automist®

DESIGNED BY PLUMIS

Design, Installation, Operation and Maintenance (DIOM) Manual

Version 1.0.0

Contents

1. Administration

1.1 Scope

This DIOM is written to cover the design, installation, and maintenance of Automist 13D, designed for the protection of one- and two-family dwellings, manufactured homes, and townhouses, as with 13D sprinkler systems.

Automist 13D is not designed for the protection of high-hazard applications such as hotels, offices, and industrial areas. It is also not designed for the protection of multi-family residential systems.

Automist 13D follows the concept that a domestic suppression system is designed to protect against a fire originating from a single ignition location.

1.2 Purpose

The purpose of this Design, Installation, Operation and Maintenance (DIOM) Manual is to provide documentation for the design and installation of an automatic fire suppression system that aids in the detection and control of a domestic fire, avoid a flash-over (total room involvement) and improve the chance for occupants to escape or be evacuated.

To avoid serious or fatal injury, or major property damage, read and follow all safety instructions in this manual and on the product.

The following SAFETY SYMBOLS in the manual or on the product warn of HAZARDS that can cause fatality, personal injury, or property damage as described below.

Warns of ELECTRICAL HAZARDS that can cause fatality, serious personal injury, or major property damage.

Warns of NON-ELECTRICAL HAZARDS that can cause personal injury or property damage.

Warns of common installation mistakes. This symbol may denote both ELECTRICAL HAZARDS and NON-ELECTRICAL HAZARDS.

1.3 Retroactivity

This DIOM manual is updated from time to time with best practices or to be in line with existing codes and standards. An installation should be designed to the latest version of this manual and maintained with respect to the version at the time of installation, as installed hardware may not be compatible with the latest design, installation and maintenance practices which are designed to the latest hardware. The manual version used for the design and installation should be documented as part of the installation's working plans for future reference at the time of maintenance.

1.4 Equivalency

Nothing in this manual is intended to limit the use of or installation of Automist in ways which allow it to perform at an equal or better level than its Listing, using more sensitive aspiration detection systems, for example. However, any change to the system installation or operation outside the scope of this manual is also outside of the scope of the system's Listing and needs to be agreed with the AHJ beforehand. Technical documentation must be provided to the AHJ to demonstrate equivalency.

1.5 Units

All units in this manual are expressed primarily in SI units (m, Mpa, kg) and Imperial units (ft, psi, lb and fortnights) in brackets (). The values of measure in this manual were originally defined using the SI system and the conversion table below:

Name of Unit	Unit Symbol	Conversion Factor
litre	L	1 gal = 3.785 L
pascal	Pa	1 psi = 6894.757 Pa
bar	Bar	1 psi = 0.0689 bar
bar	bar	1 bar = 10^5 Pa

1.6 New Technology

Automist is an example of new technology defined in NFPA 13D 1.6, UL Listed to perform the same role as a domestic sprinkler system. As such, its use is to be made according to the conditions set by its Listing and documented in this manual.

2. Definitions

2.1 Definitions

Automist Installer is responsible for commissioning the installation and confirming that it has been completed in line with these guidelines at the end of the installation.

Automist Designer is responsible for creating the working plan for Automist.

Electronically Controlled Automatic Nozzle Nozzles that are normally closed and operated by electrical energy that is initiated and supplied by fire detection and control equipment (as per NFPA 750 definition 3.3.25.2).

Authority Having Jurisdiction (AHJ) An organization, office or induvial responsible for enforcing the requirements of code or standard, or for approving equipment, or materials. Where public safety is primary, the AHJ may be federal, state, local or other regional department or individual such as a fire chief; fire marshal; chief or fire prevention bureau, labor department of health department; building official; electrical inspector; or others having statutory authority. For insurance purposes, an insurance inspection department, rating bureau, or other insurance company representation may be the AHJ. In many circumstances, the property owner or his or her designated agent assumes the role

of AHJ; at government installations, the commanding officer or departmental official may be the AHJ (as per NFPA 13D A.3.2.2).

All other terms follow the definitions found in NFPA 13D, NFPA 750, NFPA 70 and NFPA 72.

Automist Working Plans are scale drawings displaying each floor of the property and highlighting information that pertains to the design of the system. It shall be submitted for approval to the authority having jurisdiction before any equipment is installed or remodelled and follow the requirements as per NFPA 13 28.1.

All other terms follow the definitions found in NFPA 13D, NFPA 750, NFPA 70 and NFPA 72.

3. General Requirements

3.1 Qualifications

All procedures must be performed by suitably qualified personnel. The design, working plan, maintenance, and installation of the Automist system in accordance with this DIOM shall only be performed by people knowledgeable and trained in such systems and with a valid certificate of competence from the manufacturer.

4 Automist System

4.1 Introduction

Water mist fire suppression systems have demonstrated their value in assisting the protection of life and property for many years. A correctly designed, installed, and properly maintained Automist fire suppression system can detect, suppress, and control a fire at an early stage of development.

The automatic operation of the system rapidly reduces the rate of production of heat and smoke, allowing more time for the occupants to escape to safety or be rescued.

The controller continually monitors the thermopile sensors by reading the temperature while parked, ensuring that all heads are ready to operate. When triggered by a Plumis wired sensor, all the linked spray heads will begin scanning. They start measuring the temperatures within the room using an infrared thermopile sensor.

When detecting the fire to target with water mist, the infrared sensor on the spray head captures thermal images of the room using a 750-pixel sensor and processes the footage using embedded machine learning. The spray head targets a fire, even if the view is partially obstructed because the radiant heat from the smoke and its heating of surfaces is also visible by the thermal imaging sensor.

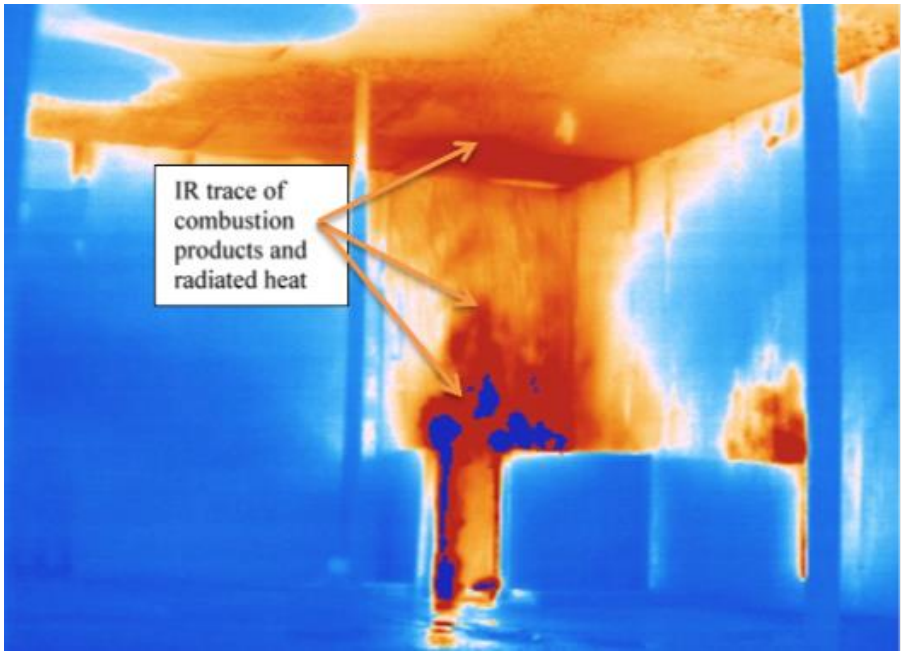

Figure 1: Interpretation of how the IR sensor views the fire

Once the temperature exceeds a threshold that head is deemed to have successfully located a fire. All heads which locate a fire during a scan are then compared to see which has the best view.

The selected spray head will lock onto the selected location, and activate the high-pressure pump, driving mains water through the unique nozzle unit, quickly directing a dense fog into the location of the fire. The high momentum vertical spray orientation with a horizontal trajectory is designed so fires can be saturated with a turbulent flow of mist, suppressing the fire.

While the water is being discharged the system monitors the heat signature of the fire. If it establishes the fire is traveling, it will pause the pump and relocate the angle of the spray head to target the optimum location.

Traditionally, for enclosed spaces, water mist has a different principle of firefighting to traditional sprinklers which suppress fires by wetting surfaces and directly cooling the flames with large water drops. Water mist uses fine droplets, which evaporate at the base of the fire, to extract heat and displace the oxygen fuel. This results in fire control, suppression, or extinguishment. Automist 13D uses a combination of both processes. The spray heads are wall mounted (around light switch height) to avoid ineffective evaporation in the hot layer in the ceiling and the upward flow of hot combustion products. Automist leverages the natural turbulence the fire creates and seeks to ensure water mist is entrained in the fire plume by targeting mist, at high pressure, directly at the base of the fire, while at the same time wetting the adjacent surfaces to impede the fire propagation.

The provision of Automist does not negate the need for other fire precautions or practical measures, which can include structural fire resistance, escape routes, smoke or fire sensors and safe housekeeping practices. Even with the installation of Automist, normal actions on the discovery of a fire need to be taken, such as immediate evacuation and the calling of the fire and rescue service.

Automist maintenance is not complex but is essential. Owners and occupiers must pay particular attention to the details within, such as the avoidance of obstructions to the water mist nozzle.

4.2 System Diagram

1. Smoke sensor (EVCA-PY-PL)
2. Spray head (SH12)
3. Pump (AP09)
4. Controller (CT03)
5. High-pressure pipe ¼” connection
6. 2 Core Sensor cable
7. 5 Core Data cable
8. Pump to controller cables (power and solenoid)

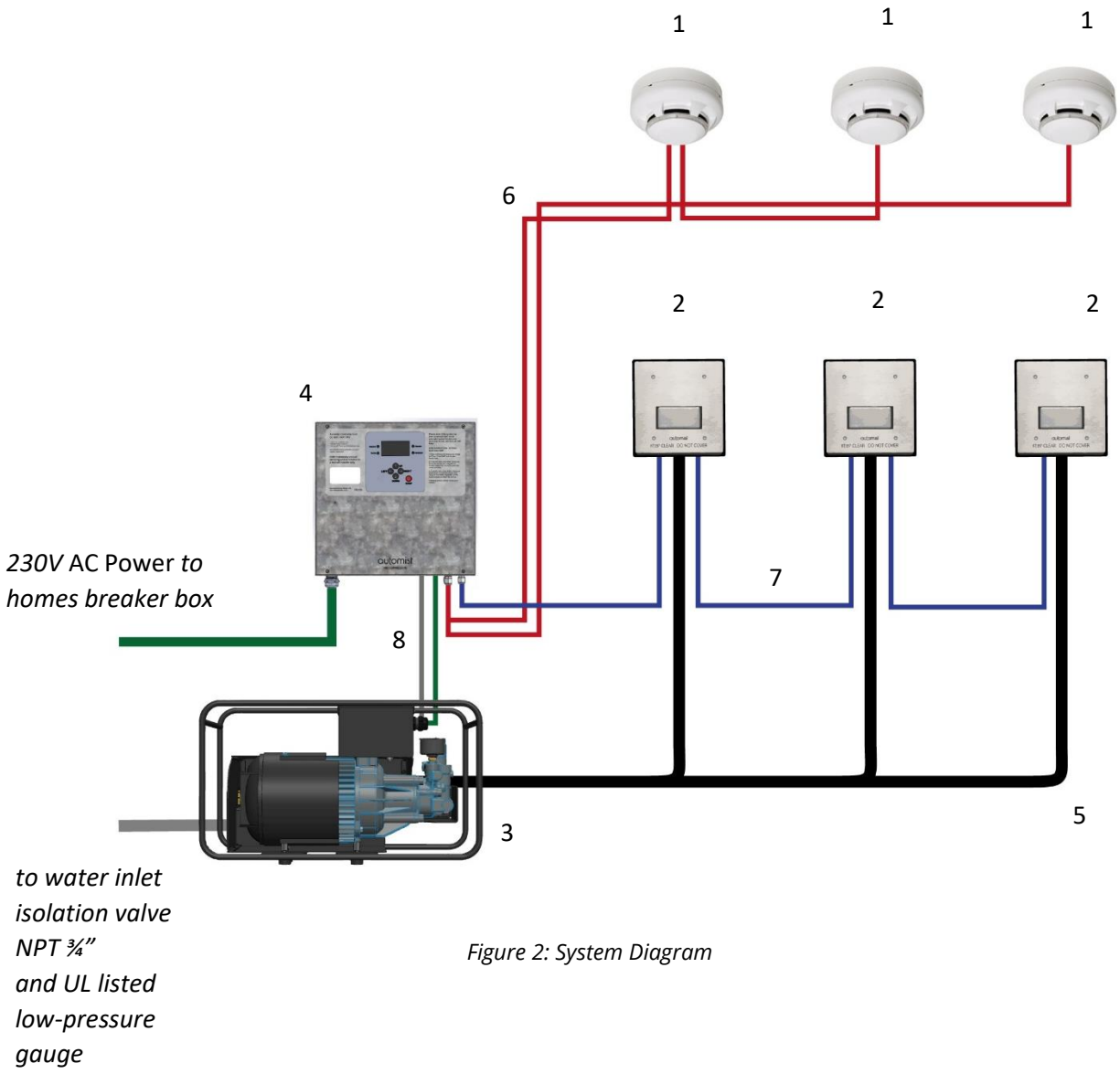

Figure 2: System Diagram

4.3 Technical limitations

Automist has been performance tested within the following operational boundaries:

- Maximum number of spray heads: 10
- Maximum number of smoke sensors in the system: 10
- Maximum number of smoke sensors in a series chain: 2
- Maximum number of scanning spray heads at the same time: 6
- Maximum number of spray heads per zone: 3
- The same sensor can belong to a maximum of 2 zones
- Maximum data cable length: 80 m (262.47 ft)
- Maximum high-pressure water pipe length: 60 m (196.85 ft)
- Maximum high-pressure water pipe length from the pump to the furthest spray head: 30 m (98.42 ft)

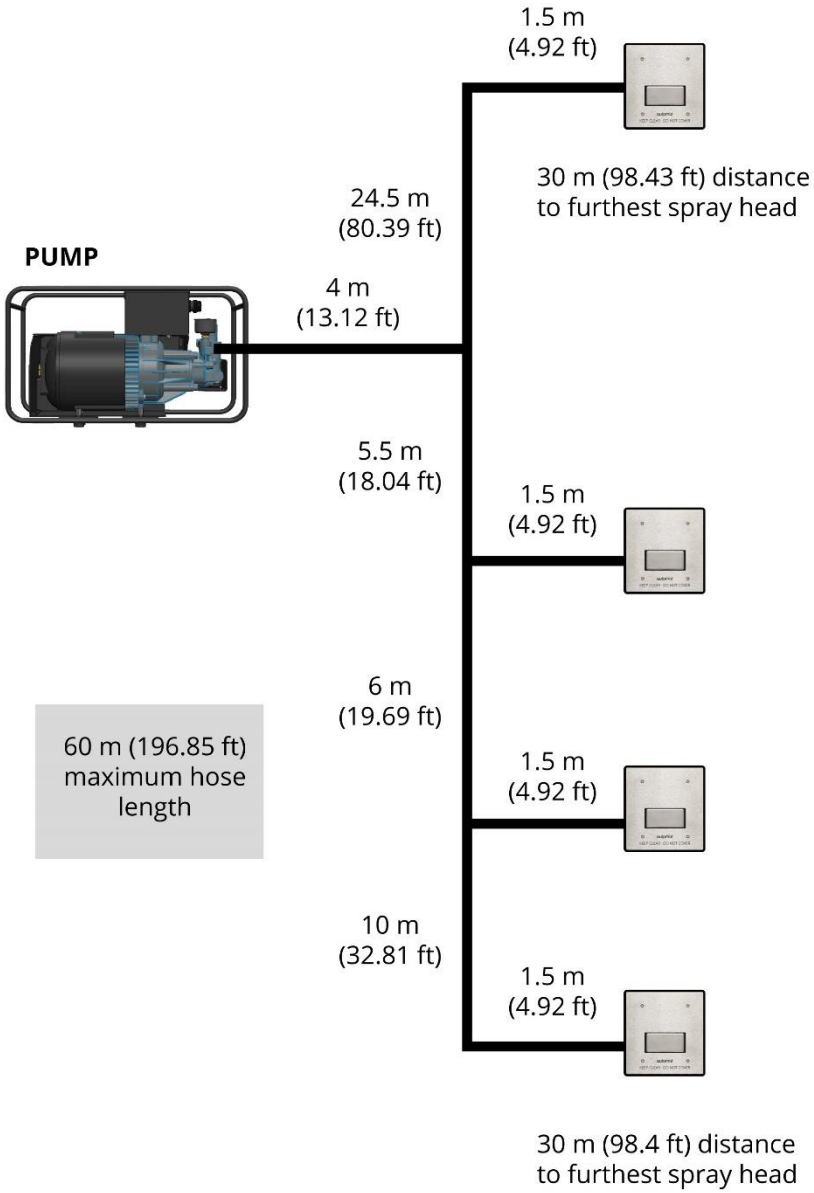

Figure 3: Understanding the maximum hose lengths

2 core sensor cable
90 m per leg

10 smoke sensors with 2 in series (5 input channels)

5 core data cable total length 80 m (262.47 ft)

10 sprayheads with 6 scanning at a time and 3 per zone

Total pipe 60 m (196.85 ft) (30 m (98.43 ft) from pump to furthest sprayhead)

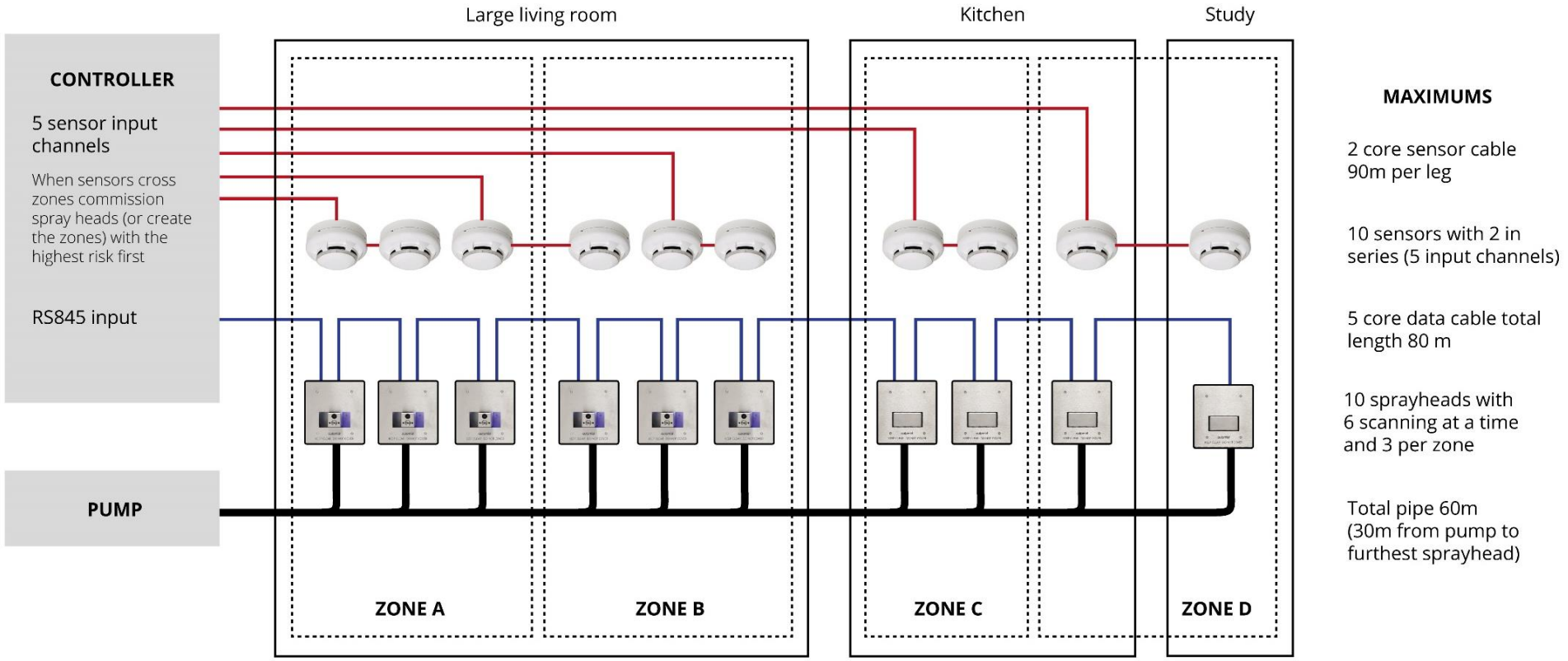

Figure 4: Technical Limitations Summary

4.4 Spray Head

Figure 5: Spray head (SH12)

Weight	1.4 kg
Size (main body)	133 mm (5.23 inch) (height) x 50 mm (1.96 inch) (depth) x 128 mm (5.03 inch) (width)
Size (back box)	119 mm (4.68 inch) (height) x 60 mm (2.36 inch) (depth) x 103 (4.05 inch) mm (width)
Operating Pressure	76 – 100 bar (1102 – 1450 Psi)
Flow rate	9 litres (2.37 gal) per minute
Spray Pattern	90° vertical blade
K Factor	1.04 - 0.02/-0.08 (0.96 – 1.02)
Minimum nozzle waterway	1 mm
Input Voltage	24 VDC (reversed voltage protected)
Input Current	Max 0.5 A
Mounting	Indoor wall-mounted
Temperature & Humidity	Indoor, dry

4.5 Pump

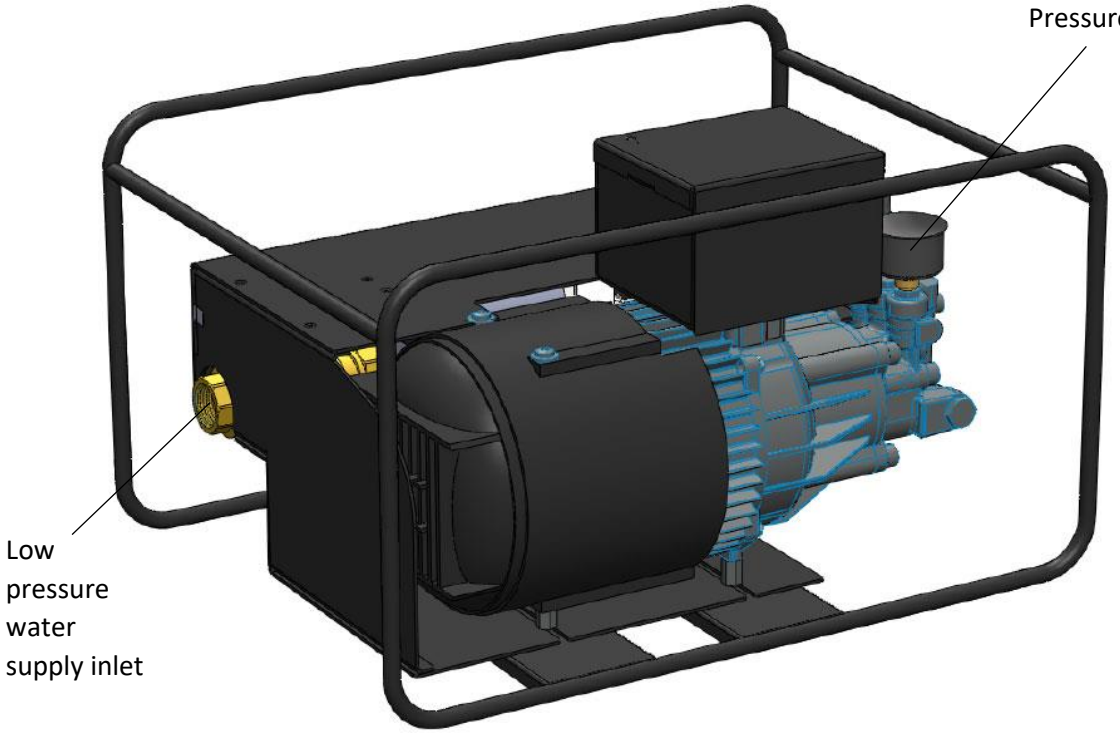

Figure 6: Pump isometric view (AP09)

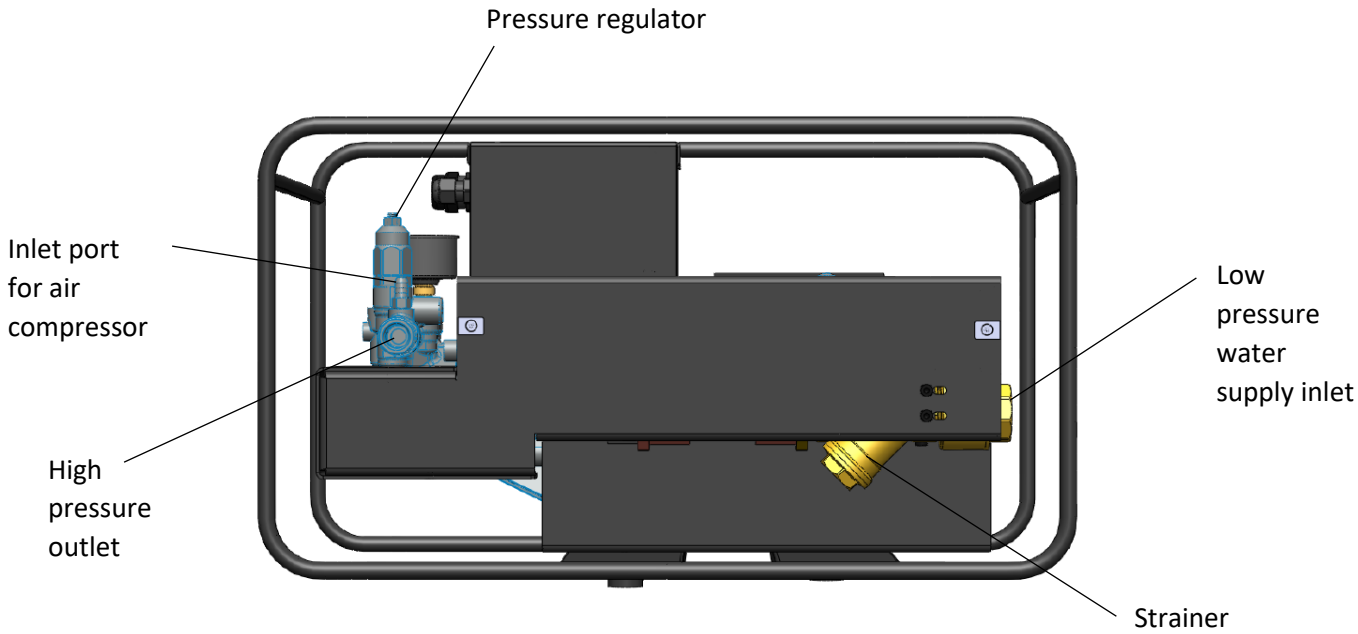

Figure 7: Pump side view (AP09)

Automist Pump Specification

Weight	23 kg
Size	250 mm (984 inch) (height) x 300 mm (11.81 inch) (depth) x 400 mm (15.74 inch) (width)
Output Pressure	76 – 100 bar (1102 – 1450 Psi)
Flow rate	9 litres per minute (2.37 Gallons) per minute
Inlet Pressure (Dynamic)	1 – 3 bar (14.5 – 43.51 Psi)
Inlet Component Pressure Rating (Static)	Max 10 bar (145 Psi)
Rated Motor Speed	2800 rpm
Input Voltage Pump	230V AC/50Hz (AP09) 60Hz (AP12)
Input Current Pump	Max 13.5 amp
Input Power Pump	Max 3 Kw
Input Voltage Solenoid	24 VDC
Type of Solenoid	Normally closed (NC)
Temperature & Humidity	Indoor, dry

4.6 Controller

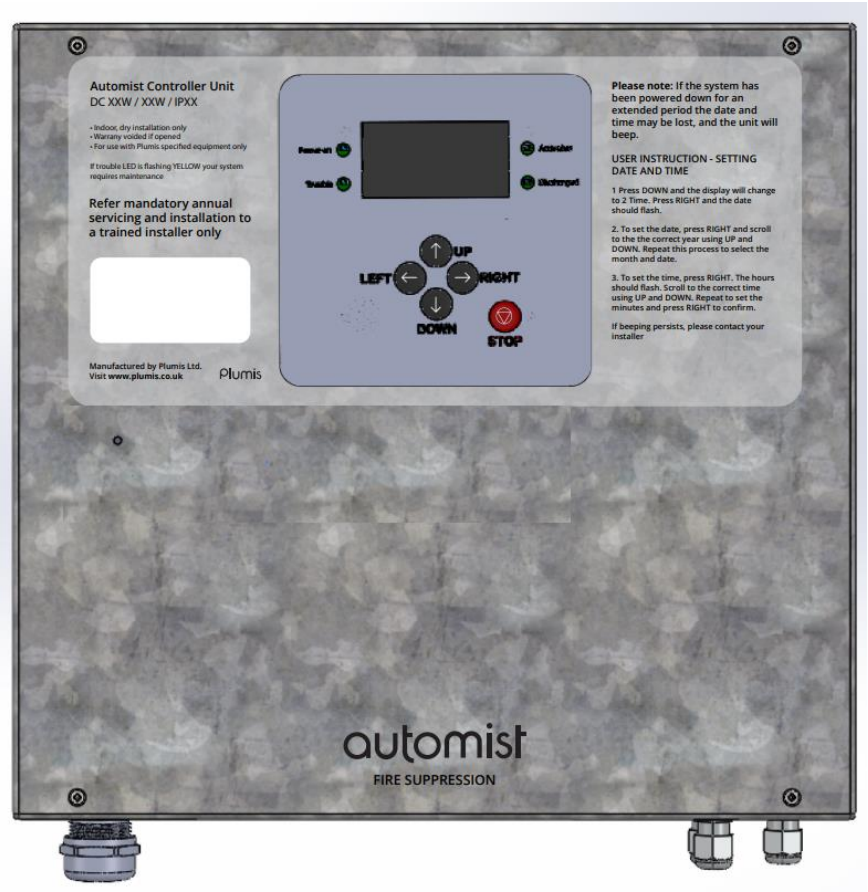

Figure 8: Automist Controller (CT03)

Automist Controller Specification

Input Supply	Single phase (Line + Neutral) or Split phase (L1 + L2)
Input Voltage	230V AC 50/60Hz
Input Current Standby mode	Up to 0.5 A
Input Current Scanning mode	Up to 0.5 A
Input Current Pumping mode	13.7 A
Input Current Controller Inrush	60 A peak
Input Current Motor Starting	75 A peak <150ms
Input Current Locked Rotor	52 A <30 s (motor protected by thermal fuse)
Overload Protection	Protection is provided by incoming power feed 20A MCB, no breakers inside the control unit. MCB is current limiting type with limitation class 3.
Safety Classification	Class I device, Earth must be fitted!
Overvoltage Category	Overvoltage Category III (transient protection via MOVs and GDTs to Earth/Ground)
Installation Altitude	< 2000 m (6561 ft)
Dimensions	325 mm (12.79 inch) W x 310 mm (12.2 inch) H x 80 mm (3.14 inch) D
Weight	6.75 kg (including battery)
Mounting Location	Indoor, dry environment only
Mounting Position	Within 3 m (9.84 ft) of the pump and recommended 0.5 – 1.5 m (1.64 - 4.92 ft) above the floor level
Temperature & Humidity	Indoor, dry

Controller terminals

Name	Type	Description
Relay 1	Output (volt-free)	Activates when a fault is detected including AC power loss
Relay 2	Output (volt-free)	Activates when the system is scanning
Relay 3	Output (volt-free)	Activates when the system is spraying
Alarm 1-5	Input / Output	Connects the controller to the smoke sensors. A maximum of 2 smoke sensors can be connected in series to one alarm output. **N.B. Connect the shield to the SHLD terminal. Do not terminate the shield at the sensor end of the cable.**
RS485 Primary	Input / Output	Connect the data cable from the controller to the spray heads. Provides RS485 communication, 24 V power supply and earth connection to the heads.
RS485 Secondary	n/a	Not active / Do not use
Solenoid 1	Output	Connection to 24 V solenoid. Connect the solenoid cable from the pump red 24V + black 0V -
Solenoid 2	n/a	Not active / Do not use
AC Power In	Input	230V AC 50-60 Hz power supply input

Battery	Input / Output	Connection to 12 V battery. Connect the battery leads red 12+ and black 0V –
Pump Out	Output	Power output for the pump motor
Sounder Circuit	Output	24 VDC 220 mA maximum current
USB	USB	Plumis use only
Pressure sensor	n/a	Not active / Do not use

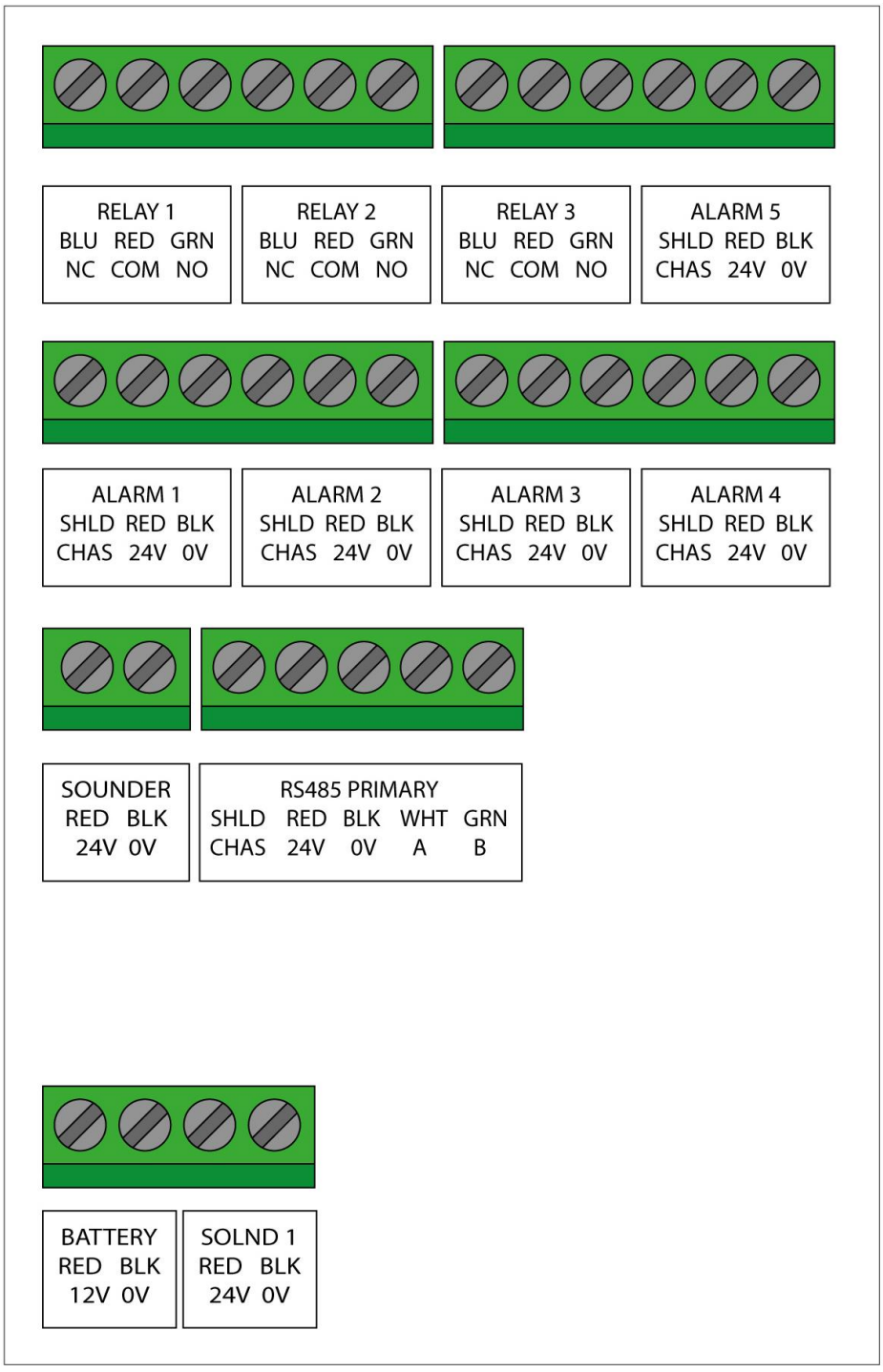

Figure 9: Controller Terminals (CT03)

4.7 Smoke Sensor

EVCA-PY-PL

The EVCA-PY-PL is a conventional photoelectric 2-wire smoke sensor only for use with the Plumis Automist Fire Suppression System. Only the base model number EVA-UB4 or EVA-UB4-6 should be installed. Operating voltage of 24 VDC. Quiescent current of 50 µA @ 24 V and alarm current of 50mA at 24V.

NOTE: The EVA-UB4 is the compatible model mounting base for the EVCA-PY-PL smoke sensor.

The Model EVA-UB4-6 mounting base is intended for applications where a 6-inch square or octagonal electrical junction box is required.

Figure 10: Plumis EVCA-PY-PL sensor

4.8 Pipes, Hoses and Fittings

All piping and fittings should be supplied and installed in accordance with the piping/fittings manufacturer's instructions and should be suitable for use at the working pressures and flows to be experienced by Automist with the necessary factors of safety.

Stainless Steel Piping

- Material: Stainless Steel only
- Stainless steel pipes and fittings must conform to
    - US (NFPA 750): ASTM A269 or ASTM A 632 or ASTM A 778 or ASTM A 789/ A 789M
- Internal diameter: 8 mm (5/16")
- Working pressure of at least: 175 bar (2538 Psi)

Flexible Hydraulic Hoses

- Standard: SAE 100R2AT
- Dimensions: 5/16" nominal inner diameter

- Hose working pressure of at least: 180 bar (2600 psi)
- Minimum burst Pressure: 720 bar (10400 psi)
- Minimum bend radius (MBR): 115mm (4.53")
- Robust rubberised exterior and single wire braiding to withstand heavy abrasion during installation and maintenance works and attempts to hammer a nail through from an adjacent wall.

Fittings

- Material: Stainless Steel only
- Working pressure of at least: 175 bar (2538 Psi)
- Standard: BSPP ¼" or 5/16" 60° cone mating surface (spray heads are ¼" only)

Given the small discharge orifice for Automist 13D due to its low flow, it is important not to use sealant tape on fittings downstream of the strainer as these could dislodge and block the nozzle.

- Maximum total length: 60 m (196.85 ft)
- NFPA13 7.5.1.3 joint compound shall be applied only to male threads

4.9 Data and Sensor Cables

Data cable specification

- Model: Alphawire 2466C
- Maximum length: 80 m (262.46 ft)
- Plumis part number: E0001_L
- Supplier specification: https://www.alphawire.com/Products/cable/alpha-essentials/communication-and-control-cable/2466C

Sensor Cable Specifications

- Cable type: FLP (fire-rated low power)
- 2 wires
- Maximum length between spray head and the furthest smoke sensor: 90m
- Not within Plumis' scope of supply
- Voltage rating: 150V+
- Current rating: 1A max
- Wire size: 18 AWG (could be 16 AWG or 20 AWG)

Wire Terminations

Data cables must be terminated with a 120-ohm resistor at the last spray head.

Smoke sensor cables must be terminated with a 5K1 ohm resistor across the last sensor.

Bootlace Ferrule Specifications: Multicomp E0508-WHITE, 0.5 mm^2 / 22 AWG, pin length 8mm, overall length 14 mm. must be used for connecting the data cable to the spray heads.

4.10 Battery for Controller

Battery specification

- The standby battery should be NP7 12VDC 7-amp hour rated.
- Low battery to fully charged time = 20 hours
- Standby time provided = 24 hours

4.11 System Strainer

The Automist pump has a strainer incorporated to help prevent contaminants from entering the system and potentially causing blockages.

This is a Y-type strainer with a port for inspection and flush-out.

5 Water Supply

5.1 Flow, Pressure and Temperature Requirements

The Automist fire pump is a positive displacement pump designed to discharge a constant flow of 9 litres (2.37gallons) per minute because only one Automist spray head will ever discharge at a fire, as this is electronically controlled. The Assumed Maximum Area of Operation (AMAO) is always a single spray head and therefore the pump only needs to supply the flow and pressure for that one spray head.

The minimum required water supply (allowing for tolerance) is **1 bar (14.5 Psi) and 11 litres** (2.9gallons) of flow per minute.

The maximum water supply pressure is **3 bar (43.5 Psi)** when the pump is flowing at 9 litres (2.37gallons) per minute.

The pump will operate automatically once a fire location and risk has been determined by the controller and will stop operating after 30 minutes (default operation time) or if the stop button is pressed on the controller.

5.2 Water Quality

The water supply for a water mist system shall be taken from a source that is equivalent in quality to a potable (drinkable) source with respect to particulate and dissolved solids.

6 Electrical Power Supply

6.1 230V 50Hz primary power

All electrical supplies to the Automist pump and controller should be installed in accordance with the regulations and requirements specific to your local jurisdiction. It is a requirement to install Automist on a separate circuit to the protected room and its contents. The fire detection and alarm system may use this circuit, as all must remain powered in the event of a fire.

6.2 24V Standby power

In the event of an electrical supply failure, the standby battery will power the controller for 24 hours. Power is supplied to the controller's display, alarms and sounder only. It does not supply power to the pump.

IMPORTANT! The standby battery is not designed to supply power to the system during an activation.

7. Installation

7.1 Water Supply (stock cock and pressure gauge)

- Install a 3/4" water supply (connection) with an isolation valve positioned so that the connection point will not be obstructed when the pump is installed. The cold-water supply must deliver the following dynamic flow and pressure:

11 litres (2.9 Gallons) per minute and maximum of 3 bar (43.5 Psi), minimum of 1 bar (14.5 Psi). If over 3 bar (43.5 Psi), then a PRV needs to be fitted.

- Install a UL listed low-pressure gauge between the isolation valve and the supply pipe to the pump.

Figure 11: Low pressure gauge

- The supply valve must be labelled as described in NFPA 750 to avoid the shut-off of the water supply to the Automist 13D system.
- The water inlet assembly and pump, which is water-filled, should be in an area of the property where exposure to temperatures below 4 °C can be avoided. If this cannot be ensured, the location of this water-filled pipework should be protected against freezing.

7.2 High-Pressure Pipes, Hoses and Fittings (indoor install)

When pipework supports are used, they should meet the following recommendations:

a) ‘Hose or pipework supports should be fixed directly to the structural elements or primary supports of the building.
b) Hose or pipework supports should not be used to support any other services.
c) Hose or pipework supports should prevent the pipe from being dislodged.
d) Supports should be secured in accordance with the piping/fittings manufacturer’s instructions.
e) Supports should not be glued, welded, or soldered to the pipe, hose, or fittings.
f) Where necessary, supports for hoses or pipework should be suitably lined to prevent corrosion and abrasion.
g) The maximum support spacing should be in accordance with the piping/fittings manufacturer’s installation instructions.’

The high-pressure pipes do not need to be protected against freezing as they are kept dry until pump discharge.

IMPORTANT REMINDER! Before installation ensure the high-pressure pipes are in line with Plumis guidelines. The maximum total length of the high-pressure pipe/hose is 60 m. The maximum allowable distance between the pump and the furthest spray head is 30m. High-pressure pipes/hoses must conform to NFPA 750 and/or this instruction manual.

High-pressure pipes/hoses can be connected in a star or a daisy chain configuration. See section 5 for the high-pressure pipe, hose and fittings specification. Any plumbing joint or fittings must be made of stainless steel, e.g., t-connectors and elbows, and must be housed in an accessible area so they can be checked for leaks during the commissioning procedure.

IMPORTANT! Pipes must be closed with caps to prevent contaminants from entering the water path until trim.

IMPORTANT! So that fire separating is effective, every joint, or imperfection of fit, or opening to allow services to pass through the element which has fire-resisting function, should be adequately protected by sealing or fire stopping so that the fire resistance of the element is not impaired.

Crimping and Testing High Pressure Hoses

Flexible hoses can either be:

a) bought pre-crimped from a specialised supplier
b) crimped at the contractor’s shop at the required lengths, or
c) crimped on site utilizing portable crimping equipment

Any hoses crimped at the shop by the installer or on-site must be pressure tested before commissioning is initiated. If hoses are tested after crimping at shop, no on-site testing is necessary.

Pneumatic Test

At a pressure of not less than 2.5 bar for not less than 24 h. Any leakage that results in a loss of pressure greater than 0.15 bar for the 24 h must be corrected.

Hydrostatic Test

At a pressure of 200 bar for 5 minutes. If the system fails to maintain the test pressure, the fault (such as permanent distortion, rupture, or leakage) must be found, corrected and the test repeated. Users must ensure all air is removed from the hoses / pipes network before undertaking a hydrostatic test. Following testing hoses / pipes must be drained and dried to remove any moisture in the network.

It is recommended that the hose is installed at least 40mm from the surface of walls to avoid being affected by protruding nails or screws.

IMPORTANT! Elbows must be used if the minimum bend radius of hoses cannot be met.

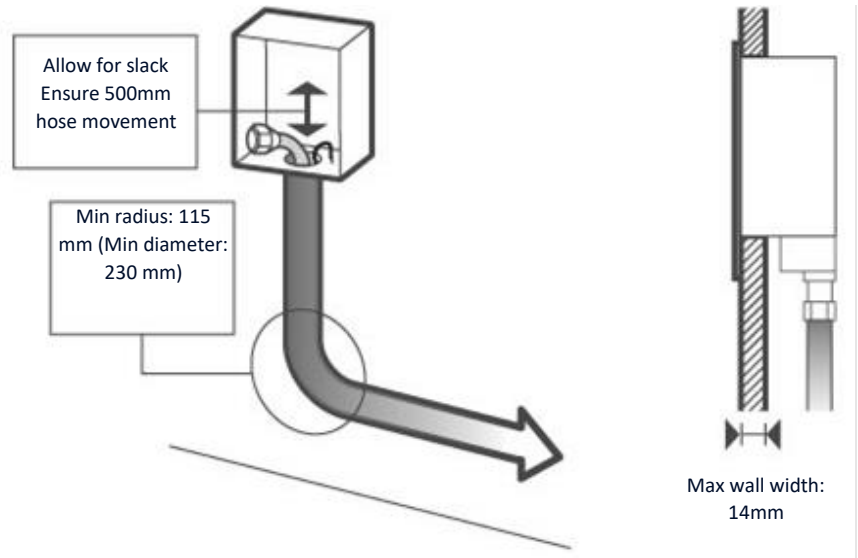

Figure 12: Mounting the Back Box and using metal conduits

IMPORTANT! When installing into solid walls, solid metal conduit must be installed to allow for movement of the hose (50mm – 2" slack) for future servicing and replacement of the hose. Solid metal protection must also be used when the hose is restricted of lateral movement. This is necessary because when the hose is not free to move it is more susceptible to being punctured accidentally. The hose or pipework should be installed in accordance with this manufacturer's design and installation manual and should be robust to internal corrosion. Structural timbers should not be notched or bored in such a way that the integrity of the structure is compromised.

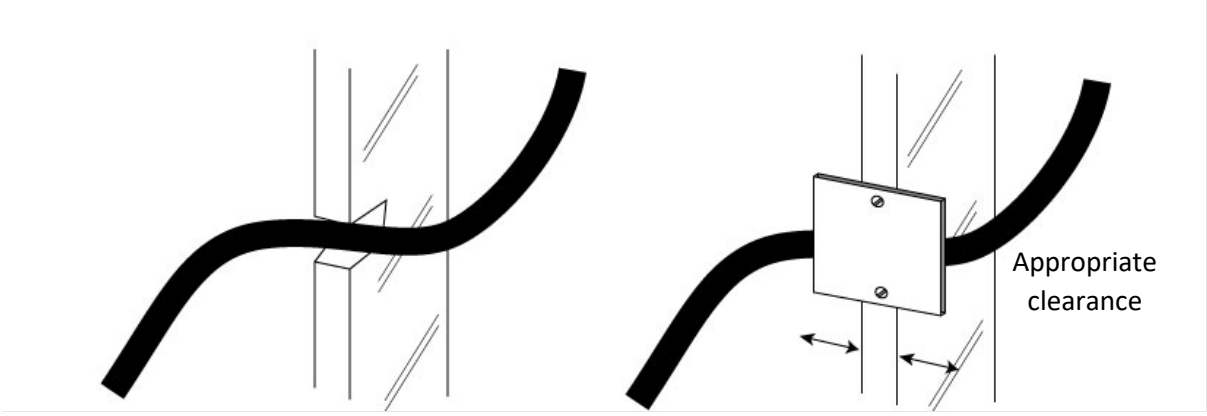

Figure 13: Example of mechanical protection within a joist

7.3 Data Cables

The spray heads are connected in a daisy chain configuration; therefore, data cables must be **labelled IN and OUT** during the rough-in so they can be correctly installed when connecting the spray heads during trim. It is recommended that the data cable(s), where possible, is loosely bound to the high-pressure pipe.

Data cables must be installed within the fabric of the building or be protected by a 30-minute rated fire barrier.

7.4 Smoke Sensor Wiring

Smoke sensors are connected to the alarm terminals on the controller.

Each alarm channel can have a maximum of 2 smoke sensors connected in series.

The shield wire is only connected at the controller end. Care should be taken to ensure the shield wire is not left exposed in the sensor base, which may cause a short circuit to any of the terminals in the smoke sensor base.

A 5.1K end-of-line resistor is installed in the last sensor as shown below.

Insulate the SHLD wire to prevent it from shorting on any terminals. Do not connect SHLD to any terminals in the base.

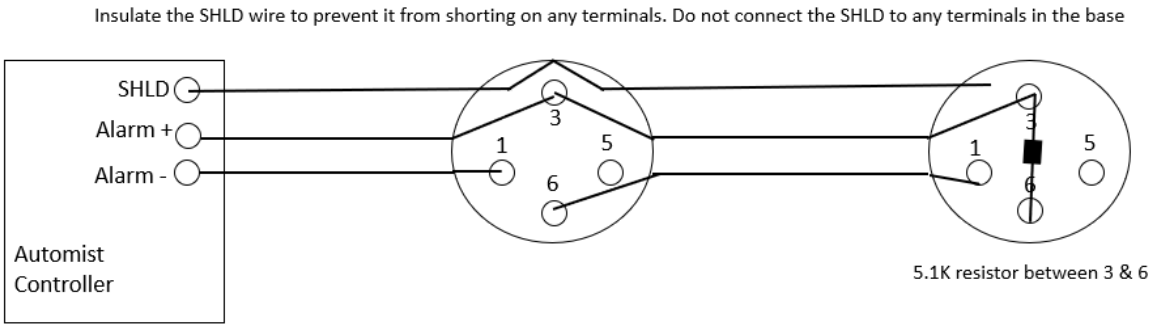

Figure 14: Wiring connection when 2 smoke sensors are connected in series.

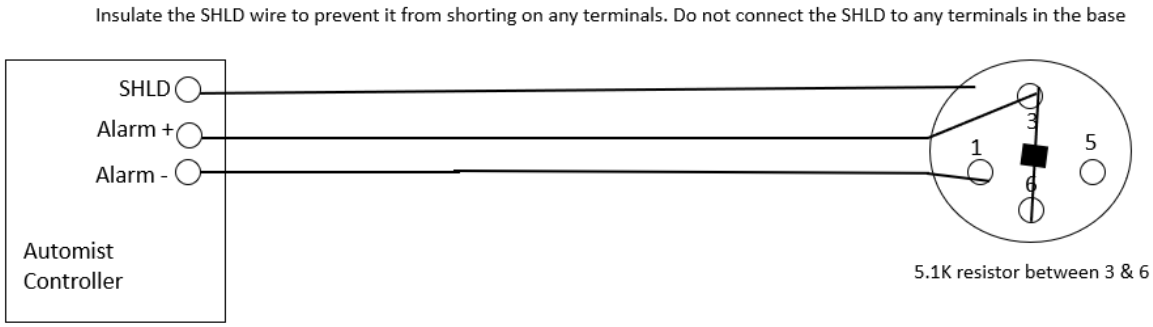

Figure 15: Wiring connection when 1 smoke sensor is connected to the alarm channel.

IMPORTANT: The installer should consult with the designer with regard to the wiring configuration of the smoke sensors. If 2 smoke sensors are wired in series but will be programmed into different zones at the commissioning stage, both zones will be activated if either sensor is triggered. See section 7.8 for more details on zoning.

7.5 Spray Head Installation

The spray head must be installed on the wall at a height of **1.25m (4.10 ft) +/- 50 mm (1.96 inch)** measured from the finished floor level to the nozzle.

The Automist spray head must be mounted to the Automist backbox (AC21). The back box dimensions for the Automist spray head are 103 mm (4.05 inch) wide x 119 mm (4.68 inch) high and 60 mm (2.36 inch) deep.

The spray heads are configured in a daisy chain configuration; therefore, **data cables must be labelled IN and OUT** during the rough-in so they can be correctly wired during the trim. It is recommended that the data cable(s) where possible, is loosely bound to the high-pressure pipe. Strip each core of the data cable to expose 10 mm of the wire and crimp a bootlace ferrule to each core of the data cable.

0.5 mm^2 / 22AWG, pin length 8 mm, overall length 14 mm.

Figure 16: Electrical wire connectors ferrules

After inserting the red, black, green, and white wires as indicated on the terminals, turn the screw

clockwise until tight. Use a torque screwdriver on the following setting: minimum 0.22 Nm, maximum 0.25 Nm. Test the connection by gently pulling on the wire to confirm it is not loose.

IMPORTANT! The alarm terminals on the back of the spray head are not used and should be left empty.

IMPORTANT! A 120-ohm EOL resistor must be wired across the green and white-out terminals of the last spray head.

The stainless-steel pipe connects to the spray head inlet with a ¼ inch fitting. Hand tighten the pipe to the spray head and then apply 15 Nm or torque using a torque wrench..

Do not over-tighten the connection.

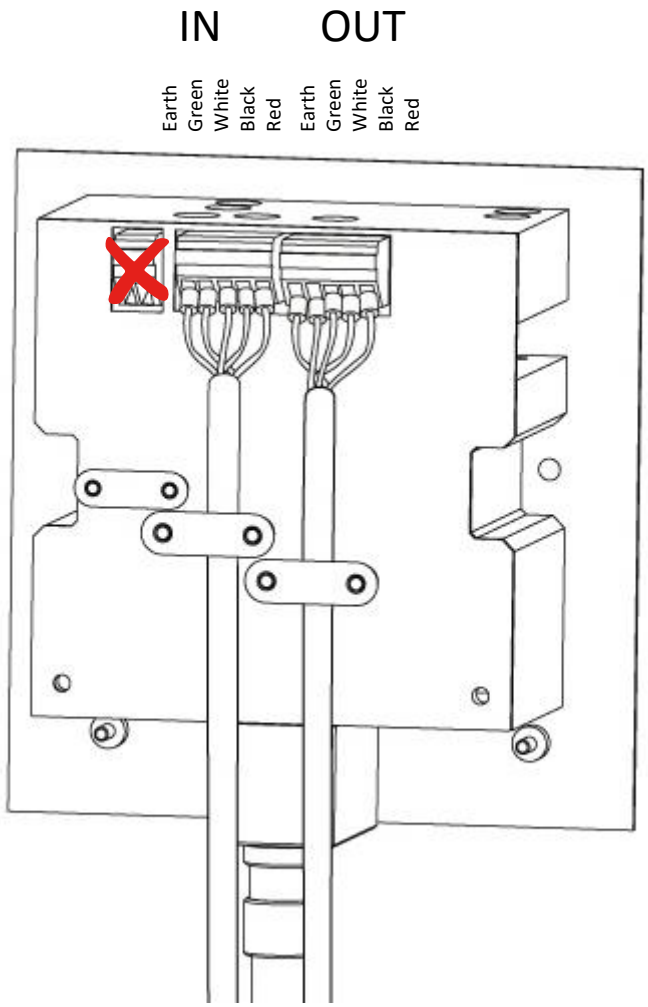

Figure 17: Electrical connections on the spray heads with ferrules

7.6 Controller Installation

The controller should be mounted securely to the wall with 4 fixings, do not drill additional fixing holes through the controller's enclosure.

The controller should be mounted at a height where the homeowner can read the display and have easy access to the stop button.

The controller should be mounted within 3m (9.84 ft) of the pump.

Ensure the 230V/240V electrical supply is isolated before connecting to the controller.

Use the glands provided to feed the cables into the controller. Do not drill additional cable entry holes into the controller's housing.

It is not necessary to use bootlace ferrules when connecting the wires to the controller's terminals.

Connect the data cable from the spray head to the primary RS485 terminals and the smoke sensor cables to the alarm terminals.

Pull the black plastic cover behind the display PCB to the left to access the 230V/240V supply terminals.

Connect the Live and Neutral from the electrical supply to the inlet supply terminals at the top of the PCB. For example, in the UK, these are the brown and blue wires of 230V 3 core mains cable. In the US, this is the black and white Hot phases of a 240V 3 wire cable supply. Red tape should be present on the white wire to indicate that it is also a hot wire, not a neutral. Depending on location, a licensed electrical contractor may be required to terminate the connection to the controller from a whip.

Connect the 230V/240V supply cable to the pump to the outlet terminals at the bottom of the PCB.

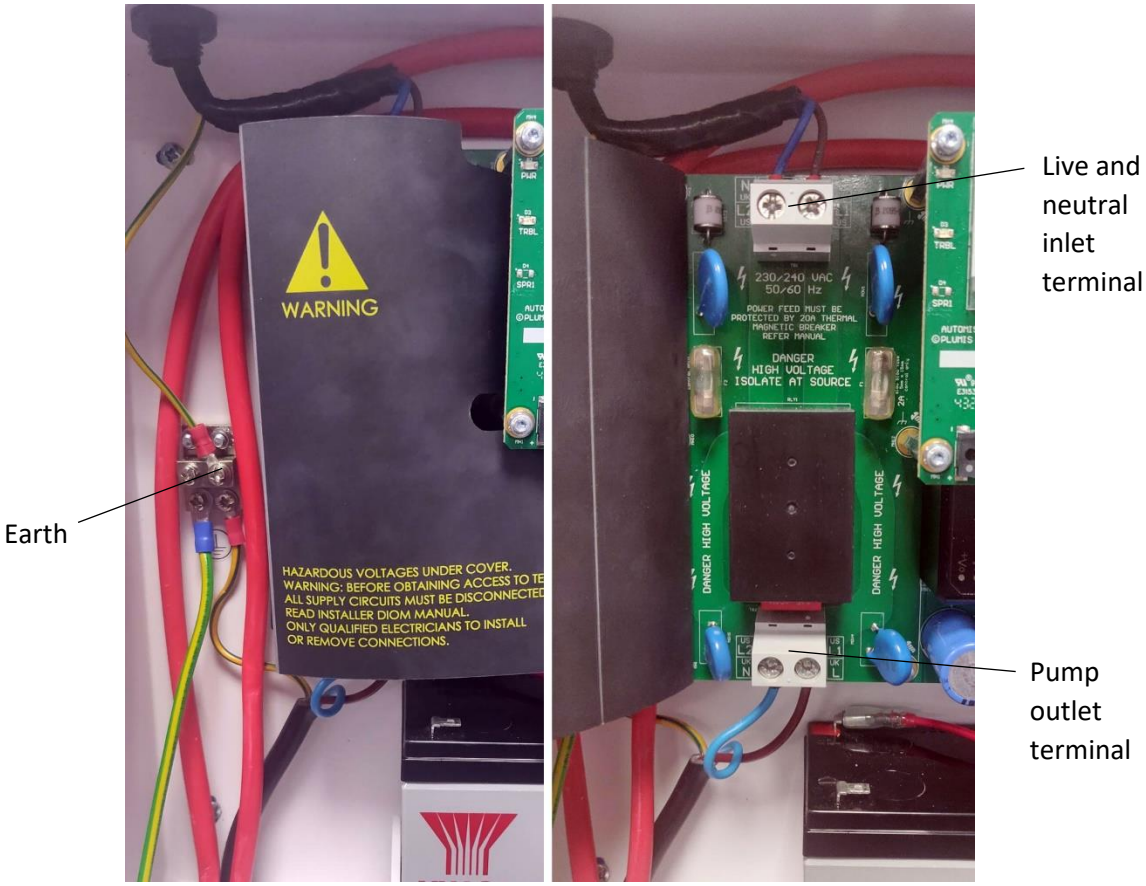

Figure 18: Black plastic PCB high voltage cover tucked closed (left) or open (right)

Tuck the black plastic cover behind the display PCB.

Connect the earth cables from the 230V/240V inlet supply (right photo above) and 230V/240V pump outlet supply to the earth block on the controller (left photo above). In the UK, this is the green/yellow wire and in the US this is the green wire.

7.6.1 Connecting the Backup Battery

When installing or replacing the battery connect the red battery lead to the positive terminal and the black lead to the negative terminal.

The battery should be orientated as shown below to ensure the battery leads are kept away from any of the other cables in the controller.

When connecting the battery for the first time, See section 7.9 commissioning before powering on the system.

Figure 19: Controller Battery

Securely attach the earth wire ring terminal to the lid and secure the lid to the controller with the screws provided.

IMPORTANT: The earth connector to the lid must be connected, failure to do so could result in electric shock causing death or serious injury.

7.7 Pump Installation

The Automist pump should be:

a) located such that it is unlikely to be affected by a fire;
b) located where the temperature can be maintained above 4 °C (39.2 F);
c) protected against the effects of fire; and
d) suitably protected against flooding

To mitigate overheating when running for long periods, the pump must be installed in locations with a clearance of 100 mm from any obstruction.

The pump is supplied with a prewired cable connected to the (internal) solenoid valve. This cable connects to the solenoid 24 VDC + and – terminals on the controller.

Connect the water inlet supply to the pump using a brass or stainless steel 1/4" BSP Parallel Male x M22 x 1.5 Metric Female adapter.

Figure 20: 1/4" BSP Parallel Male x M22 x 1.5 Metric Female adapter

When connecting the adapter to the pump, hold the brass pump inlet connector with a wrench whilst tightening the adapter with a second wrench. This will prevent the inlet pipe in the pump from twisting when connecting the adapter.

Remove the screw and remove the lid of the pump connection point as indicated in the picture below.

Figure 21: How to open the pump connection point

Disconnect the earth ring terminal on the lid to completely remove the lid.

Feed the 230V/240V AC Power cable from the controller through the gland on the pump housing and hand tighten the gland.

Crimp an insulated ring terminal connector M5 stud size to the Live, Neutral and Earth wire of the supply cable.

Connect the 230V AC Power supply to the pump's AC Power terminal as pictured below. For example, in the UK, the red wire terminal is Live, the black wire terminal is Neutral and the green/yellow wire terminal is Earth. In the US, the red and the black wire terminals are the Hot terminals and the green/yellow wire terminal is the earth.

The Earth connection must be used.

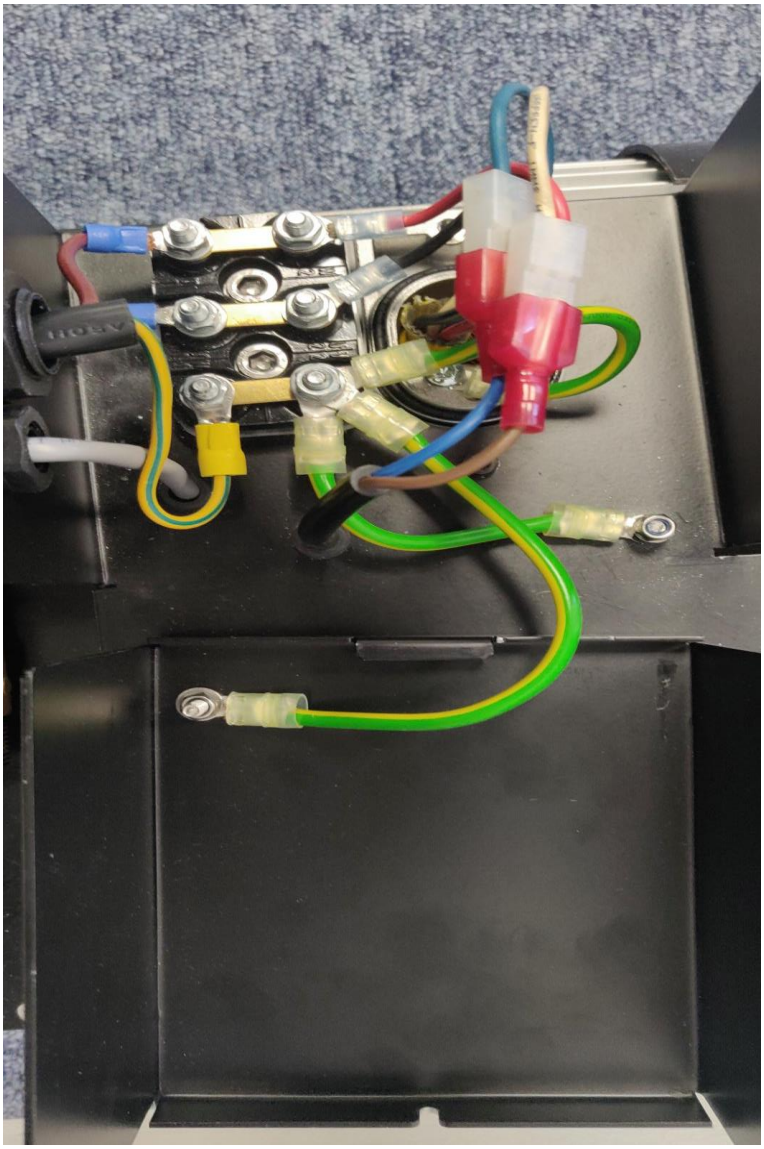

Figure 22: Pump wiring connections

Once all pump wiring connections have been made, reattach the earth terminal to the lid and hook the lid cover back into position. Secure the lid by tightening the lid fixing screw.

IMPORTANT: The earth connector to the lid must be connected, failure to do so could result in electric shock causing death or serious injury.

7.8 Zone Configuration

The Automist system can have up to 10 zones configured to the system. Each room would generally be classed as 1 zone; however, zones could be created from adjoining rooms or sections of a large room which requires more than 3 heads.

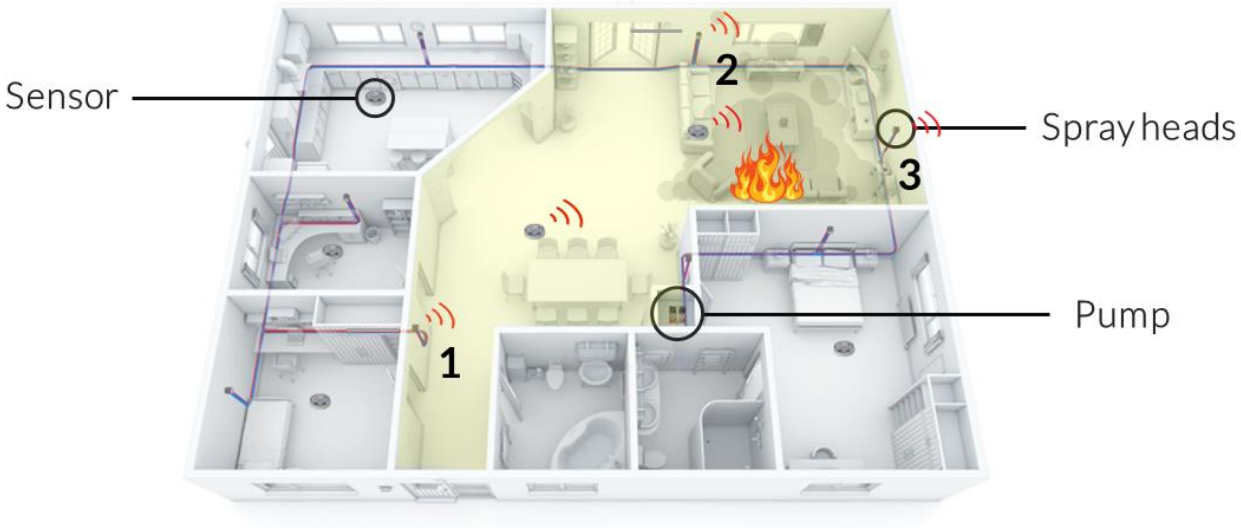

Figure 23: Yellow zone (above) contains 3 wall mounted spray heads and 2 ceiling mounted smoke sensors

Smoke sensors and spray heads are paired together to create a zone. If any sensor in a zone activates the paired spray head(s) will scan the room to look for fire.

The systems zones should be defined in the **Working Plan** and configured by the **Installer.**

Based on 4.3 Technical limitations:

- The same smoke sensor can belong to a maximum of 2 zones.
- Maximum number of Spray Heads per Zone: 3.
- Maximum number of smoke sensors connected in series chain: 2.
- The same spray head can belong to up to 5 zones.

For example, Zone X has 3 heads, Zone Y – 2 heads, Zone Z – 2 heads. Zone X and Y were triggered first, so 5 heads are scanning. Then Zone Z was triggered, but only one of the two heads was added to the scan, because of 6 scanning heads limit. The head that was added from the Zone Z is the one that was poked first during the Commission Address mode.

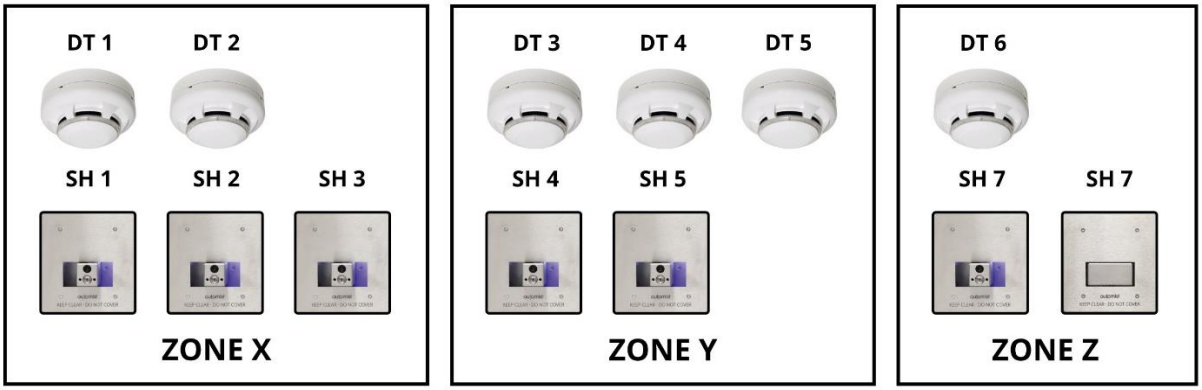

Figure 24: Zone Diagram

7.9 Powering up the system

Connect the battery, see section 7.6.1. Connect the red lead to the positive terminal and the black lead to the negative terminal of the battery.

Secure the lid to the controller and ensure the earth ring is connected to the controller.

Check the pump's wiring cover is securely fitted.

With the controller lid in place. Switch on the AC Power electrical supply to the system.

The controller will carry out a self-test diagnosis and display the Software version number.

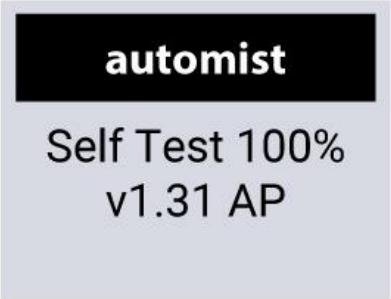

Figure 25: Power up screen

If there are any faults on the system an error code will be displayed, the controller will beep, and the yellow trouble light will flash. See list of error code section for more information on errors and troubleshooting.

If no errors are present the system will be in an uncommissioned state. When the system is not commissioned the spray head LEDs are yellow and the controller is beeping.

The controller will display a prompt to set the time and date.

7.9.1 Setting the time and date

When the system is first powered up, or a commissioned system has been down powered for a long period of time, the controller will go straight to the time and date menu.

The time and date must be set before proceeding further.

If the controller does not go straight to the time and date menu proceed as described below.

To enter the menu mode, hold the LEFT button for 10 seconds. The controller will beep, and the display will show menu 1. Sounder.

Press the DOWN button and the display will change to 2. Time, to change the time press Right button the date will flash, use the UP or DOWN buttons to scroll through and select the correct year.

Press the Right button and scroll up or down to select the correct month.

Press the RIGHT button and use the UP and DOWN buttons to select the correct date of the month.

Press the RIGHT button and the display will show the time with the hours flashing, use the UP or Down button to select the hour. Note the system uses a 24-hour clock so 4 PM would be 16:00.

Press the RIGHT button, the minutes will flash, use the UP or DOWN button to select the correct minutes. Press the RIGHT button to set the programmed time.

When in the menu mode if no buttons are pressed for 1 minute the controller will time out and return to idle mode.

If you need to go back a stage whilst setting the date or time press the LEFT button to go back one stage.

Pressing the LEFT button in the Menu mode will take the controller out of Menu mode.

NOTE: If the system has been down powered for period of time the system date and time may be lost. In this scenario when the controller is powered up, the system will go straight to the time menu. Set the date and time then return the system to idle mode. The display will show system healthy. If an error message occurs consult the error code section on this manual and repair the fault.

When the system is powered up for the first time after setting the time and date the system will be in uncommissioned mode.

7.9.2 Commissioning

Commissioning incorporates five stages:

1. **Addressing**. Where all the spray heads are bound to the system by linking their internal addresses to the RS 485 communication channel between the controller and spray heads.
2. **Spray head and data test**. The spray heads will start scanning and communications will be sent back down the RS 485 data bus to the controller.
3. **Smoke sensors and zoning**. Where the sensors and spray heads are placed into the different zones they have been specified to protect.
4. **Discharge (or flow).** Tests the IR sensor to ensure the sensor can differentiate a temperature of at least 6 degrees C (42.8F). Test each spray head to verify the correct pressure and water flow is being expelled from the nozzle. This replicates a response to a fire while allowing for the water to be collected.
5. **Drainage**. Where the water left in the piping is expelled through the spray heads to return the system to a dry, standby state.

NOTE: After the system has been successfully commissioned and the face plate(s) have been fitted, the installer must complete the smoke sensor test mode to ensure the smoke sensors and spray heads have been paired correctly. See the smoke sensor test mode section (12.2.3) of this manual to complete this process.

7.9.2.1 Commissioning Stage 1 - Addressing

The yellow trouble light will flash on the controller, and the system will beep every 8 seconds, the display will show **Automist Uncommissioned** and the **date (hh:mm)** and **time (YYYY-MM-DD)**.

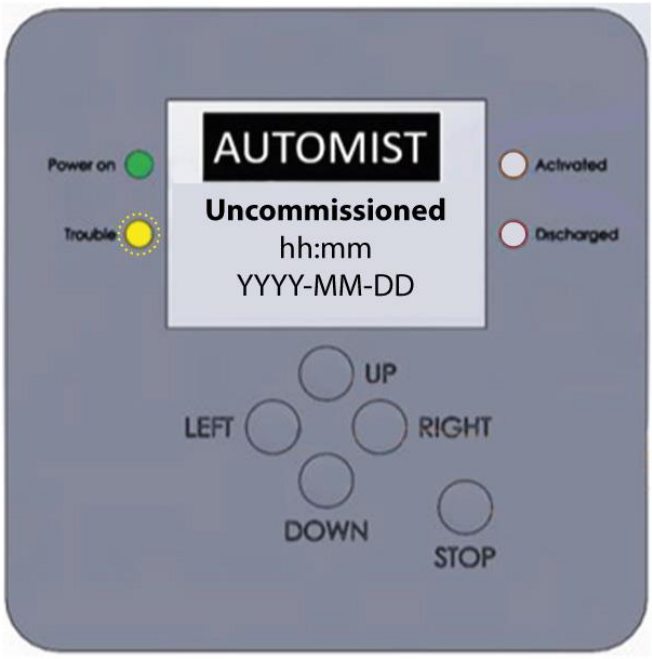

Figure 26: Uncommissioned Controller

Press and hold the LEFT and RIGHT buttons together for 10 seconds to enter the commissioning mode.

The display will show **Commission 1/6** indicating the system is in stage 1, followed by **Total heads 0** and **– Poke heads**.

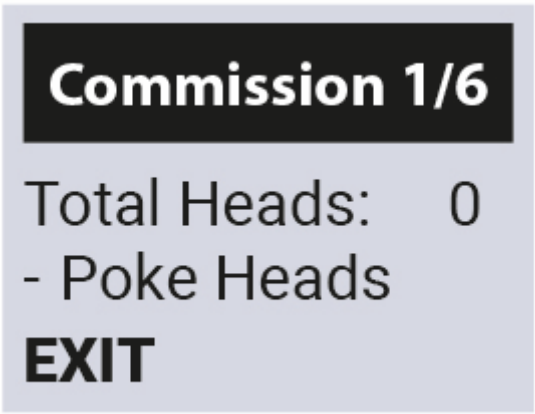

Figure 27: Commissioning Stage 1

Poke each head by briefly and firmly pressing the side of the pivot head.

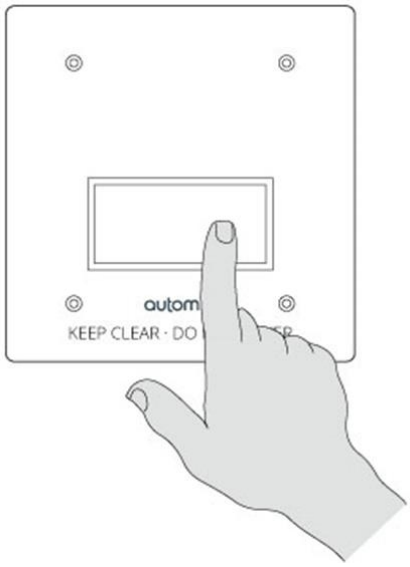

Figure 28: Gently press the outside surface of the spray head with your finger to address it

The spray head's LED will change from flashing yellow to green and the controller will beep to confirm the spray head has been registered to the system.

The display will show **Total Heads 1**.

Repeat the process for all the spray heads connected to the system and check the controller shows the correct number of spray heads registered into the system. If not check all the spray heads are green, if any are flashing yellow, "poke" the head to add it to the system.

When all the spray heads have been programmed press the RIGHT button on the controller.

7.9.2.2 Commissioning Stage 2 - Self-test

The display will show **Testing Heads** with a **progress counter from 0-100%**. The spray heads will start to scan the room during the self-test. When the test is 100% complete the spray heads will return to the flush position with a green light.

The display will then show, **Testing heads: passed.**

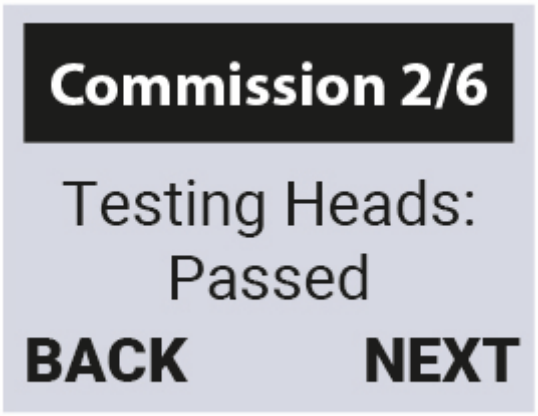

Figure 29: Commissioning Stage 2

On the spray heads that pass the test the LED will light green. On the spray heads that fail the test the LED will light red. This can happen because of either the IR sensor or servo failure. If it does, enter Commissioning Stage 1 - address, unpair the head, and replace with a new one.

If the progress does not reach 100%, The spray head(s) that have bad RS485 connection will not indicate either green or red.

If the self-test fails, check all the spray heads in and out cables are wired the correct way round.

Check the colour of the wires connected to the correct terminal on the spray head and in the controller.

Press the RIGHT button to proceed to the next stage.

7.9.2.3 Commissioning Stage 3 - Zoning Smoke Sensors

Read section 7.8 of this manual explaining how the system is zoned before programming the system.

The display will then show **Commissioning 3/6** to show you have moved to stage 3 and **Total Zones 0** (where the first Zone ID created is 0).

The spray head's LED will change from green to yellow.

Activate the smoke sensor(s) that you want to allocate to Zone 0, the spray head's LED will turn red. The display will change to show **Zone ID : 0** and **Heads : 0**.

Poke the spray head(s) that you want to assign to Zone 0, and the LED will flash green, the number of green flashes indicates the number of spray heads programmed to that zone. These spray heads will scan if the smoke sensor(s) you just assigned activates.

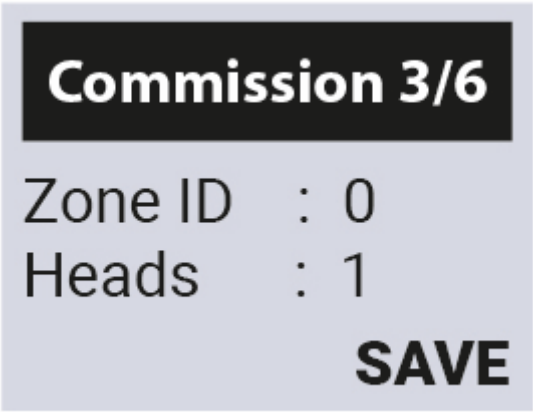

Figure 30: Commissioning stage 3

If you assign a spray head to the smoke sensor in error, poke the spray head again to unpair the spray head with the smoke sensor, the spray head will turn red to indicate it has been unpaired.

When the smoke sensor(s) have been paired with the spray head(s) check the number of heads shown on the display is the correct number of heads assigned to that zone.

Press the RIGHT button to save the allocation, the display will show, **Total Zones 1** and **Trigger Zone**.

To program the next zone, repeat the process of activating the smoke sensor(s) and head(s) that you want to program to the 2nd zone.

The display will count the number of total zones as each new zone is created.
When all zones have been programmed press the RIGHT button to go to the next stage, the display will show **clearing zones please wait** and then move to stage **4/6**.

If you need to delete a zone during stage 3

1. Trigger **all** the smoke sensors that are in the zone.
2. Make the sure display shows **Zone ID: x**, and x is the Zone ID that is about to be deleted.
3. Poke all the heads that have green LED indication. If successful, the head LED will turn red.
4. Press RIGHT on the user interface to finish. Now the display shows **Total Zones: n-1**.

7.9.2.4 Commissioning Stage 4 – Flow test

The display will show **Commission and flow test 4/6** to show you are in stage 4. The display will show the number of heads tested compared to the number of heads programmed into the system.

The spray head's LED will glow red and lock pending head selection. Poke the first spray head the nozzle will point to a 90 degree angle.

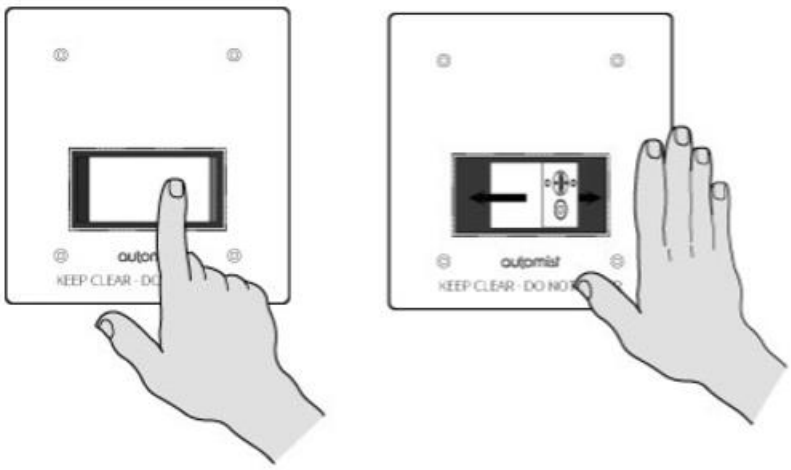

Figure 31: Gently poke the spray head (left) to trigger a heat scan (right)

The nozzle will then rest at a 90-degree position and the LED will turn solid yellow waiting for the flow test to begin.

Connect the commissioning hose (CM06) to the nozzle and place the other end of the hose in a bucket.

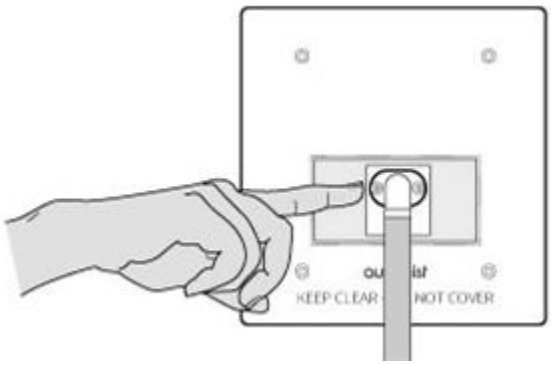

Figure 32: Gently poke the spray head to trigger the pump to run

Gently push the head 45 degrees to initiate the flow test. The head will begin to flash yellow to indicate water is about to flow, during this period the head may be pushed again, or the STOP button can be pressed on the controller to cancel the discharge test.

Once the pump is activated, the head will light blue, and the red discharge light will be illuminated on the controller. At this point, the pump can only be stopped by pressing the STOP button on the controller.

The pump will run for 1 minute, during the last 30 seconds record the pressure reading from the pressure gauge attached to the pump.

The pressure reading must be approx. 90 bar (1305.33 PSI).

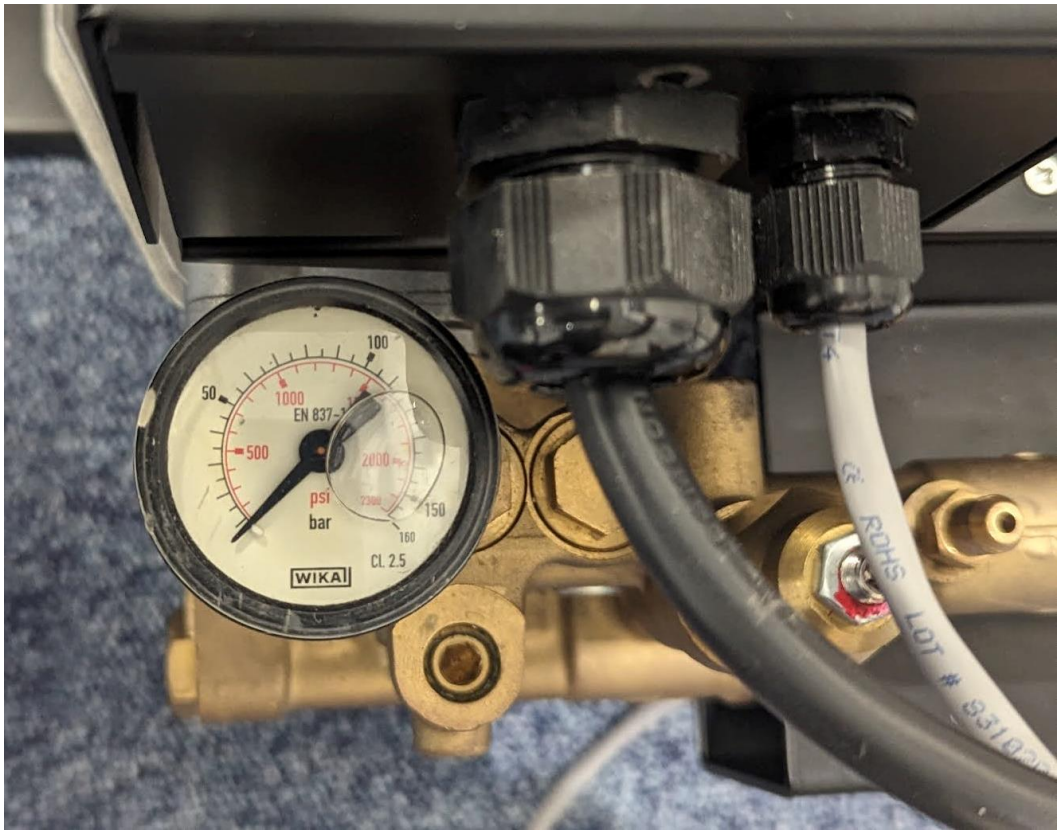

Figure 33: Pump pressure gauge

IMPORTANT! The pump features a cut-out which will disable it if the pressure becomes excessive, so it is critically important not to leave an installed system with an out-of-spec pressure. By leaving an installed system with pressures outside the specified range, you could be liable for deaths or injuries. If the achieved output pressure is outside the specified range, refer to the commissioning troubleshooting guide and contact Plumis if the issue cannot be resolved.

IMPORTANT! Check and record that there are no leaks, use a flashlight to look into the cavity wall to ensure there is no leak from the spray head. Check there are no signs of leaks at the pump or along the high-pressure pipes, especially where there are any joints.

IMPORTANT! The commissioning tool must be removed after the discharge test and the water has stopped flowing into the bucket, otherwise, the spray head cannot return to its parked position.

IMPORTANT! Wipe the spray heads IR sensor dry with a clean dry cloth or tissue, to ensure that there is no water on the IR sensor.

When the commissioning hose has been removed and the sensor dried, poke the spray head. If the flow test has been successful, the head will return to the locked position (inward-looking) and the LED will be green.

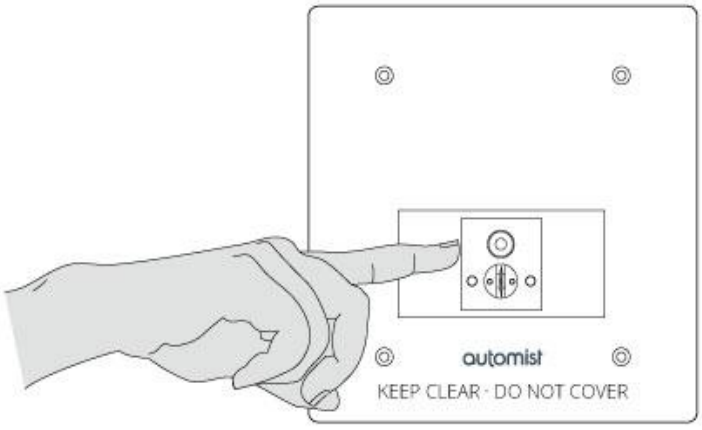

Figure 34: Remove the commissioning hose and gently poke to close the spray head

Repeat the process for every spray head. When all the spray heads have been tested the controller's display will show the number of spray heads tested compared to the number of spray heads programmed in the system. The **NEXT** option will be displayed, you cannot proceed to the next stage until all the spray heads have been flow tested.

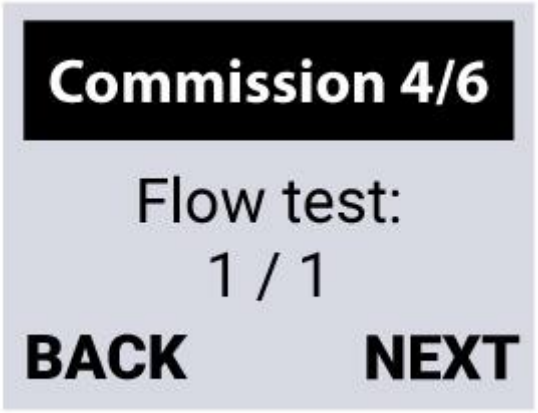

Figure 35: Commissioning stage 4

Remember to record the pressure readings of each spray head tested.

Press the RIGHT button on the controller to go to the next stage.

7.9.2.5 Commissioning Stage 5 - Drainage

The display on the controller will read **Commission 5/6 Drain pipes**. The spray head(s) will flash multi-coloured and return to the locked position to indicate you are in stage 5.

Figure 36: Commissioning stage 5

Connect an air compressor with a Schrader type female connector to the pump's inlet port.

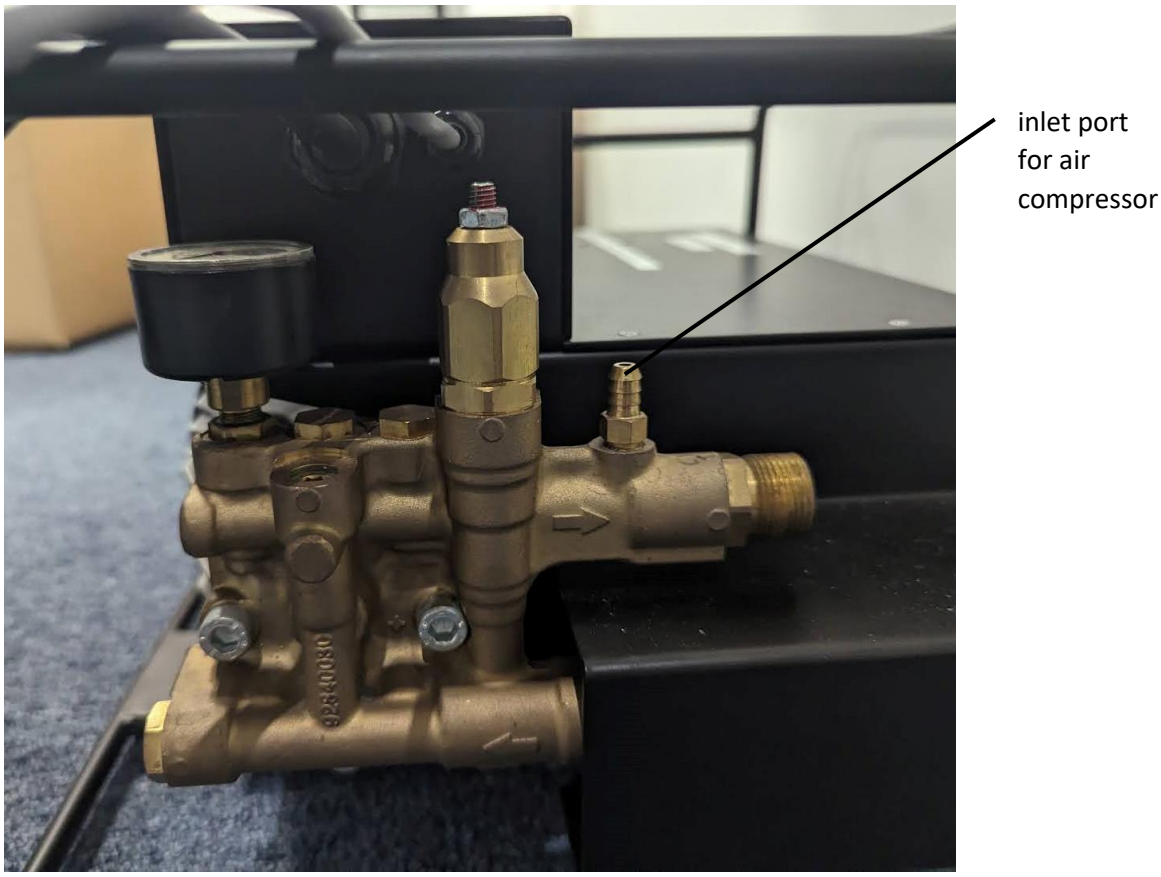

Figure 37: Pump inlet port for air

IMPORTANT! The high-pressure pipe must be cleared of water by an air compressor pump with a maximum pressure of 8 bar (116 Psi). Start with the head that is highest and furthest from the pump, and work your way back to the pump decreasing in height whilst ensuring you open every head in the system in turn.

NOTE: The spray heads when released from the locked position will expel some low-pressure water from the nozzle, be prepared to catch the water in a bucket or paper towel as soon as the spray head is poked.

Poke the first spray head to be drained to release it from the locked position.

Attach the commissioning hose to the nozzle and put the other end of the hose in a bucket to collect the expelled water.

When the air compressor is switched on some air and water will be expelled from the system causing the end of the hose to thrash about in the bucket, secure the end of the hose in the bucket or enlist a 2nd person to hold the end of the hose steady in the bucket.

Run the compressor until no more water is being collected in the bucket and only air is being expelled from the nozzle. The time required to expel the water will vary depending on the pipe routing and pipe lengths.

When the spray head is only expelling air, turn the compressor off and remove the commissioning hose from the spray head.

Use a dry cloth or tissue to ensure any droplets are dried and removed from the thermal sensor.

Poke the head to return it to the locked position, repeat this process and drain the other spray heads one by one.

IMPORTANT! Leaving water in high-pressure pipes following the commissioning/servicing process can lead to dripping nozzles, particularly if any part of the piping passes above the nozzles. To prevent this, the water must be expelled after commissioning.

When all the spray heads have been drained, remove the compressor from the pump inlet air port. The controller will display **NEXT** in the bottom right of the screen, press the RIGHT button to move to stage 6

7.9.2.6 Commissioning Stage 6 – Sensor test

The display will show Sensor test followed by the number of sensors to be tested. The spray heads LED will turn red.

Poke one of the spray heads, the spray head will point at a 90 degree angle and the LED will turn yellow.

Poke the head again and it will return to the locked position and the LED will turn green.

Repeat this process for each spray head, when all sensors have been checked the controller will display **FINISH** and the total number of tested heads will be displayed.

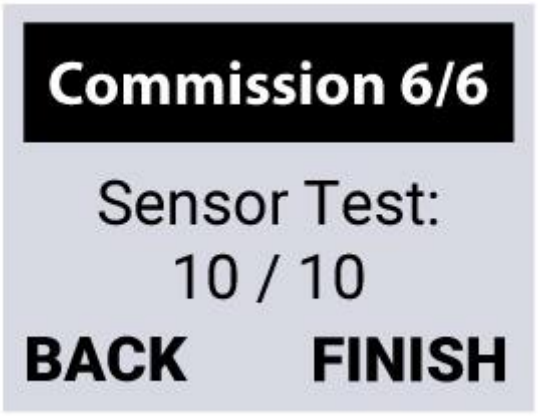

Figure 38: Commissioning stage 6

Press RIGHT on the controller to finish commissioning.

If the sensor test fails, the spray head will remain at a 90 degree angle. Clean the sensor with a soft tissue and poke the spray head again to carry out the test again.

If the sensor cannot be cleaned and continues to fail the test press the LEFT button to go back to Stage 1 and poke the head to decommission it from the system, replace the spray head and repeat the commissioning process to commission the new spray head to the system.

NOTE: The other spray heads will remain commissioned but during the drain pipes stage all nozzles should be drained after flow testing the replacement spray head

The controller will now display **Automist system healthy** and the **time** and ***date*** with the green power on LED illuminated. The spray heads will leave the locked position and return to the flush position.

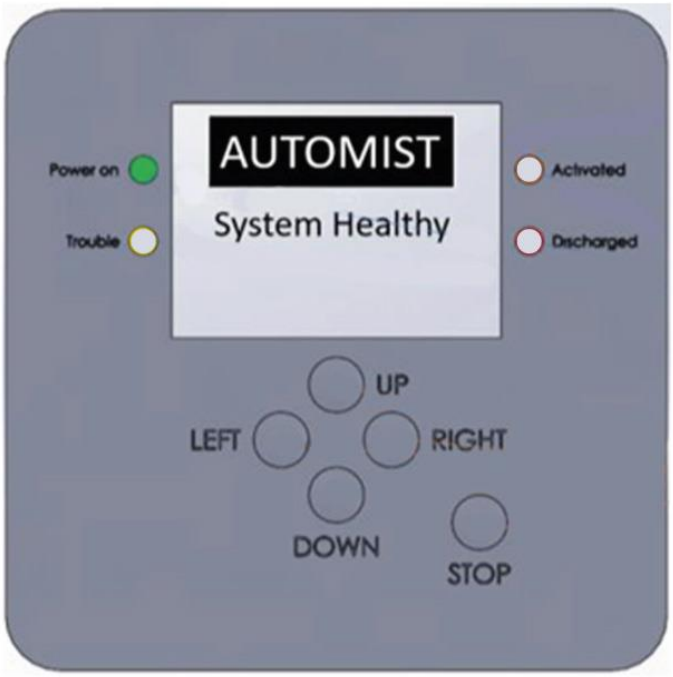

Figure 39: Controller Automist System Healthy

Attach and fasten the front plate to the intermediate plate and align, ensuring parallelism to floor and wall.

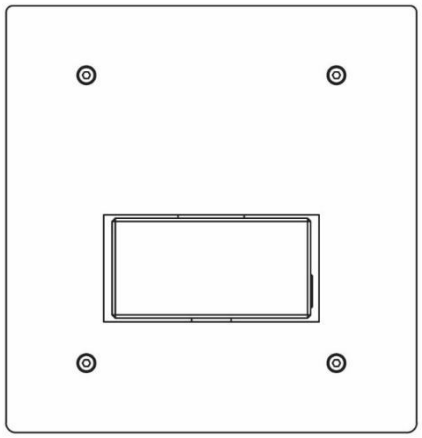

Figure 40: Front plate attached on the spray head

Ensure there is good clearance around the rotating head and the front plate. It is recommended to perform a final sensor test mode to ensure the spray heads have the freedom to rotate. This is incorporated with the smoke sensor test mode. (see section 12.2.3).

7.10 Programming the outputs

The controllers' relays will default to operate as per table the below.

Relay	Configuration	On	Off
1	0 (default)	System is healthy and protecting from fire.	Possible reasons: System is not commissioned. Error in the system. No mains power supply.
	1	Error in the system.	System is healthy and protecting from fire.
	2	Power is on.	No mains power supply.
2	0 (default)	System is in scanning mode: smoke sensor activated.	System is not scanning for fire.
	1	Error in the system.	System is healthy and protecting from fire.
	2	Possible reasons: 1. System is in scanning mode: smoke sensor activated. 2. Fire is being suppressed: fire found, system is in mode pump and pump is running.	System is not scanning for fire and pump is not running.
3	0 (default)	Fire is being suppressed: fire found, Pump is activating.	System is not in Pump mode or stop button was pressed during the suppression.

Relay 3 is reserved for activating when the pump is running. If you want to reallocate the function of relay 1 and 2.

NOTE: Ensure the system is not in commissioning mode.

Hold the LEFT button for 10 seconds, the system will display **Sounder**, press the DOWN button twice and the display will show **Relays**.

Press the RIGHT button and the display will show **Relays config** and **Relay 1.**

Press the UP or DOWN buttons to navigate between relay 1 2 or 3.

Press the RIGHT button to **SELECT** the relay's function to be changed.

The display will show **Configure** and the **relay number** you are configuring the curser will flash on the relay configuration option number.

Press the UP or DOWN button to select either 0, 1 or 2 as described in the table above press the RIGHT button to **SET** the desired relay configuration.

The display will show SAVING and return to the relay config screen.

Keep pressing the LEFT button to go **BACK** to return the system to **System Healthy** idle mode.

NOTE: when in the Menu mode, if a button is not pressed for 1 minute the system will time out and revert back to idle mode, any changes not saved will need to be reprogramed by following the steps above.

7.11 Erasing the controller's memory

Power cycle (switch the AC Power off and on) the system before attempting to recommission if the system has been powered for more than 1 hour.

IMPORTANT! Once returned to factory settings (default) , the system will need to be fully commissioned including the flow test before the system can be returned to operational mode.

To erase the memory and return to the factory default settings, hold the RIGHT and LEFT buttons for 10 seconds to enter commissioning stage 1.

Hold the stop button for 10 seconds, the memory will be erased, and the system will beep and return to stage 1.

8 Spray Head Position and Location

8.1 Design Criteria

The placement of Automist sprayheads is governed by simple design criteria. A single Automist spray head has a maximum 6 m (19.69 ft) range in front and 4 m (13.12 ft) range on either side along the wall. The spray pattern acknowledges it is easier for Automist to address fires in front of the spray head as opposed to alongside it.

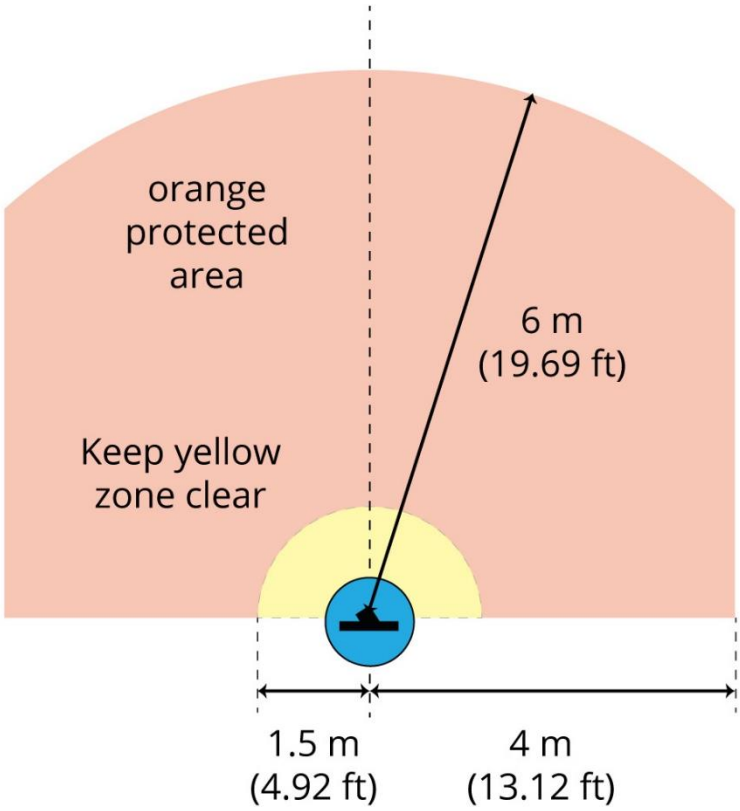

Figure 41: Automist spray pattern

IMPORTANT! Keep clear 1.5 m (4.92 ft) radius around the head (see below) of obstructions and fire loads (e.g. white goods, sofas, microwaves).

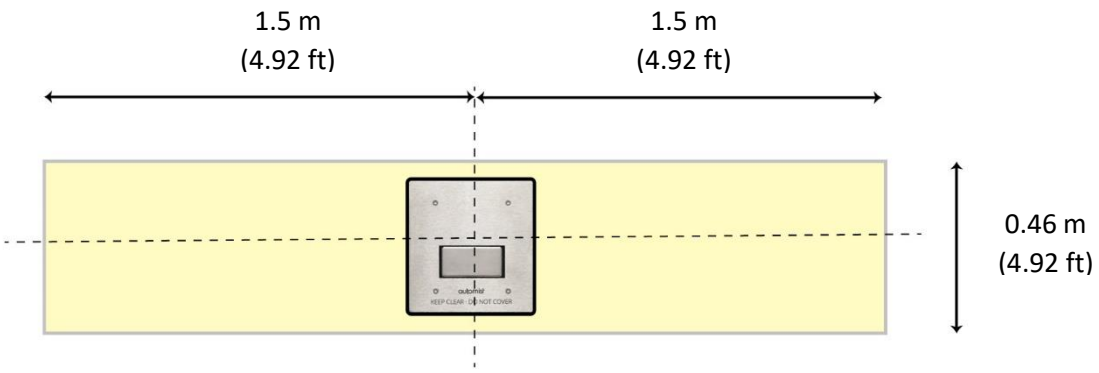

Figure 42: Front view of the keep clear zone

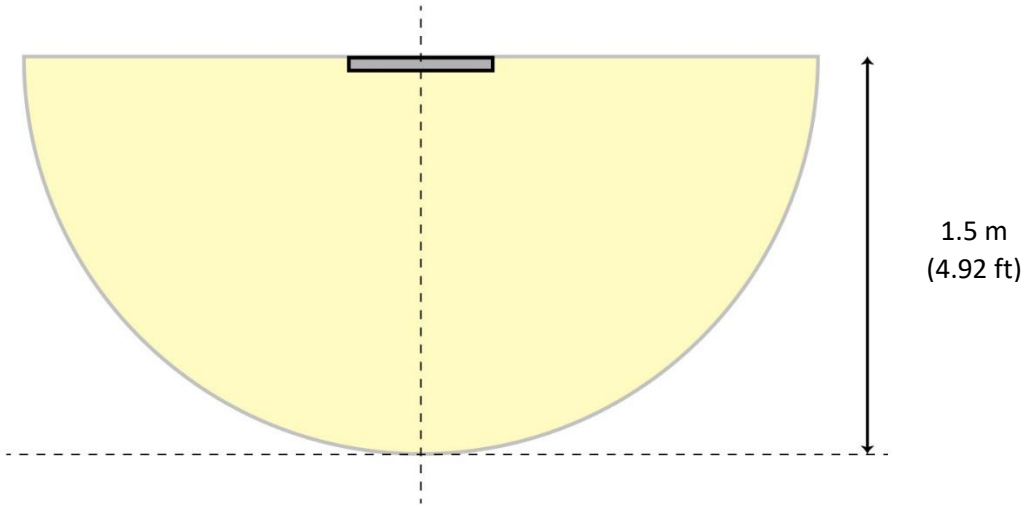

Figure 43: Top view of the keep clear zone

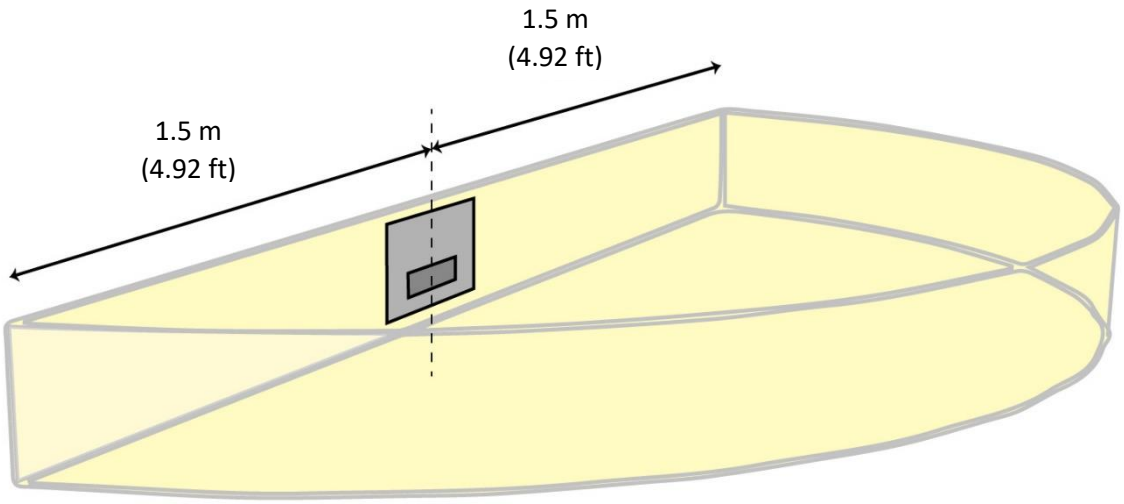

Figure 44: Profile view the keep clear zone

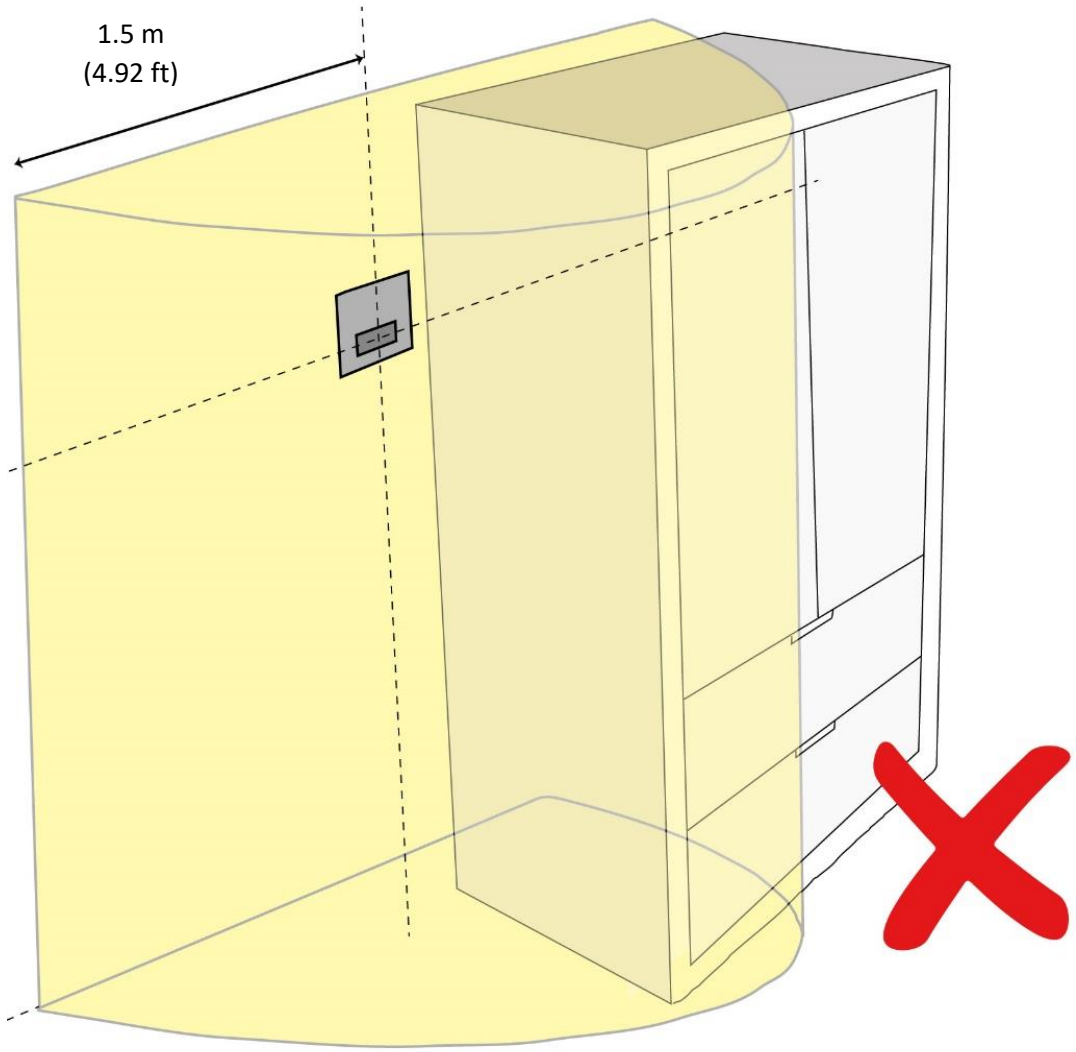

Figure 45: Obstructions are not allowed in the keep clear zone

Visibility extends radially from each mist head and ends wherever there is an obstruction. If an obstruction is fixed (e.g. a kitchen island with splashback, large fridge, bookshelf, or a built-in wardrobe) and equal or more than 0.9 m (2.95 ft) high, it must be regarded as blocking the line of sight from any spray head positioned within 3 m (9.84 ft) and reflected in the working plan. Obstructions higher than 0.9 m (2.95 ft) and wider than 0.3 m (0.98 ft) must be regarded as blocking the line of sight at any distance.

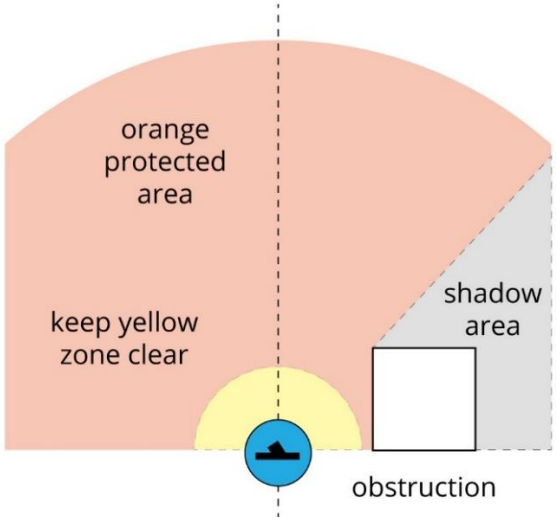

Figure 46: Automist obstruction

An obstruction can impact the ability of an active fire suppression system to suppress a fire and its objective to cap the fire growth (limit the production of heat and toxic gas). The obstruction risk for the Automist system differs from traditional ceiling-mounted systems. The following must be considered (but not limited to):

	Traditional ceiling-mounted suppression	**Automist**
Spray head	Ceiling mounted	Wall mounted
Obstruction Plane	Horizontal	Vertical
Examples of obstruction to either detection or suppression	Concealed fires (e.g. under worktops and cupboards, fire under a table), light fixtures, HVAC ducting, ceiling fans, beams girders under joints, and high wardrobes under the nozzle.	Large wall-mounted furniture (e.g. a fridge, a bookcase, wall cupboard, cabinet or wardrobe) too close (horizontally) to the spray head.

This excludes a householder disabling the suppression system by fully obstructing the spray head or by creating de facto room partitions is akin to wilfully removing fire alarms, decorating/painting over concealed sprinkler heads, or removing sensors and are beyond the scope of this recommendation.

IMPORTANT! The Automist head must be located where the spray pattern will not be obstructed and 1.5 m (4.92 ft) horizontal clearance provided 180 degrees around the spray head. Where the sprayhead cannot be located away from an obstruction, an additional sprayhead shall be located to cover the other side of the obstruction.

The overall objective of a working plan is to ensure the coverage pattern covers all the square footage within the property. The maximum allowable single shadow area (unprotected space) follows 13D best practice of:

- 1.4 m^2 per nozzle
- 1.7 m^2 per nozzle if it covers an architectural feature such as a bay window or box window.

8.2 Position of Spray Heads

The spray head must be installed at a height between 1.2 m – 1.3 m (3.39 ft – 4.27 ft) from the finished floor level. The height is measured from the finished floor level to the nozzle.

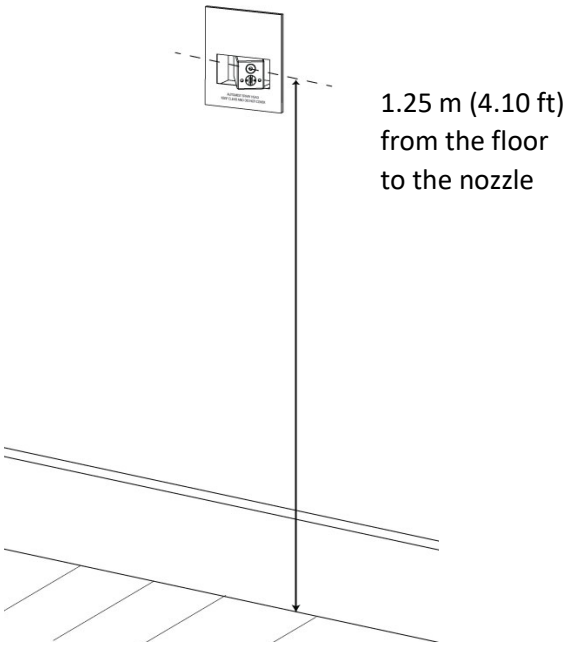

Figure 47: Automist nozzle height

If mounting above a worktop, the spray head must be located at least 100 mm (3.94 inch) from the bottom of the upper cupboard (so the spray pattern is not affected by the cupboard above), and as high as possible above a worktop up to 400 mm (15.75 inch) (to help is clear any potential worktop objects).

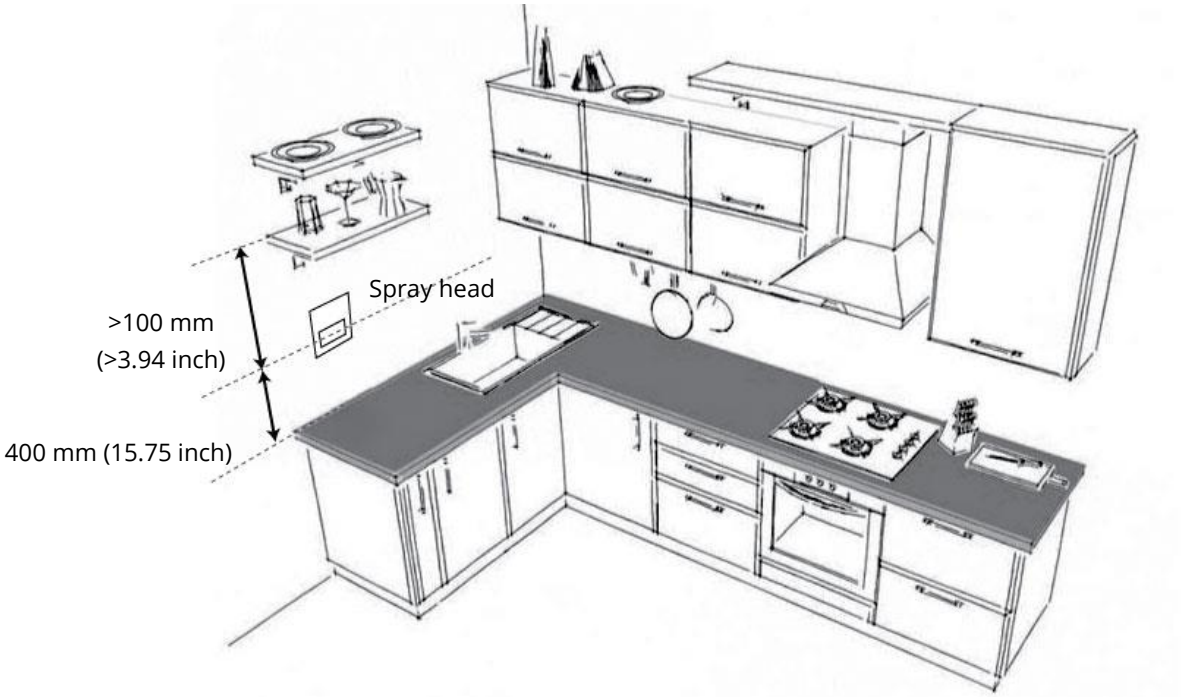

Figure 48: Automist spray head above a worktop

The spray head must be positioned at least:

- 1.5 m (59.06 ft) away from any hob
- 1.5 m (59.06 ft) away from any oven (if in direct line of sight)
- 3 m (118.11 ft) away from any log burners or small fireplaces
- 0.3 – 0.5 m (11.81 – 19.69 ft) away from the window frame edge to allow space for curtains

Figure 49: Clearance either side of a window

- 0.55 m (21.66 ft) away from an internal corner, If the spray head is too close to a corner it can be obstructed by movable furniture on the adjacent wall.

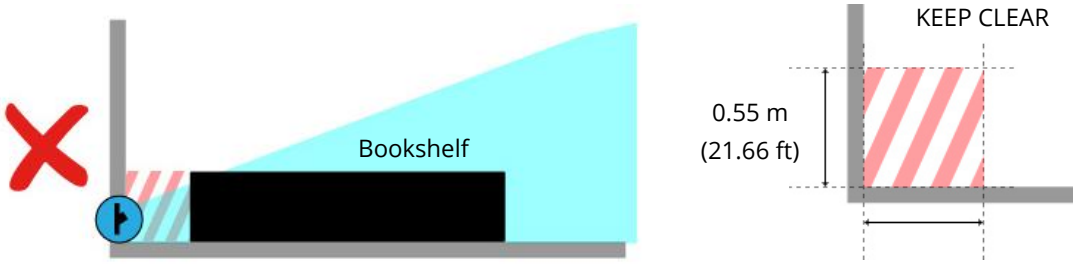

Figure 50: Bookshelf blocking a spray head (left) in keep clear zone an internal corner (right)

- 0.9 m (35.43 ft) from the door hinge so the head is not located behind the door and is considerate of the direction of the swing.

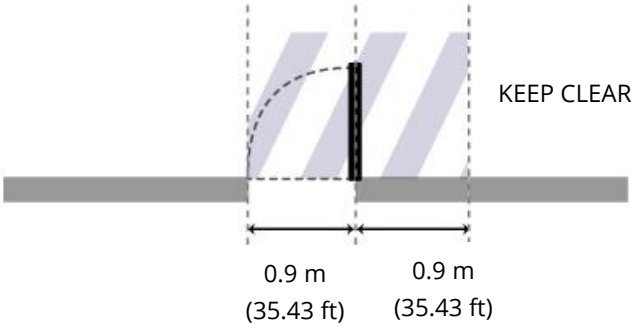

Figure 51: 0.9m (35.43 ft) away from the door hinge

Locate the spray heads in positions considerate of the principals below (where 1 supersedes 2, and 2 supersedes 3):

1. **Select a position where the likelihood of placing something directly in front of the spray head is reduced.**
   Although the spray head is engraved with KEEP CLEAR and DO NOT COVER, use the proximity to a feature in the room where people are less likely to put something against the wall (e.g. alongside a light switch, or above a radiator).

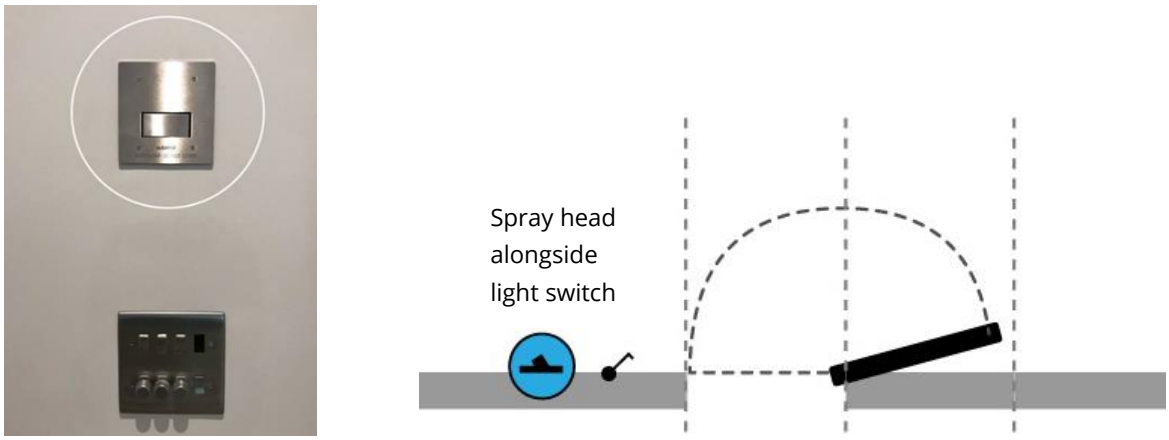

Figure 52: Spray head alongside light switch picture (left) diagram (right)

2. **Select a position with a direct and unobstructed line of sight to the fire risks.**
   Ensure most of the potential fire risks are in front of the spray head (e.g. the kitchen hob and white goods under the work surface). Typically, the only large movable item of furniture in the kitchen is the fridge. If all worktops, the oven, and the hob are 45 degrees in front of the spray head, only obstructing the spray head directly will obscure the view of the main fire risks. This configuration reduces the potential impact of placing something alongside the spray head.

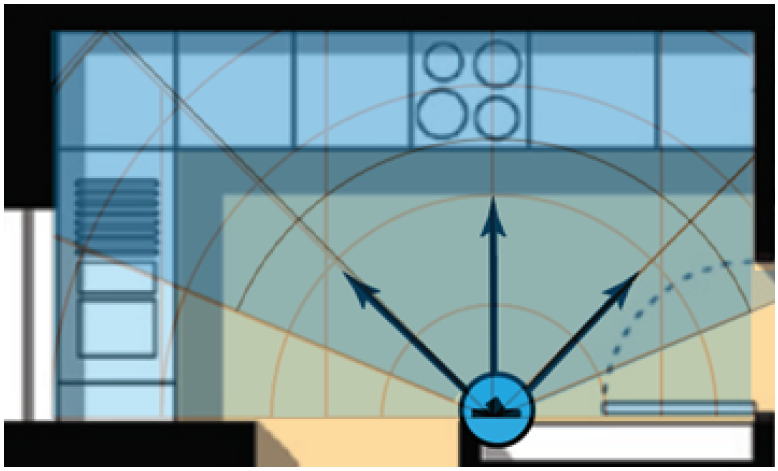

Figure 53: Example of a good spray head location with a good line of sight to the kitchen fire risks

In an open-plan living room, the staircase is often an ideal location opposite the likely fire sources, such as the wall-mounted TV, sofa, and fireplace.

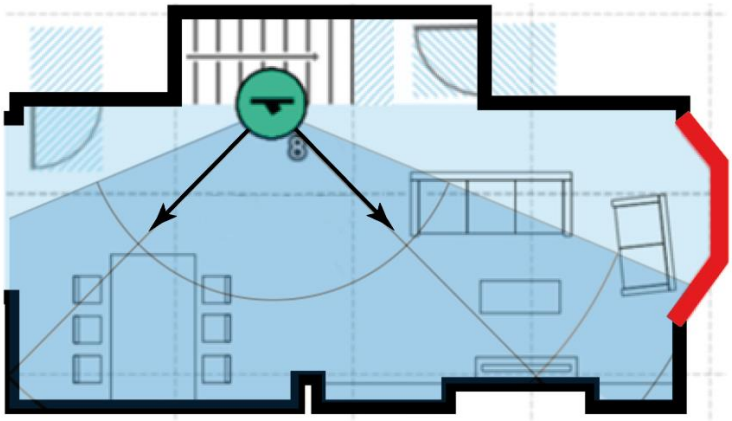

Figure 54: Example of a good spray head location with a good line of sight to the living room fire risks

3. **Select a position where the impact of placing something alongside the spray head is reduced.**

Each room has a main risk in terms of tall moveable furniture (e.g. The fridge in a kitchen, the TV entertainment cabinet, tall drawers in a living room, or a wardrobe in a bedroom). The risk of obstruction is increased the longer the wall is, so shorter walls are preferred. In a rectangular room, it is preferable to spray with the length of the room, as opposed to across the length of the room assuming this does not conflict with a primary or secondary objective. As you can see (below) an obstruction alongside the head, removes more coverage for the latter.

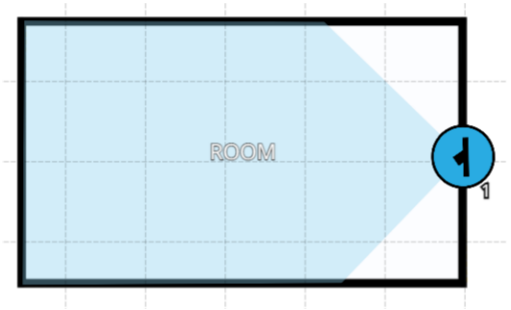

Figure 55: Spraying with the length of the room

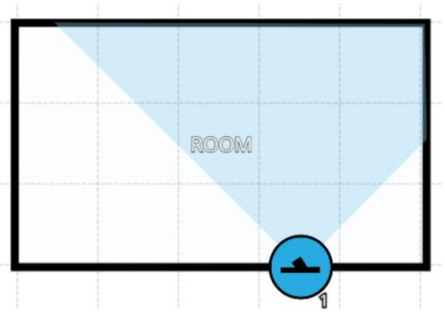

Figure 56: Spraying across the length room

If there is a concern a spray head may be obstructed, it is advisable to add another spray head into the affected room to add redundancy.

8.3 Working Plan Drawing

Plumis offers an online working plan tool to facilitate the positioning of spray heads. The Automist installation should be designed to facilitate easy maintenance. Parts requiring service or access (e.g. the pump and controller) should be installed in an accessible location.

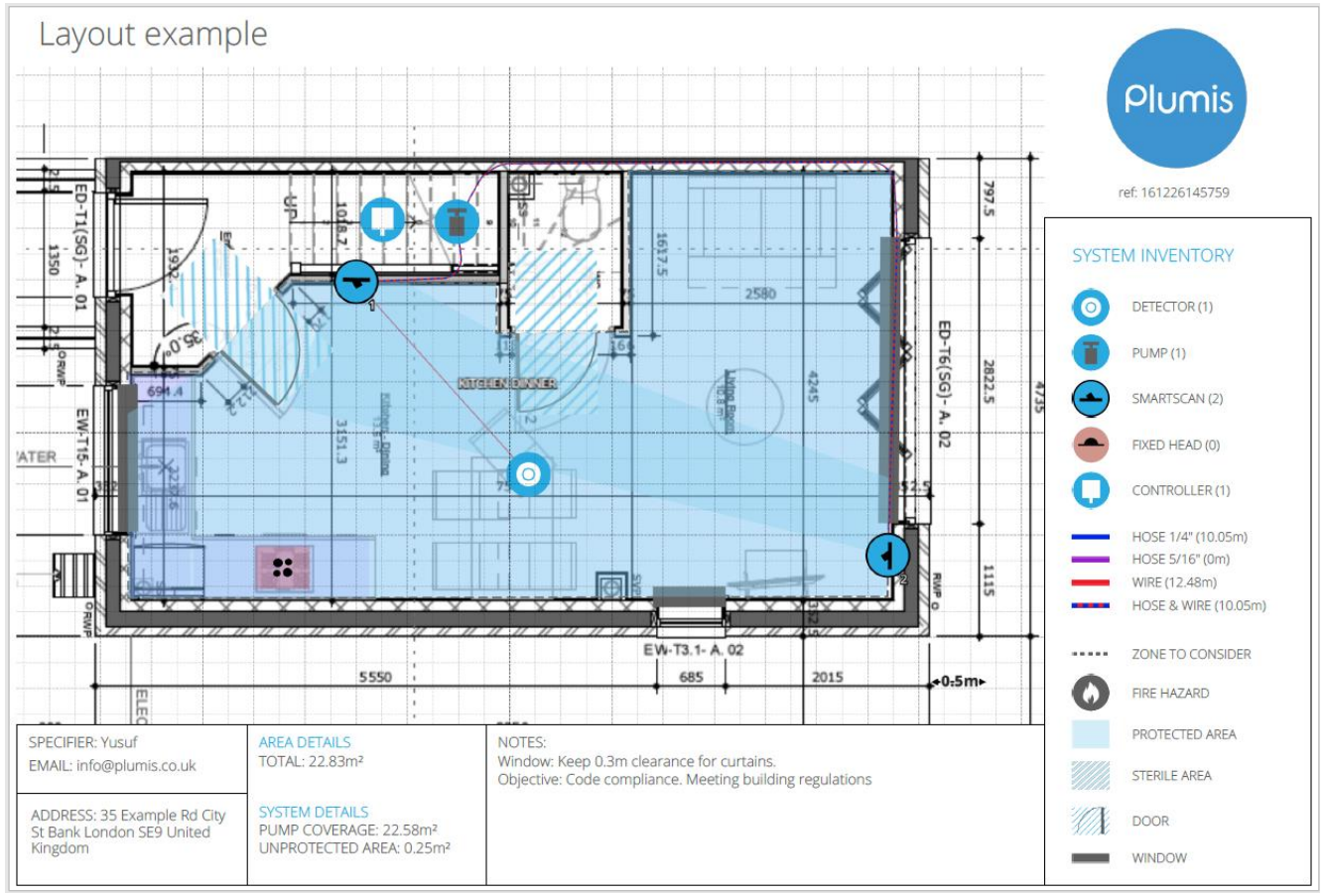

Figure 57: Annotated Working Plan

8.4 Location of Spray Heads

When the system is used to meet the Building Code, the locations of spray heads and therefore the coverage or protected area should follow the requirements in NFPA 13D 8.3. NFPA 13D 8.3 details which type of room requires suppression (e.g. small bathrooms, closets, pantries, garages, attics and rooms in a tiny house).

When the system is used as a fire safety upgrade for enhancing an otherwise code-compliant dwelling, for example, for asset protection or homeowner elective installation, the rooms which require suppression is defined by the AHJ (see definitions).

9 Smoke Sensor Position and Location

9.1 Design Criteria

Detectors should be installed in accordance with NFPA 72 where there is a conflict with the following rules, the Plumis rules below must be followed.

9.2 Position of Smoke Sensors

1) Where smoke sensors are installed, no bedroom door should be further than 3 m (9.84 ft) from the nearest smoke sensor.
2) Sensors within rooms should be cited such that no point is further than 5.3 m (17.38 ft) from the nearest smoke sensor.
3) Sensors must be mounted on ceilings and should be located at least 300 mm (11.38 inch) horizontally from any wall, border of a zone or light fitting unless, in the case of light fittings.
4) Ceiling-mounted sensor bases must be fixed directly to the ceiling and not countersunk.
5) Where structural beams create an obstacle to the flow of smoke across a ceiling the beam must be considered as a wall:
    a. The sensor must not be located on the beam.
    b. Sensors must be provided on both sides of the beam.
    c. The sensor must not be located closer than 300 mm (11.38 inch) to the beam.
6) Sensors should not be mounted adjacent to, or directly above, heaters or air-conditioning vents.
7) Sensors should be mounted in positions that are reasonably accessible for maintenance.
8) Sensors should be located close to the middle point of the longest diagonal line for a zone with only one sensor. If a zone has multiple sensors, they should be located along the longest diagonal line and have equal spacing between them.
9) A maximum of 2 sensors can be on any one circuit.

9.3 Smoke Sensor Working Plan

The location of the smoke sensors must be marked on the main working plan. See 8.3 includes all the core components that make up the system.

9.4 Smoke Sensor Location

Smoke sensors should be installed in all the rooms which have a spray head.

10 Hydraulic Calculations

Automist is a pre-engineered system as per NFPA 3.3.13.7. All components connected to the water supply are designed to be installed according to pretested limitations. It has a maximum total pipe length of 60 m (196.85 ft). All fire tests were performed with the worst-case scenario; 60m total pipe lengths with an inner diameter of 8 mm (5/16”).

Pipe Flow/Friction Factor Calculations I: (U.S. units)

1. *Calculation of Head Loss, h_L, and Frictional Pressure Drop, ΔP_f, for given flow* rate, Q, pipe diam., D, pipe length, L, *pipe roughness, ε, and fluid properties,* ρ *&* μ.
   Determine Friction Factor, f, assuming completely turbulent flow

$$f = [1.14 + 2\log_{10}(D/\varepsilon)]^{-2}$$

Pipe Diameter, D_{in} = 0.315 in, Pipe ID = 8 mm

Pipe Diameter, D = 0.0263 ft

Pipe Roughness, ε = 0.00015 ft, Commercial Steel

Friction Factor, f = 0.03159

Pipe Length, L = 98.43 ft, Max Length = 30 m

Cross-Sect. Area, A = 0.0005 ft^2

Pipe Flow Rate, Q = 0.006 cfs, Max Flow rate = 9.4 l/min

Ave. Velocity, V = 10.2 ft/sec

Fluid Density, ρ = 1.94 slugs/ft^3, Water

Reynolds number, Re = 25,595

Fluid Viscosity, μ = 0.00002034 lb-sec/ft^2, 70 F (room temperature)

2. *Check on whether the given flow is “completely turbulent flow”.*
   (Calculate f with the transition region equation and see if differs from the one calculated above.)

$$f = \{-2*\log_{10}[((\varepsilon/D)/3.7)+(2.51/(Re*(f^{1/2}))]\}^{-2}$$

Transition Region Friction Factor, f: *f = 0.0348*

Repeat calc of f using the new value of f: *f = 0.0347*

Repeat again if necessary: *f = 0.0347*

3. *Calculate h_L and ΔP_f, using the final value for f calculated in step 2:*

$$h_L = f(L/D)(V^2/2g) \text{ and } \Delta P_f = \rho g h_L$$

Frictional Head Loss, h_L = ***211.40 ft***

Frictional Pressure Drop, ΔP_f = ***13193 psf***

Frictional Pressure Drop, ΔP_f = ***91.62 psi*** *or* ***6.32 bar***

11 Acceptance

11.1 General

The system must be commissioned in the following circumstances.

- Once all the components of the system have been installed and the system is powered.
- As part of a yearly maintenance cycle.
- If plumbing or construction work takes place, new smoke sensors are installed, or maintenance work occurs which could affect the system.
- After an activation following a fire.
- Commissioning must be performed by a trained Installer.

Press and hold the LEFT and RIGHT buttons for 10 seconds to enter commissioning mode. You can only enter commissioning mode within 60 minutes of the system powering on, this is to avoid unwanted uncommissioning.

12 Inspection, Testing and Maintenance

The maintenance requirement for Automist is once per year. the maintenance consists of a visual inspection, smoke sensor tests and recommissioning the spray heads.

12.1 Inspection

The controller should show **system healthy** on the display panel, if there are any error messages displayed or the system is beeping consult the troubleshooting section of this manual.

Ensure there is 1.5 m (4.92 ft) clearance around the spray heads, if an obstruction has been placed in sight of the spray head the homeowner should be instructed in writing to remove the obstruction.

During the service, it is required to inspect the mesh through the inspection port on the pump and clean the mesh when contamination is found.

Inspect the smoke sensors to ensure they are clean and have not been painted or covered up.

Determine whether any modifications have been carried out and whether the working plan is still accurate. If there has been a material alteration to the building beyond the scope of NFPA 13D, an assessment should be made as to whether the category of system is still appropriate.

12.2.1 Smoke Sensor Sensitivity Test

During the annual service, a sensitivity test should be carried out on the EVCA-PY-PL smoke sensor(s).

It is recommended to use the Trutest™ smoke sensitivity tester manufactured by detector testers. See the manufacturer's instructions for how to carry out the sensitivity test.

- The Trutest™ device must be set for use with photoelectric detectors.
- It is recommended the test is carried out using the slow ramp feature.
- The EVCA-PY-PL is a low-profile device.
- The EVCA-PY-PL is a photoelectric device.
- The sensitivity of the EVCA-PY-PL sensor must be in the range of 3.56%/ft to 4.78%/ft. If the sensor fails the sensitivity test it must be cleaned and retested, if the sensor fails again, it must be replaced.

12.2.2 Smoke sensor activation test

During the smoke sensor test mode see section (12.2.3). the following procedure should be used to test the smoke sensors. Sensors offer maximum performance when tested and maintained in compliance with NFPA 72. The sensor may be tested in the following ways:

1. To test the optical sensor using HSI FIRE & SAFETY Aerosol canned smoke testers HO-25S or HO-30S. From a distance of 2 to 4 ft. (0.6 to 1.2 m) aim spray for 1 - 2 seconds at the vents on the side of the sensor. The sensor will activate within 1 to 10 seconds if the sensor is functioning properly.

2. If using Smokesabre™ aerosol gently pull the sabre so it is fully extended. Hold the can vertically close to the sensor. Spray the sensor in 1-second bursts every 10 seconds as necessary.

3. Check that the sensor gives an alarm condition within 15 seconds. Check the red LED indicator lights on the sensor. If the red LED fails to light, check the power to the sensor and the wiring in the sensor base.

4. After the sensor has given the alarm condition, the sensor is reset by the control unit. It may be necessary to allow a short time to elapse before resetting the sensors, to allow any residual smoke from the test to disperse.

5. Sensors that fail these tests should be cleaned as described under the Cleaning the Smoke Sensors Section (below) and retested. If the sensors still fail these tests they should be replaced.

6. Before proceeding to the next sensor, ensure that the sensor previously tested does not re-operate due to the presence of residual aerosol.

12.2.3 Smoke sensor test mode

Once the system is commissioned smoke sensor test mode allows you to test the sensors in the home without activating the Automist pump, by causing the paired heads to begin scanning. Sensor testing is a normal part of the system's maintenance:

- In the ***System healthy*** idle mode, press and hold the Right button for 10 seconds to enter the *Test Mode*.
- The display will show ***Test Mode***.

- Test the smoke sensor(s) (as detailed in 12.2.2). All paired heads flash yellow then red and scan, non-paired heads flash yellow then red but remain closed. The orange activated LED will flash on the controller while the spray head is scanning.
- Test all smoke sensors in turn and ensure the correct head(s) perform the scan when the sensor(s) are tested.
- The smoke sensor test mode is deactivated by pressing the STOP button; this will be confirmed by the GREEN LED returning to constantly lit and the display showing ***System healthy***.
  In this mode after a 15-minute period of inactivity, the system will time out and return to idle mode, and the display will show ***System healthy***.
- After the test is complete ensure, the LED is not lit on the smoke sensor and the spray head is not scanning before leaving the test mode.

NOTE If during the smoke sensor test mode, the incorrect spray heads are scanning, reconfigure the zones in stage 3 of the commissioning process to ensure the correct smoke sensor(s) are paired with the correct spray head(s).

12.3 Maintenance

Spray head weekly test

Once the system has been commissioned, the spray head(s) will move approximately 5 degrees once per week. The week Is counted from the day the system is commissioned. This test will take place at 15:00 every week. There is a small noise emitted as the motor moves and resets the spray head.

NOTE If the system is power cycled where the AC Power supply and battery are disconnected and reconnected, this test will occur every 7 days from the day the system is powered up.

This is normal and it is recommended customers are made aware that this test is carried out automatically, so the resident does not assume a fault with the system if they see the spray head(s) briefly moving.

Cleaning the Smoke Sensors

IMPORTANT! Sensors must be serviced at least annually.

It is recommended that the smoke sensor be removed from its mounting base for easy cleaning and that sensors be cleaned at least once a year.

Do not disassemble, repair, or modify the smoke sensors. It may cause a fire or electric shock.

1. Carefully remove the sensor head from its base.
2. Use a soft, lint-free cloth, moistened with alcohol for sticky deposits, to clean the plastic enclosure.
3. Using a soft bristle brush (e.g. an artist’s paintbrush) carefully brush between the vanes in a linear motion away from the apertures on the plastic enclosure.

4. Ensure that no debris remains on or around the photo chamber once cleaning is complete.
5. Reinstall the sensor.
6. Test the sensor according to the section below, Testing the sensors.
7. Set the system back to normal operation mode.

Replace the consumables

- Replace the standby battery every 5 years.
- Replace the smoke sensors every 10 years.

12.3.1 Recommissioning after an activation

IMPORTANT! Even a small fire in close proximately to any components could cause damage to parts of the system. It is important to inspect the full system post an incident.

After an activation the display will show **uncommissioned** and the Yellow LED flash on the controller. The spray head that activated will be pointing at the angle of the fire, the other spray heads will be in the locked position looking inwards.

After the pump has activated all the spray heads and smoke sensors in the zone that activated should be visually inspected for damage, tested, and recommissioned. The infrared sensors of the spray heads in the zone that activated should be cleaned.

All smoke sensors should be inspected and tested in smoke sensor test mode. The smoke sensor(s) in the zone that activated must be replaced.

Enter commissioning mode.

At stage 4, recommission all the spray heads in the zone that activated and any that may have been affected by the fire.

At stage 5, expel the water from **all the spray heads** connected to the system.

12.4 Troubleshooting

If the Automist controller detects a fault the yellow LED will flash, and the controller will beep. The display will show an error ID code. Use the table below to identify the description of the error code and the suggested corrective action to resolve the issue.

The controller can be silenced by pressing the stop button. If after 12 hours the fault is still present the controller will start beeping again.
Only by addressing and repairing the fault can the system be permanently silenced and returned to standby mode.

ID	Name	Description	Diagnostics and fixing
0	NO_ERROR	No error.	N/A
1	ERR_HEAD_ERROR_MOTOR_HIGH_CURRENT	Spray head servo motor overcurrent.	1. Find which spray head is flashing 1x red pulse per cycle. 2. Investigate if something is preventing the nozzle from scanning. 3. If no obvious reason – replace the spray head.
2	ERR_HEAD_ERROR_READING_TEMPERATURE	The spray head is not able to read the temperature.	1. Find which spray head is flashing 2x red pulse per cycle. 2. Replace the spray head. The most likely reason for this failure is a damaged spray head (internal wiring).
3	ERR_HEAD_ERROR_MOTOR_POSITION	This error ID is only used to represent error 79 (ERR_SERVO_FEEDBACK_OUT_OF_RANGE) as head LED blinks.	Check Error ID 85 (ERR_HEAD_FAILED_WIGGLE_TEST).
4	ERR_HEAD_ERROR_COMMS_LOST	No communication between the controller and the spray head. NOTE: This is the error detected by the head. When the controller detects the same error, it displays ID 14.	1. Find which spray head is flashing 4x red pulse per cycle. 2. If the system has been commissioned, make sure the spray head with the error has been poked during commission address mode. If not – return to commissioning. 3. Check the RS485 wiring. 4. Replace the spray head. If other spray heads are also in the same error – replace the controller.
5	ERR_HEAD_ERROR_RESERVED_ID2	N/A	N/A
6	ERR_HEAD_ERROR_RESERVED_ID3	N/A	N/A

7	ERR_HEAD_ERROR_SMOKE SENSOR_SHORT_CIRCUIT	The smoke sensor input on the spray head is shorted. NOTE: Smoke sensor input on the head should not be used!	1. Find which spray head is flashing 7x red pulse per cycle. 2. Check the smoke sensor wiring. 3. If the smoke sensor connected to the spray head is okay – replace the spray head.
8	ERR_HEAD_ERROR_RESERVED_ID4	N/A	N/A
9	ERR_HEAD_ERROR_WATCHDOG _RESET	Spray head software is getting stuck.	1. Find which spray head is flashing 9x red pulse per cycle. 2. Restart the system. 3. If the error happens again, replace the spray head.
10	ERR_HEAD_ERROR_READING_FLASH	Spray head configuration memory failed.	1. Find which spray head is flashing 10x red pulse per cycle. 2. Replace the spray head.
11	ERR_HEAD_ERROR_WRITING_FLASH	N/A	1. N/A
12	ERR_HEAD_ERROR_RESERVED_ID5	N/A	N/A
13	ERR_HEAD_ERROR_IN_MOTION	The spray head detects long continuous servo movement and cannot take an accurate temperature reading (causing blurred images).	1. Find which spray head is flashing 13x red pulse per cycle. 2. Check if the nozzle still scans freely. If yes – find the reason (e.g., the controller is requesting it to move). 3. If there is no external reason stopping its movement the servo feedback might be broken. Replace the spray head.
14	ERR_COMMS_LOST_WITH_HEAD	Controller – spray head communication is lost. The same as ID = 4 but seen from the controller side.	1. Check the RS485 bus wiring. 2. Find if any of the spray heads are flashing 14x red pulse per cycle. This will reduce the scope of diagnostics. 3. If the wiring is ok, replace the spray head. 4. If the error persists – replace the controller. NOTE: If replacing the head that was commissioned, first go to Commissioning Stage 1 - Addressing and unpair it (if possible). Otherwise, the controller will give this error until the fault is rectified.
15	ERR_CTLR_COMMANDS_FAILING	Certain commands of RS485 communication with the spray head is failing.	1. Check the RS485 bus wiring (e.g. integrity of wiring and connections). 2. Replace the spray head. 3. If the error persists – replace the controller.

16	ERR_CTLR_PAIRED_SMOKE SENSOR_NOT_BROADCASTING	N/A	N/A
17	ERR_SMOKE SENSOR_OPEN_CIRCUIT	Commissioned smoke sensor end-of-line resistor is not detected.	1. Check if every smoke sensor is secured on its base. 2. Check the smoke sensor's wiring. 3. If the wiring is correct, replace the spray heads one by one, so see that it has a wired connection to the smoke sensors. 4. If the error persists - replace the controller.
18	ERR_SMOKE SENSOR_WIRELESS_BATTERY_LOW	N/A	N/A
19	ERR_SMOKE SENSOR_WIRELESS_GENERAL_FAULT	N/A	N/A
20	ERR_SMOKE SENSOR_DIRTY_SENSOR	N/A	N/A
21	ERR_SMOKE SENSOR_TAMPER	N/A	N/A
22	ERR_READING_FLASH	Controller configuration memory is failed.	Replace the controller.
23	ERR_WRITING_FLASH	N/A	N/A
24	ERR_BUTTON_STUCK	The user interface button is pressed for more than 30 seconds.	1. Make sure the buttons are not being held or stuck (e.g. because of some dirt). If possible – remove the cause of the stuck button. 2. Replace the controller.
25	ERR_DIRECT_SMOKE SENSOR_SHORT_CIRCUIT	The smoke sensor input on the controller has been shorted.	1. Check the wiring of the smoke sensors to the controller. 2. If no short circuits are present – replace the controller.
26	ERR_SM_COMMS_AR_LOST	Controller internal communication error.	1. Disconnect the battery. 2. Power cycle the controller. 3. Reconnect the battery. 4. If error persists – replace the controller.
27	ERR_SM_COMMS_HV_LOST		
28	ERR_SM_COMMS_PM_LOST		
29	ERR_SM_COMMS_UI_LOST		
30	ERR_SM_COMMS_AR_COMMANDS_FAILING		
31	ERR_SM_COMMS_HV_COMMANDS_FAILING		

32	ERR_SM_COMMS_PM_COMMANDS_FAILING		
33	ERR_SM_COMMS_UI_COMMANDS_FAILING		
34	ERR_PUMP_TEST	The pump motor test failed.	Possible cause: a. Short circuit (motor + wiring resistance < 0.3 Ohms). b. Open circuit (motor + wiring resistance > 3 Ohms). c. Residual voltage (> 1V) detected on the motor and the test cannot be started. d. At least one motor wire is shorted to the ground. e. The resistance measurement circuit is faulty. To resolve: 1. Check the wiring between the controller and pump and make sure the resistance is within limits. 2. If the wiring is correct – replace the controller.
35	ERR_MAINS_MONITORING	The AC Power monitoring circuit is faulty.	Replace the controller.
36	ERR_HV_DCDC_FAIL	Controller internal failure.	Replace the controller.
37	ERR_SOLENOID_1_FAULT	Solenoid fault 1.	Possible cause: 1. Open Circuit. 2. Short Circuit. 3. Short to ground or power supply. To resolve: 1. Check the Solenoid 1 wiring. 2. Replace the Solenoid 1. 3. If the error persists - replace the controller.
38	ERR_SOLENOID_2_FAULT	Solenoid fault 2.	Possible cause: 1. Open Circuit. 2. Short Circuit. 3. Short to ground or power supply. To resolve: 1. Check the Solenoid 2 wiring. 2. Replace the Solenoid 2.

			3. If the error persists - replace the controller.
39	ERR_AR_RELAY_FAULT	The controller relay outputs driving circuit is faulty.	Replace the controller.
40	ERR_GROUND_FAULT_LIMIT_LOW	Ground is shorted to 0V.	1. Check the wiring. 2. Find which node shorts ground to 0V and replace. 3. If the error persists - replace the controller.
41	ERR_GROUND_FAULT_LIMIT_HIGH	Ground is shorted to 24V.	1. Check the wiring. 2. Find which node shorts ground to 24V and replace. 3. If the error persists - replace the controller.
42	ERR_COMM1_24V_FAULT_LIMIT_LOW	Controller RS485 bus 24V voltage is too low.	1. Disconnect all the wires from the controller RS485 primary connector. 2. If this error goes away – connect node by node to find which node is causing the voltage to drop. 3. If the error persists – replace the controller.
43	ERR_COMM1_24V_FAULT_LIMIT_HIGH	Controller RS485 bus 24V voltage is too high.	1. Disconnect all the wires from the controller RS485 primary connector. 2. If this error goes away – connect node by node to find which node is causing the error. 3. If the error persists – replace the controller.
44	ERR_COMM2_24V_FAULT_LIMIT_LOW	N/A	N/A
45	ERR_COMM2_24V_FAULT_LIMIT_HIGH	N/A	N/A
46	ERR_COMM1_24V_DRIVE_FAULT	Controller RS485 bus 24V circuit failure.	Possible reasons: 1. Undervoltage / Overvoltage. 2. Overcurrent. 3. Reverse current. 4. Overheat. Steps to resolve: 1. Disconnect all the wires from the controller RS485 primary connector. 2. If this error goes away – connect node by node to find which node is causing the error.

			3. If the error persists – replace the controller.
47	ERR_COMM2_24V_DRIVE_FAULT	N/A	N/A
48	ERR_COMM1_OVERCURRENT_FAULT	Controller RS485 bus 24V overcurrent.	1.25 A current limit is exceeded. Steps to resolve: 1. Disconnect all the wires from the controller RS485 primary connector. 2. If this error goes away – connect node by node to find which node is causing the error. 3. If the error persists – replace the controller.
49	ERR_COMM2_OVERCURRENT_FAULT	N/A	N/A
50	ERR_COMM1_MID_LEVEL_FAULT_LIMIT_LOW	RS485 bus communication lines A or B are shorted to 0V.	1. Check the wiring. 2. Disconnect node by node till the error goes away. 3. Replace the broken node (spray head). 4. If the error persists by disconnecting all the nodes – replace the controller.
51	ERR_COMM1_MID_LEVEL_FAULT_LIMIT_HIGH	RS485 bus communication lines A or B are shorted to 24V.	1. Check the wiring. 2. Disconnect node by node till the error goes away. 3. Replace the broken node (spray head). 4. If the error persists by disconnecting all the nodes – replace the controller.
52	ERR_COMM2_MID_LEVEL_FAULT_LIMIT_LOW	N/A	N/A
53	ERR_COMM2_MID_LEVEL_FAULT_LIMIT_HIGH	N/A	N/A
54	ERR_PRES_5V_FAULT_LIMIT_LOW	N/A	N/A
55	ERR_PRES_5V_FAULT_LIMIT_HIGH	N/A	N/A
56	ERR_PRES_IN_FAULT_LIMIT_LOW	N/A	N/A

57	ERR_PRES_IN_FAULT_LIMIT_HIGH	N/A	N/A
58	ERR_SND_24V_FAULT_LIMIT_LOW	The sounder's driving voltage is too low.	1. Disconnect sounder. 2. If the error goes away – replace the sounder. 3. If the error persists - replace the controller.
59	ERR_SND_24V_FAULT_LIMIT_HIGH	The sounder's driving voltage is too high.	1. Disconnect sounder. 2. If the error goes away – replace the sounder. 3. If the error persists - replace the controller.
60	ERR_SND_END_OF_LINE_RESISTOR_FAULT	The sounder end-of-line resistor is not detected.	1. Check the sounder wiring. 2. Make sure the end-of-line resistor is present. 3. Replace the sounder. 4. If the error persists – replace the controller.
61	ERR_SND_OVERCURRENT_FAULT	The sounder's using too much current.	Current has exceeded 200 mA. 1. Check the wiring. 2. Replace the sounder. 3. If the error persists – replace the controller.
62	ERR_SND_DRIVE_FAULT	Controller sounder driving circuit failure.	Possible reasons: 1. Undervoltage / Overvoltage. 2. Overcurrent. 3. Reverse current. 4. Overheat. Steps to resolve: 1. Disconnect the sounder. 2. If this error goes away – replace the sounder / check the wiring. 3. If the error persists – replace the controller.
63	ERR_PUMP_DRIVE_FAULT	Controller pump driving circuit failure.	Replace the controller.
64	ERR_PM_BATTERY_VOLTAGE_LIMIT_LOW	The backup battery is disconnected or very low voltage.	The measured battery voltage is < 8V. 1. Make sure the battery is connected. 2. Make sure the battery voltage is > 8V. 3. If the error persists after connecting a good battery – replace the controller.

65	ERR_PM_BATTERY_UNDERVOLTAGE_LIMIT	The backup battery voltage is low.	The measured battery voltage is < 11V. 1. Wait for a few hours, the battery should charge automatically, and the error will disappear. 2. If the error doesn't go away – replace the battery. 3. If the error persists after replacing the battery – replace the controller.
66	ERR_PM_BATTERY_OVERVOLTAGE_LIMIT	The backup battery voltage is too high.	Measured battery voltage is > 14.5V. 1. Check the wiring. 2. Replace the battery. 3. If the error persists – replace the controller.
67	ERR_PM_CHARGER_FAULT	N/A	N/A
68	ERR_PM_5V_FAULT	N/A	N/A
69	ERR_PM_3V3_FAULT	Controller internal error.	Replace the controller.
70	ERR_PM_BATTERY_TEST_FAULT	The backup battery is faulty.	The measured battery internal resistance + wiring resistance is > 0.2 ohms. 1. Check the connections. 2. Replace the battery. 3. If the error persists – replace the controller.
71	ERR_PM_24V_FAULT_LIMIT_LOW	Controller internal error.	Replace the controller.
72	ERR_PM_24V_FAULT_LIMIT_HIGH	Controller internal error.	Replace the controller.
73	ERR_PM_REF_VOLTGE_LIMIT_LOW	Controller internal error.	Replace the controller.
74	ERR_PM_REF_VOLTGE_LIMIT_HIGH	Controller internal error.	Replace the controller.
75	ERR_OS_FAULT	The controller failed to initialize. Some functions might not work.	1. Disconnect the battery. 2. Power cycle the controller. 3. Reconnect the battery. 4. If the error persists – replace the controller.
76	ERR_SW_UPDATE_FAULT	The controller failed to initialize. Some functions might not work.	1. Disconnect the battery. 2. Power cycle the controller. 3. Reconnect the battery.

			4. If the error persists – replace the controller.
77	ERR_RTC_HARDWARE	Controller internal error.	Replace the controller.
78	ERR_PCB_TEMP_SENSOR_HARDWARE	N/A	N/A
79	ERR_SERVO_FEEDBACK_OUT_OF_RANGE	The spray head's main body position is not in the requested position.	Possible cause: 1. The main body is stuck. 2. The Servo motor is faulty. To resolve: 1. Find which head is producing this fault. 2. If no obvious reason (e.g., some external body is not allowing the head to move) - replace the head.
80	ERR_SETTINGS_DATA_LOST	The controller configuration is not valid / lost.	Possible cause: 1. The very first power on. 2. EMC noise during configuration saving. 3. Controller internal fault. To resolve: 1. Disconnect the battery. 2. Power cycle. 3. Reconnect the battery. 4. If the error persists – replace the controller.
81	ERR_HEAD_TOO_MANY_BAD_PIXELS	The spray head temperature sensor is faulty.	The spray head has more than 7 bad pixels. 1. Find which spray head is faulty. 2. Replace the spray head.
82	ERR_RTC_TIME_LOST	System time has been lost due to the discharged supercapacitor.	1. Enter the time and the error will be cleared. 2. Make sure that the system has been powered up for at least an hour (to charge the supercapacitor). 3. If fully powering off and powering on (with the battery disconnected) is causing this error to re-appear – replace the controller.
83	ERR_PM_TEMP_SENSOR_HARDWARE	The temperature sensor responsible for battery charging is not working, battery cannot be charged.	Replace the controller.

84	ERR_UI_LED_DRIVER_HARDWARE	User Interface LEDs and LCD backlight are not working.	Replace the controller.
85	ERR_HEAD_FAILED_WIGGLE_TEST	During periodic head movement, one or more spray heads have reported at least one of the following errors: • (1) ERR_HEAD_ERROR_MOTOR_HIGH_CURRENT • (2) ERR_HEAD_ERROR_READING_TEMPERATURE • (3 / 79) ERR_SERVO_FEEDBACK_OUT_OF_RANGE / ERR_HEAD_ERROR_MOTOR_POSITION The spray head that has failed is blinking yellow. The number of blinks represents the error.	1. Check which spray heads are blinking red or yellow. 2. Count the number of blinks between long pauses. 3. Check the reference of actions for each of the errors. 4. Press the STOP button to clear the error.

13 Appendix

Table of Figures

