normal text when the user is
	not detected and when the EV Open input is activated. The
	sash will drive open when the user is not present and the
	sash is clear. The sash can be operated manually when the
	user is detected (auto open, tiptronic & pushbuttons are
	disabled).
Emergency (dn)	This is displayed along with the normal text when the user is
	not detected and when the EV Close input is activated. The
	sash will drive closed when the user is not present and the
	sash is clear. The sash can be operated manually when the



Alarm message	Description
	user is detected (auto open, tiptronic & pushbuttons are disabled).
Sash Opening	This is displayed when the Sash Open Footswitch has been operated whilst the operator is present.
Sash Closing	This is displayed when the Sash Close Footswitch has been operated whilst the operator is present.



14. Cleaning and maintenance

14.1 Cleaning

The Auto Sash Controller and AFA4000/1 are generally maintenance free.

All parts fitted within the laboratory space may need occasional cleaning depending on the environmental conditions and usage. Include the following:

Part	Method	Notes
Keypad	Use a dry cloth, optical lens or screen wipe to remove dust, dirt, grease or finger marks.	Do not remove the keypad whilst the unit is powered up. Isolate the power if the keypad is removed for cleaning.
Personnel Sensor	Use a dry cloth, optical lens or screen wipe to remove dust, dirt, grease or finger marks.	Do not adjust the sensor position whilst cleaning. If the sensor angle is adjusted the user detection may be compromised.
Light Curtains	Use a dry cloth, optical lens or screen wipe to remove dust, dirt, grease or finger marks.	The Light Curtain is calibrated to detect glass objects. Make sure the light curtain is kept free from obstructions and kept clean.
Under Sash sensor	Use a dry cloth, optical lens or screen wipe to remove dust, dirt, grease or finger marks.	Do not adjust the sensor position whilst cleaning. If the sensor angle is adjusted the sensor beam will be compromised.



14.2 Contamination

When any part of the Auto Sash Control system is contaminated it must be either removed and decontaminated or disposed of and replaced with a new part.

The local in-house Risk assessment, removal and disposal procedures (SOP) and COSHH requirements must be observed whilst de-contaminating or disposing of the contaminated part and should only be carried out by trained and competent parties.

Isolate the power to the controller before removing or replacing any contaminated parts to avoid the risk of electric shock.

14.3 Maintenance

14.3.1 Faulty / replacement parts

If a faulty part has been identified (section 13.1), the Auto Sash Control system should be isolated and marked as *Faulty – do not use /Out of service* until a replacement part has been fitted. The fume cupboard can be operated manually during this period.

No special tools or parts are required for maintenance.

14.3.2 Validation

Once a replacement part has been fitted the Auto Sash Control system operation should be fully tested to ensure safe operation.

A new tested label should be fitted or a new date should be applied to an existing label to show that the system has been repaired and tested and is safe to use.



15. Technical specifications

15.1 AFA4000/1 Airflow Monitor

15.1.1 Physical

Specification	AFA4000
Dimensions (device)	148 mm (H) x 80 mm (W) x 25.9 mm (max) (D)
Dimensions (mounting bracket)	143.4 mm (H) x 75.4 mm (W)
Mounting	Semi flush
Connections	Flying leads with plug in connections
Airflow sensor	Remote SM7 / ILS (In-line Sensor)
Pushbuttons	Three Configurable pushbuttons
Display	Digital velocity display m/sec Graphical display: • Green: Safe • Amber: Caution • Red: Alarm
Com port	RS485 com port Modbus RTU and BACnet
Alarm indication	Red graphic with Audible alarm

15.1.2 Operational information

Specification	AFA4000	
Alarm range	0.20 - 2.00 m/s remote SM7 or ILS Airflow	
	sensor	
Control range	Face Velocity control 0.20 - 2.00 m/sec	



Specification	AFA4000
Control resolution	0.01 m/sec
Control response	< 2 seconds
Control output 1	0 - 10 / 2 - 10 Vdc control output for damper, valve or inverter drive
Control output 2	0 - 10 / 2 - 10 Vdc control output for bleed or supply air damper/inverter or 0 - 10 Vdc volumetric output
Field set up	2-point velocity calibration with on screen instructions
Accuracy	Face velocity ± 5%

15.1.3 I/O

Specification	AFA4000
Digital output	3 configurable outputs
Digital input	3 configurable inputs
Night setback	Digital input activation
Sash high	Digital input activation via proximity sensor or micro switch

15.1.4 Temperatures

Specification	AFA4000
Monitor operating range	+13 to +30℃
Airflow sensor operating temperature	+15 to +30℃
Airflow sensor working temperature	Ambient to +30℃
Storage temperature	-30 to +65℃



15.1.5 Regulatory

•	
Specification	AFA4000
Agency listings	CE RoHS
Hazardous area (remote airflow sensor)	Gas group IIC Temp Class T6 with ATEX certified I.S. Zener Barriers

15.2 Auto Sash Controller

15.2.1 General

	Auto Sash Controller	Options and features
Power Supply	1005 -240 Vac; 50/60 Hz; 3 A	 2 m power lead with plug-in connector 0.75 mm2, 300 V, 6 A rated cable
Keypad	16*2 Backlit LCD display with pushbuttons	 UK single gang socket (85 mm x 85 mm) version US single gang socket (3" x 2") version
Drive Motor Assembly	PWM output DC motor and clutch	 Chain and sprocket shaft drive Sash wire pulley drive Rack and pinion sash direct sash drive
Personnel Sensor	PIR with background re-learn function	
Sash Position Sensor	Steel wire sprung potentiometer	 1 m length for bench type F/Cs 3 m length for walk-in type F/Cs
Sash Sensor	PIR sensor with glass detection	Light Curtain (retro-fit and new build types)



	Auto Sash Controller	Options and features
		Under the sash retro-reflective
		(single sensor)
Tilt Switch	Inhibits controller when switch is	Fitted to the access panel of the
	open	fume hood
Field Set up	Menu calibration and setup with	Menu adjustment of motor speed
	password protection	/ time delays etc
BMS Inputs	4 programmable volt-free inputs	Open sash
		Close sash
		• Fire Alarm (close sash)
		• Emergency open / close sash
BMS Outputs	Programmable volt-free (sash	Always Open / Closed
	position) outputs:	Open / Close on sash fault
	Voltage:	alarm
	• 0 – 10 V	Open / Close on user detected
	• 1 – 10 V	Open / Close on obstruction
	• 0 - 5 \/	detected
	• 0 - 3 V	Open / Close on sash open /
	• 1-50	closed
	Current:	Remote audible alarm
	• 0 – 20 mA	
	• 4 – 20 mA	
Control	Sash operation	Manual sash operation (where
Functions		user detected) Tiptronic 'touch
		sensitive' open/close
		 Auto-Close (unoccupied
		condition)
		Auto-Open (pushbutton enable
		feature)
		Keypad Pushbutton open/close
		Footswitch open/close
		(optional)



	Auto Sash Controller	Options and features	
		BMS input open / close	
Alarms	Audible/visible indication	Obstruction detected	
		Sash fault	
Status	Keypad LCD display	Sash status (user present / open /	
Indication		closing / closed etc)	
Connections	Flying leads with plug-in	(All cable lengths can be	
	connections	specified)	
Agency Listing	CE RoHS		
Mains Power	On-board fuse (F1) 3.15 A, 250 V rated		
Protection			



15.2.2 Environmental conditions

	Rating	Notes
Pollution Degree	Pollution degree 2	Laboratory Areas
Over-Voltage Category	300 V Cat II	
Operating Temperature	-20 to 60 °C	
Range		
Operating Humidity Range	20 - 90% RH non-condensing	
Storage Temperature Range	-20 to 80 °C	

15.2.3 Controller connections

Connector	Terminal Connection	Ratings &
		Specification
Power Supply CN15	• 2 m power lead with flying	• 100-240 Vac; 50/60
	lead with 3 Way plug in	Hz; 3A (Fused 3.15
	terminal block	A)
	• 0.75mm2, 300 V, 6 A Rated	
	Cable	
Keypad CN4	Backlit LCD display with	• Max 24 Vdc 100
	pushbuttons	mA (PTC Fused 200
	RJ45 Cable 2 m	mA)
Drive Motor Assembly CN7	• 2 m flying lead with 4-way	Motor 0-24 Vdc
	plug-in terminal block	PWM Output
		Clutch 24 Vdc
		Max total power
		135W (5.6A)
Personnel Sensor CN6	• 2 m flying lead with 4-way	• Max 24 Vdc 100
	plug-in terminal block	mA (PTC Fused
		200 mA)



Connector	Terminal Connection	Ratings &
		Specification
Sash Position Sensor CN5	• 2 m flying lead with 3-way plug-in terminal block	 Bottom Switch: 24 V (PTC Fused 200 mA) Sash Pos Sensor: 3.3 Vdc 43 mA Max
Sash Sensor CN3	 PIR sensor with Glass Detection Light Curtain or Under Sash Sensor with 3 m flying lead 	 Max 24 Vdc 100 mA (PTC Fused 200 mA)
Tilt Switch CN2	• 2-way plug in terminal block	 Max 24 Vdc 100 mA (PTC Fused 200 mA)
BMS Output Relays CN11,12,13,14	 4 programmable volt-free outputs Change-over relays R1 -R4 3-way plug-in terminal blocks 	• Max 30 Vac/dc 1 A
Analogue Outputs CN9	 6-way plug-in terminal block 0-10 Vdc over Sash Height (2-way) (Programable 0- 10, 1-10,0-5,1-5V) 4-20mA over Sash Height (2 Way) (Programable 0- 20 or 4-20 mA) External Sounder (2-way) 	 0-10 V Max 10 V (Current limited) 4-20 mA Max 24 V Max 24 Vdc 100 mA (PTC Fused 200 mA)
BMS Digital Inputs CN10	 4 programmable digital inputs 8-way plug-in terminal block 	 Max 24 Vdc 100 mA per input Input impedance 100kΩ



Connector	Terminal Connection	Ratings & Specification
RS485 Comms (Optional)	Plug-in expansion module	 Isolated RS485
	 8-way plug in terminal 	output
	block	

15.2.4 Supply and field wiring requirements

	UK	3-pin single-gang socket or fused spur 3 A rated for 3-pin
		plug
Mains	USA	2-pin single-gang socket or fused spur 3 A rated for 2-pin
5Supply		plug
	EURO	2-pin single-gang socket or fused spur 3 A rated for 2-pin
		plug
Note [.]	The controller she	ould be positioned so that the mains connection can easily be

Note: The controller should be positioned so that the mains connection can easily be isolated. Ensure that the mains connector can be accessed for removal.

15.2.5 Auxiliary equipment interconnections

15.2.5.1 TEL supplied equipment

All TEL supplied equipment is provided with plug-in terminal connections.

- 1. Isolate the mains supply to the controller **before** connecting any equipment.
- 2. Follow the installation instructions in the relevant sections of this manual.
- 3. Where possible test the mechanical operation of the equipment before the mains power is switched on to the controller. Test that the sash position sensor draw wire is free and is not catching.

15.2.5.2 3rd party equipment

All 3rd party equipment must be within the electrical specification (page 162) and the connection diagram on page 87.

All 3rd party equipment performance must comply with the requirements of the Auto Sash controller. Parameter re-configuration may be required, when the equipment does not meet the required performance characteristics for the factory settings.

1. Isolate the mains supply to the controller **before** connecting any equipment.



- 2. Follow the installation instructions in the relevant sections of this manual.
- 3. Where possible test the mechanical operation of the equipment before the mains power is switched on to the controller. Test that the motor assembly is free and the sash moves correctly by hand. Test that the sash position sensor draw wire is free and not catching.



16. 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:

- 1. 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.
- 2. 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
- 3. Seller does not provide any warranty on finished goods manufactured by others. Only the original manufacturer's warranty applies
- 4. 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.

The foregoing is IN LIEU OF all other warranties and is subject to the conditions and LIMITATIONS stated herein. NO OTHER EXPRESS OR IMPLIED WARRANTY OF FITNESS FOR PARTICULAR PURPOSE OR MERCHANTABILITY IS MADE.

THE EXCLUSIVE REMEDY OF THE USER OR PURCHASER, AND THE LIMIT OF LIABILITY OF SELLER FOR ANY AND ALL LOSSES, INJURIES, OR DAMAGES IN CONNECTION WITH THIS PRODUCT (INCLUDING CLAIMS BASED ON CONTRACT NEGLIGENCE, STRICT LIABILITY, OTHER TORT, OR OTHERWISE) SHALL BE THE RETURN OF THE PRODUCT TO THE FACTORY OR DESIGNATED LOCATION AND THE REFUND OF THE PURCHASE PRICE, OR, AT THE OPTION OF THE SELLER, THE REPAIR OR REPLACEMENT OF THE PRODUCT. IN NO EVENT SHALL SELLER BE LIABLE FOR ANY SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES. SELLER SHALL NOT BE RESPONSIBLE FOR INSTALLATION, DISMANTLING, REASSEMBLY OR REINSTALLATION COSTS OR CHARGES. NO ACTION,



REGARDLESS OF FORM, MAY BE BROUGHT AGAINST THE SELLER MORE THAN ONE YEAR AFTER THE CAUSE OF ACTION HAS ACCRUED.

The purchaser and all users are deemed to have accepted the terms of this LIMITATION OF WARRANTY AND LIABILITY, which contains the complete and exclusive limited warranty of Seller. This LIMITATION OF WARRANTY AND LIABILITY may not be amended or modified nor may any of its terms be waived except by a writing signed by an authorized representative of the Seller.



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