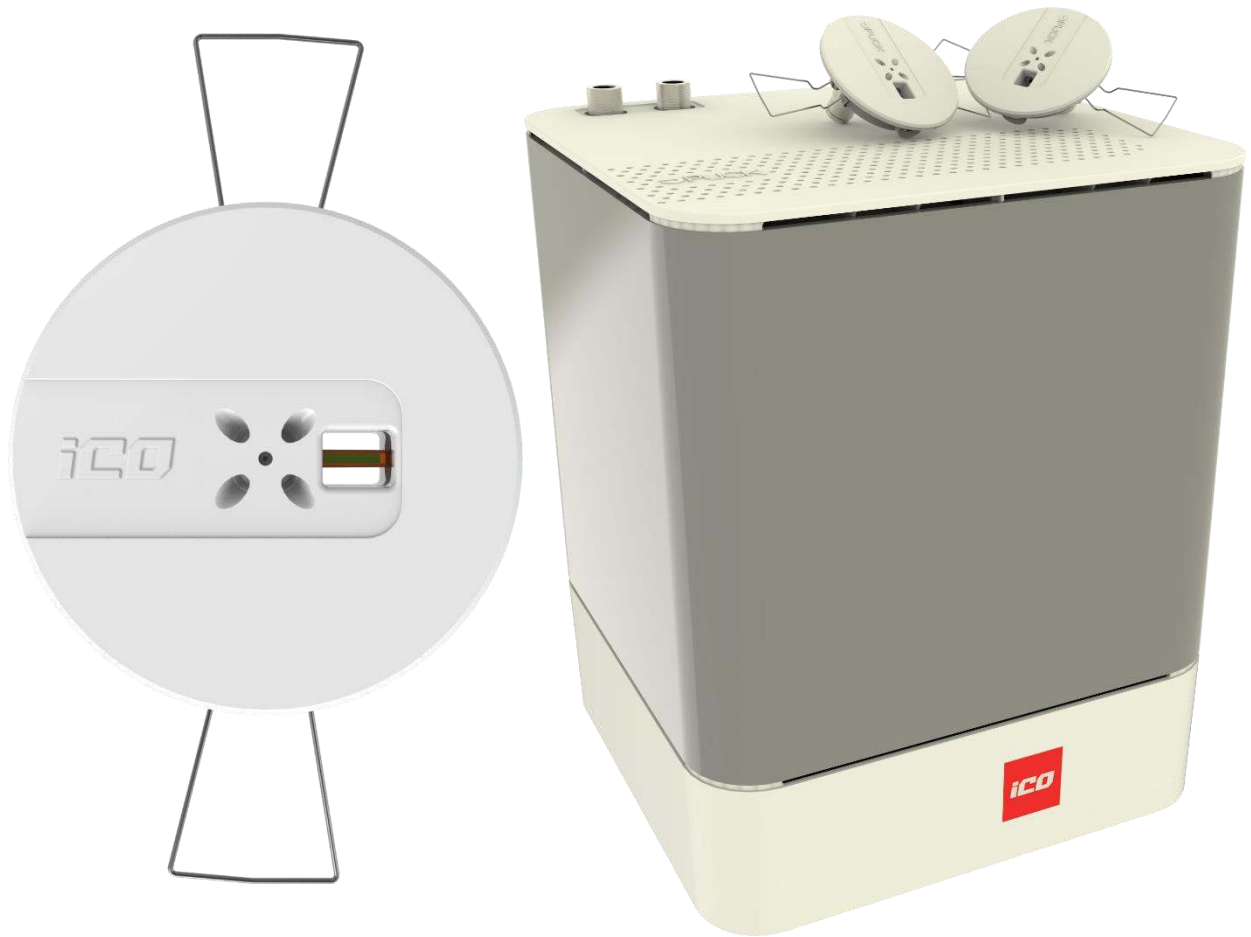




SYSTEM MANUAL



Schedule of Amendments

Revision	Date	Description of amendments:
Revision 14	03/06/19	Formatting Updated Introduction Updated Information on stainless steel pipework and fittings added Updated power supply recommendations Online certificate removed

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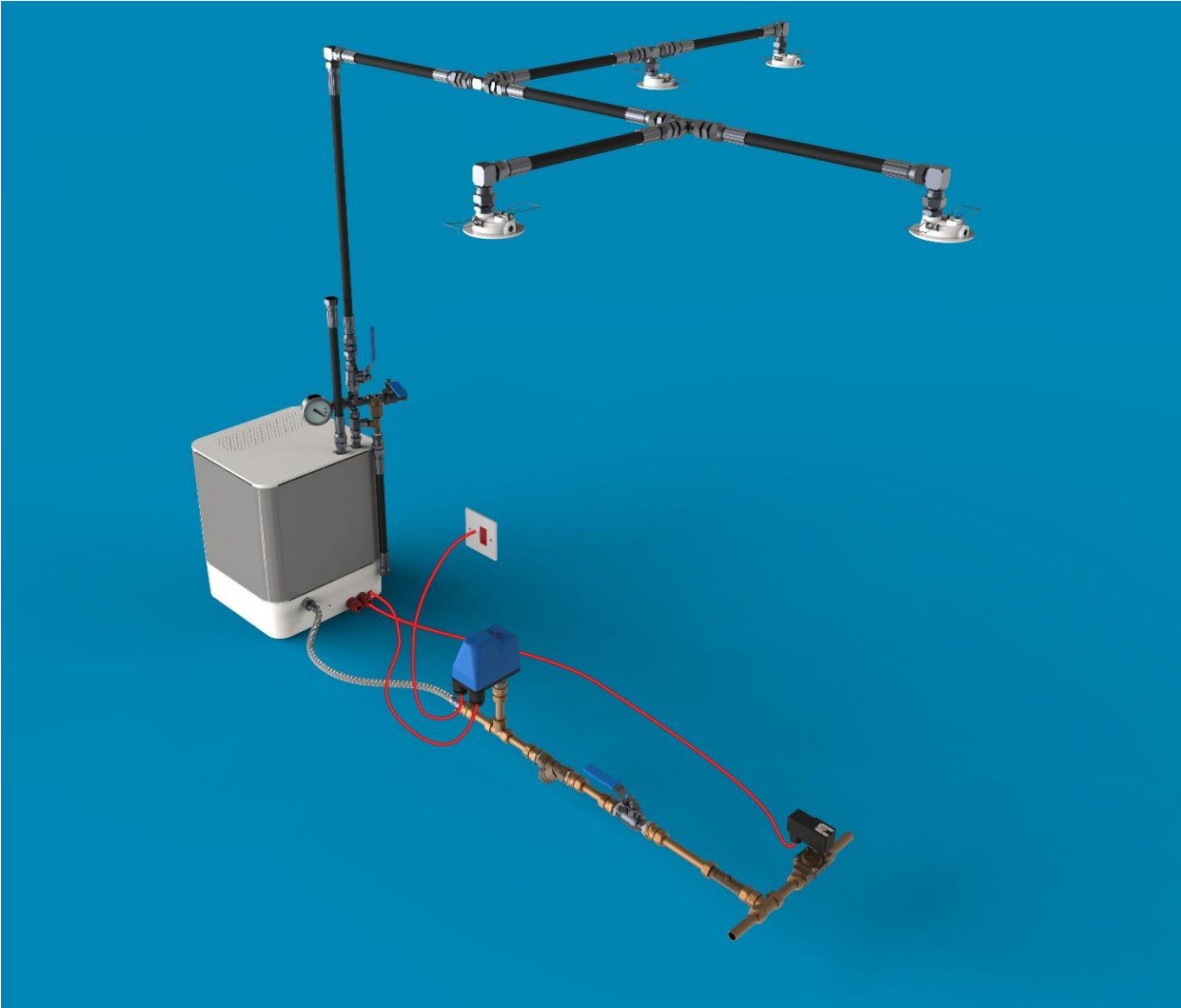
BS8458 FIRE TEST REPORTS

BS9252 FIRE TEST REPORTS

CE DECLARATION



DOMESTIC WATER MIST FIRE SUPPRESSION SYSTEM



Description

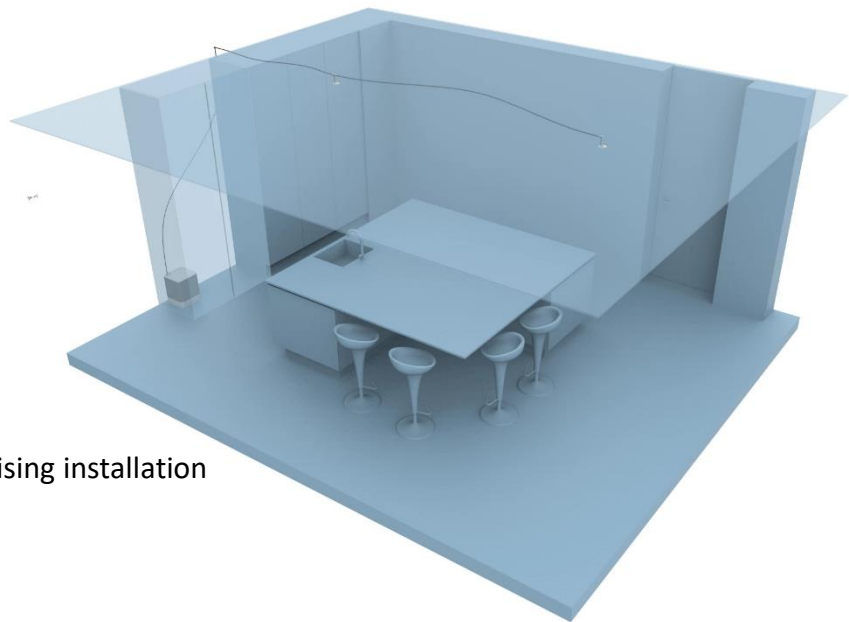
Watermist fire suppression systems have demonstrated their value in assisting the protection of life and property in industrial and commercial applications for many years. The advent of watermist nozzles that operate at an earlier stage in the development of a fire, together with the recognition that the largest numbers of deaths from fire occur in the home, have led to the

introduction of watermist fire suppression systems specifically designed for residential and domestic occupancies. A correctly designed, installed and properly maintained watermist fire suppression system can detect, suppress and control a fire at an early stage of development, and activate an alarm. 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.

ICO is a revolutionary fire suppression system offering discrete protection coupled with industry leading pricing, efficient system design and easy install. ICO's lightweight nozzles sit just 3mm below the ceiling making them non-intrusive whilst offering complete protection. These nozzles connect to a compact pump unit using flexible pipework. This keeps design and installation time to an absolute minimum and allows for potentially large cost savings. The ICO pump unit includes a self-test facility. ICO is compatible with all fire panels offering fire and fault n/o and n/c contacts.

Advantages

- Industry leading pricing
- Low profile nozzles (colour matching available)
- Compact pump unit
- Low flow system, mains supplied, does not require large water storage tank
- Flexible pipework, minimising installation time
- Self-test facility
- Compatible with fire panels using voltage free contacts
- Stainless steel pipework available where system is not installed behind fire rated barrier



Certifications

- ICO is 3rd party fire tested to BS:8458 for up to 80m² per fire compartment

- ICO is 3rd party performance fire tested BS:9252

Requirements

- Hydraulic hose must be installed behind fire rated barrier.
- 240V 16A lockable isolator fused power supply direct from the board non-RCD side. Circuit breakers are not acceptable.
- Connected water source must supply no less than 12 litres per minute at 1 bar
- Permanent drainage connection for the pump.
- Pump unit must not be installed in sealed area, ventilation required.

Technical Data

Pump Unit

Part No:	PU_0001
Dimensions:	345mm x 280mm x 268mm 100mm of clear space required around all sides for ventilation.
Voltage rating:	240V
Current rating:	13A
Power Supply Connection:	Dedicated 16A fused supply on from the NON RCD side of the board Fire rated cable required
Fire relay contact rating:	30VDC, 1A max
Fault relay contact rating:	30VDC, 1A max
Inlet connection:	½" BSP



Outlet connection:	¼" BSP
Water requirement:	12 lpm @ 1 bar Minimum
LED status colours:	Blue - Primed Orange – Fault Red – Activation
Sound Pressure level	75db @ 1 m when running
Drain requirement	Permanent drainage connection required for the pump

Nozzle

Part No:	PU_0034
Dimensions:	ø72mm x 19mm
Weight:	48g
Standard Colour:	White
Bulb specification:	57°C, quick response
Fixing method:	Torsion springs
Hole diameter for install:	ø56-60mm
Maximum Ceiling Height	3.5m



1/2" Strainer

Part No:	PU-042
----------	--------

Material: Brass
 Diameter: 1/2" - BSP
 Function: Water Filtration



ICO Control Valve Arrangement

Part No: PU-071
 Function: Required for each pump.
 Pressure indication
 Pressure relief
 System isolation
 System drain



System Isolation Valve: 3/8" BSP Swivel Connection
 Drain Valve: 1/4" BSP
 Pressure Relief Valve : Pre-set at 70 bar
 Gauge Port 1/4" BSP Connection
 Pressure Gauge 0-200Bar
 Connection to pump 1/4" Male

Pressure Gauge

Part No. PU-069

Function: Pressure Indication
Pressure Range: 0-200bar
Connection 1/4" BSP



Mains Low Pressure Switch

Part No. PU-072

Function: Switches power off to the pump in the event of low pressure water supply to prevent pump running dry. Installed in series on the power cable to the pump the device interrupts the electric connection between the line and the load when the pressure decreases below the established value (stop pressure) The reset is automatic when the pressure becomes again higher than the start value or when pressing the reset button



Cut-out pressure range 0,05÷0,4 bar

Cut-in pressure range: 0,4÷0,75 bar

Rated Current 16A

Voltage 250V

Connection ¼" Female

Self-Centring Bonded Seal

Part No: PU-0037

Material: Zinc plated steel

Seal type: Nitrile

Diameter: ¼" – 3/8" BSP



¼" BSP CAP

Part No: PU-045

Material: Steel Zinc Plated

Diameter: 1/4" - BSP

Function: End cap



Priority Demand Valve

Part No: PU-073

The priority demand valve is required to be fitting along with the ICO system if a property has less than 37 litres/minute at the inlet to the property.

Voltage 12V

Connection 1/2" - BSP

Approval WRAS



This manual contains only our recommendations for design and installation of the ICO fire suppression system. The system is fire tested to BS8458 & performance fire tested to BS9252, it does not guarantee installation compliance. Installation compliance is the responsibility of the installer.

The data contained within this manual is provided for informational purposes only HiPro Industries Ltd believes this data to be accurate; however, all dimensions and data are approximate and this document is presented without any guarantee or warranty whatsoever.

These systems are only to be designed and installed by competent individuals. The information contained within this manual is not comprehensive, anyone designing and installing these systems must be trained and have a full understanding of all facets of the system and its components and as such installation of these systems is carried out at their own risk.

Any questions or clarification concerning the information presented in this manual should be addressed to:

HiPro Industries Ltd
Office: 0117 317 8133
E-Mail: sales@hipro-industries.com
Bristol: Park House, 10 Park Street, Bristol, BS1 5HX
www.HiPro-Industries.com

SYSTEM DESIGN

This manual contains manufacturers recommendations for the design, installation and commissioning of the ICO fire suppression system. This manual should be read in conjunction with the following standards as applicable:

BS 8458
BS 9251
BS 9252
BS 7671

(Other standards may apply)

Initial considerations

Before undertaking the design of a domestic or residential watermist system for a specific property, the designer should evaluate at least the following factors before starting work on the project:

- a) the risk to be protected;
- b) the type of occupancy of the property (i.e. domestic or residential);
- c) the water supply requirements and availability;

NOTE In buildings where there is a mix of residential and commercial use (e.g. where flats are above shops), it is generally appropriate to protect the residential parts using BS 8458, and the commercial parts using BS 8489-1 3) or BS EN 12845.

Extent of Watermist Protection

Watermist system protection should be provided in all parts of the dwelling, with the exception of the following areas, which may be excluded unless required by a fire strategy or risk assessment:

- a) bathrooms fitted with a door and with a floor area of less than 5 m²;
- b) cupboards and pantries fitted with doors and with a floor area of less than 2m², and rooms in which the smallest dimension does not exceed 1 m, where the walls and ceilings are covered with non-combustible or limited-combustible materials;
- c) non-communicating, attached buildings such as garages, boiler houses, etc.;

NOTE 1 “Non-communicating” means separated from the protected premises by not less than 30 min fire resisting construction in accordance with the relevant part of BS 476 or the equivalent European Standard, for example:

- BS 476-21/BS EN 1365-1 for load-bearing walls;
- BS 476-22/BS EN 1364-1 for non-load-bearing walls and partitions;
- BS 476-21/BS EN 1365-2 for floors;
- BS 476-23/BS EN 13381-1 for suspended ceilings;
- ad hoc BS 476-20/BS EN 1366-3 for penetrations of walls and floors by services.

The parts of the BS 476 fire resistance test standards are to be read in conjunction with BS 476-20. The European fire resistance test standards are to be read in conjunction with BS EN 1363-Depending on the design of the building, there might occasionally be a need

to refer to other fire resistance test standards. Certain authorities might require 60 min fire-resisting construction.

- d) crawl spaces;
- e) uninhabited loft/roof voids;
- f) ceiling voids;
- g) external balconies permanently open to the outside.

NOTE 2 A fire strategy or risk assessment might demonstrate that extensive spread of fire or smoke, particularly between rooms and compartments, is likely to take place and therefore that the fire risk in the area is such that watermist coverage is necessary.

Where suppression systems are being installed in England and Scotland as a compensatory feature to address a specific risk or hazard it may be acceptable to protect only part of a building. Refer to approved document B, Scottish technical standards and BS9991 for further information.

Use of Watermist Systems as a Compensatory Feature

There are occasions when a suppression system is used as a means of demonstrating compliance with building regulations or to compensate for, or overcome, circumstances where a building is unable to achieve compliance with guidance issued in support of building regulations. For example:

- an older building where the existing construction cannot achieve the required fire resistance appropriate to the use of the premises;
- a new build that cannot meet the necessary access requirements for fire appliances;
- loft conversions where it is either not practical or not possible to secure adequate means of escape.

Where suppression systems are being installed in England and Scotland as a compensatory feature to address a specific risk or hazard it may be acceptable to protect only part of a building. Refer to approved document B, Scottish technical standards and BS9991 for further information.

Category of System

The designer should at an early stage determine which category of system is applicable, as this affects various design considerations, such as the water requirements for the system. The category of system should be determined by the type of building as shown below.

Domestic occupancy Single family dwellings such as:

- Individual dwelling house
- Individual flat
- Individual maisonette
- Transportable home

Houses of multiple occupation (HMOs) *(Buildings with more than two floors and five or more lettable bedrooms should be treated as a residential occupancy)*

Bed and breakfast accommodation *(Buildings with more than two floors and five or more lettable bedrooms should be treated as a residential occupancy)*

Boarding houses *(Buildings with more than two floors and five or more lettable bedrooms should be treated as a residential occupancy)*

Blocks of flats 18 m or less in height and with a maximum total floor area of 2,400 m² *(This height is the height of the floor of the top storey above ground) (Where the fire strategy requires the communal rooms and corridors to be protected by a watermist system, then the building should be treated as a residential occupancy)*

Residential occupancy (ICO does not currently support residential occupancies)

Blocks of flats greater than 18 m in height *(This height is the height of the floor of the top storey above ground)*

Sheltered and extra care housing

Residential care premises

Residential rehabilitation accommodation

Dormitories (e.g. attached to educational establishments)

Hostels

Water Supplies

Our recommendation is to install a single pump for domestic occupancies which will allow for two nozzle operation which is in line with the area of operation required for the equivalent sprinkler system as specified in BS9251 category 1 & 2.

For residential occupancies we would recommend a dual pump system which will allow for 4 nozzle operation which is in line with the area of operation required for the equivalent sprinkler system as specified in BS9251 category 3. (NOT CURRENTLY SUPPORTED)

Where the mains water supply connection serves only the watermist system, the flow rates at each pump must be 12lpm.

Where the mains water supply connection serves both the watermist system and the domestic or residential occupancy supply, the watermist system should be capable of providing the water demand at the pump/s by:

- a) the operation of an automatic priority demand valve; or
- b) for domestic occupancies, the flow rate at the pump plus at least 25 lpm; or

NOTE 1 Attention is drawn to the water regulations, which might require a greater minimum flow rate.

- c) for residential occupancies, the flow rate at the pump plus at least 50 lpm. (NOT CURRENTLY SUPPORTED)

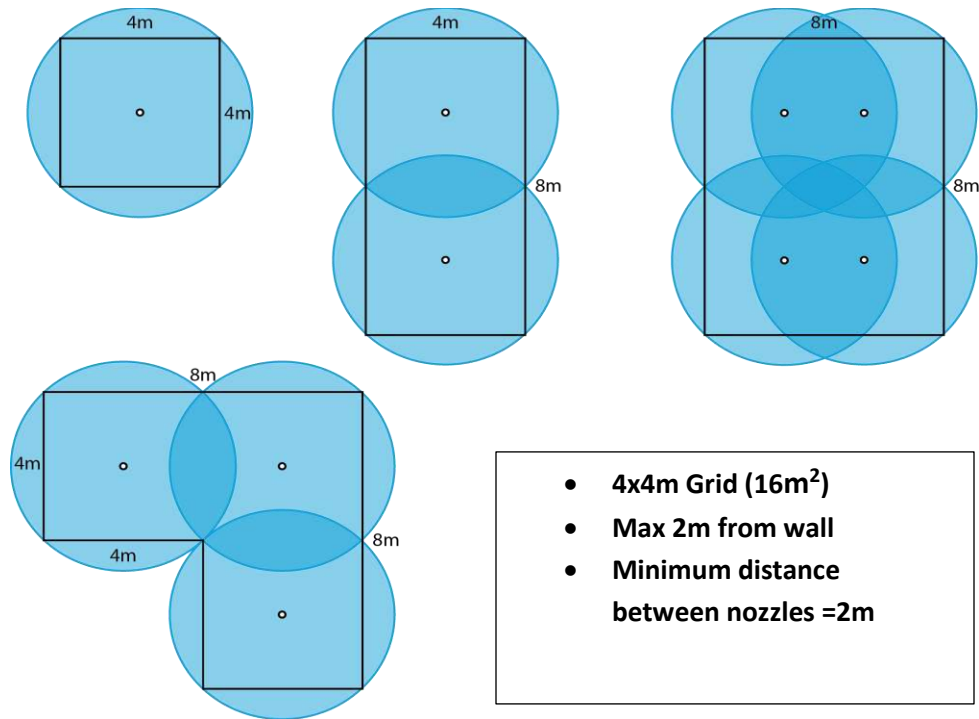
NOTE 2 Attention is drawn to the water regulations which might require a greater minimum flow rate depending on the design demand for the occupancy

Flows should be tested and verified at the main water supply pipe to the property.

Pump location

If the pump is situated in the fire risk it is recommend to install this at low level within a cupboard. Alternatively the pump can be situated outside of the fire risk.

Nozzle Spacing, Flat Ceilings –



NOZZLES SHOULD BE POSITONED SO THEY ARE OUT OF REACH OF CHILDREN.

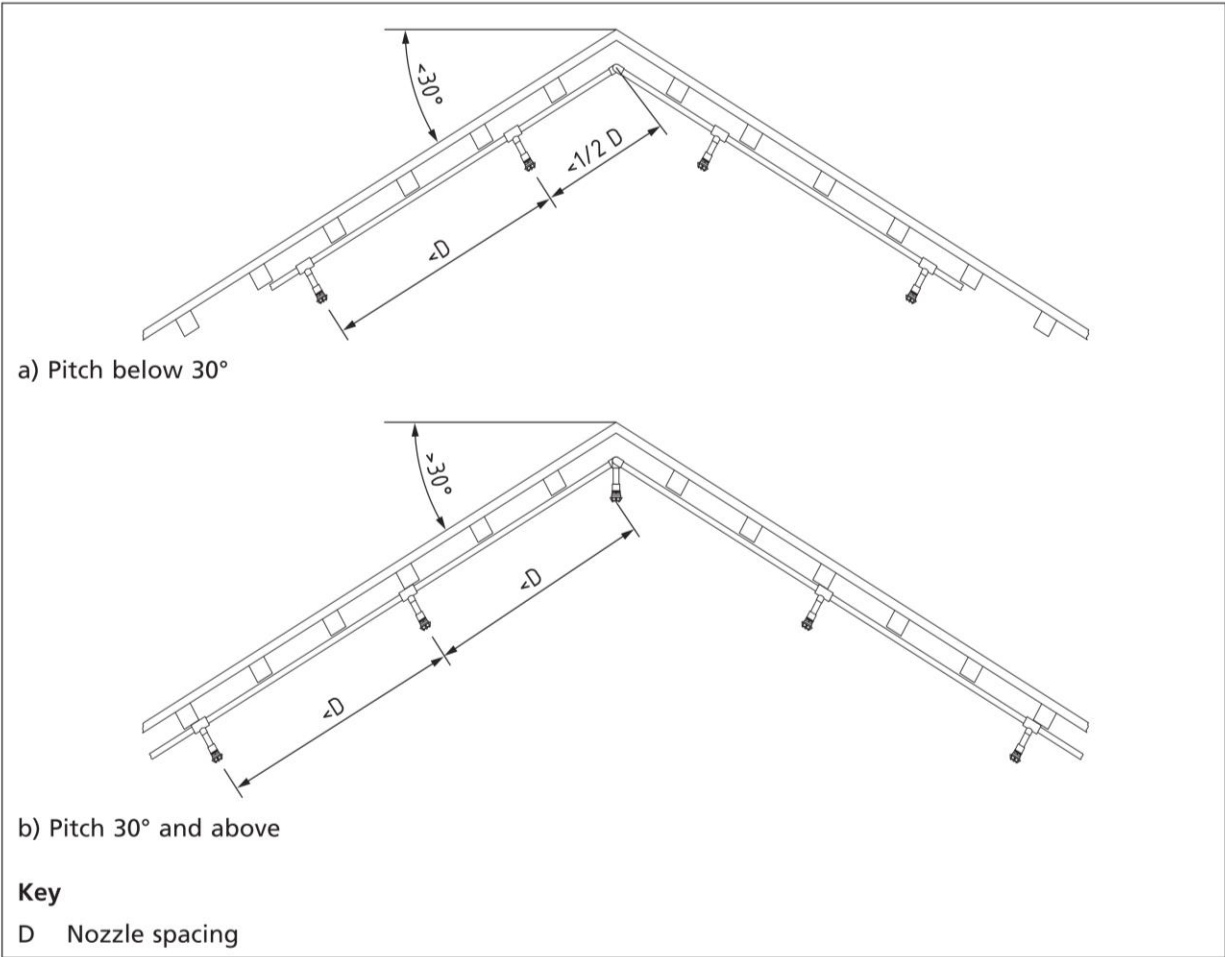
Nozzle Spacing, Sloped Ceilings-

Where nozzles are fitted within a sloping ceilings, nozzle positions should be determined by the pitch of the ceiling.

Where the pitch is below 30°, nozzles should be mounted at standard spacing's when measured in line with the pitch of the ceiling.

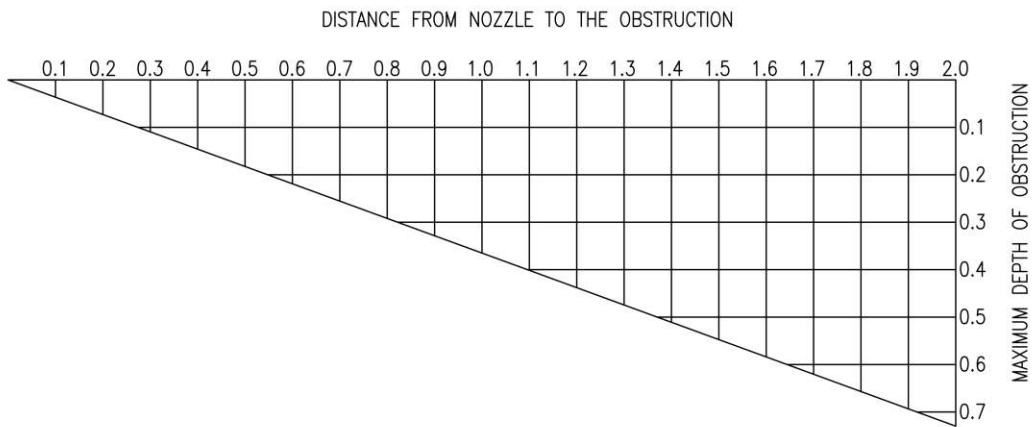
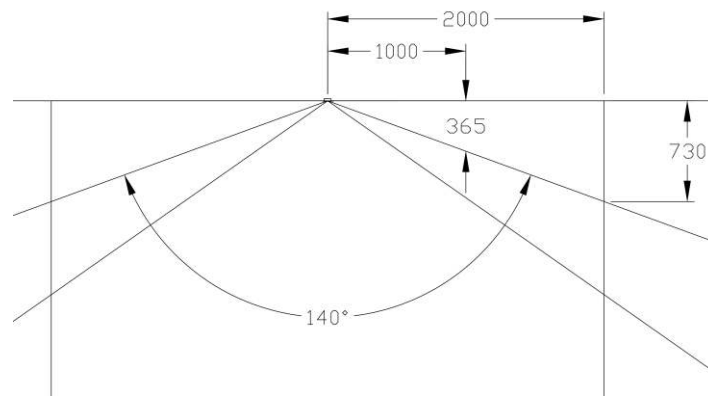
Where the pitch is 30° and above, the first row of nozzles should be mounted within 300 mm radially from the apex of the ceiling.

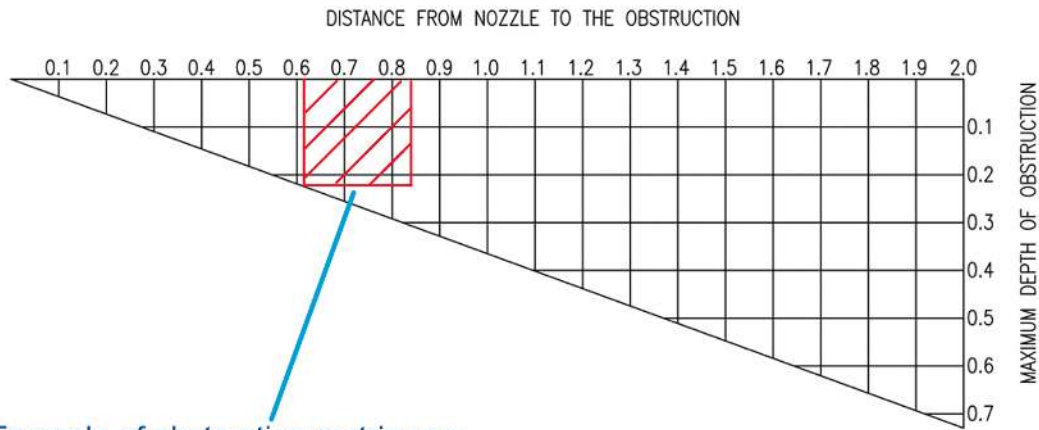
All nozzles should be mounted perpendicular to the ceiling as shown below



Distance from Obstructions

Nozzles should be positioned away from obstructions to allow a 140° spray pattern.



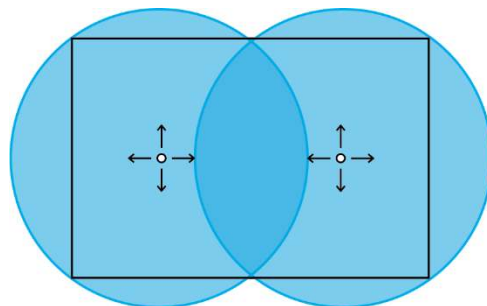


Example of obstruction matrix use.

If obstruction fits wholly inside matrix, nozzle positioning is unaffected.

Nozzle orientation

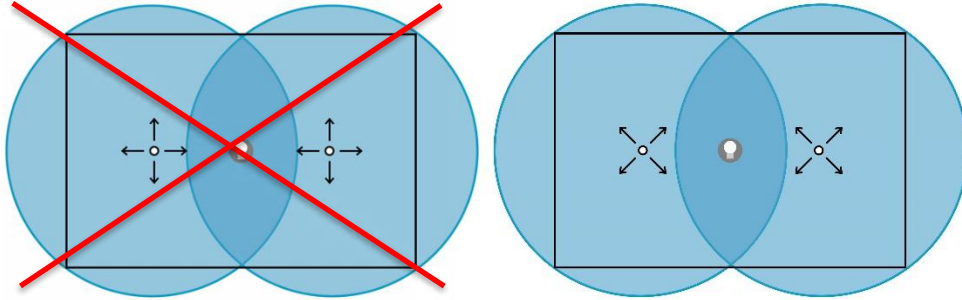
The preferred nozzle outlet orientation is perpendicular to the walls.



Nozzle Orientation – Pendant Light Fittings

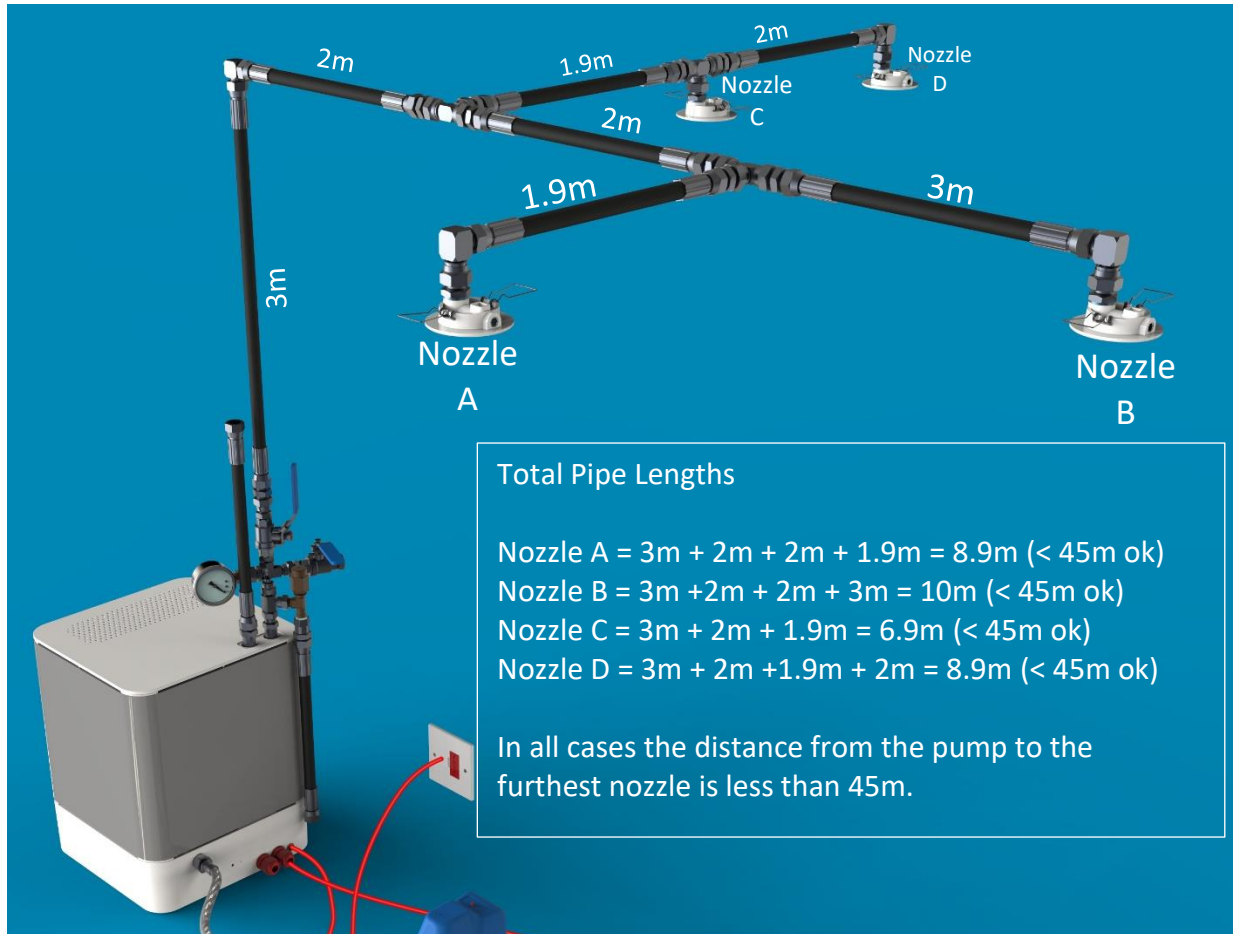
Nozzle spray angles should not be directed at pendant light fittings.

The spray direction can be rotated 45° to spray into the corners of the room to avoid the pendant light fitting. Nozzles should be at least 500mm away from a pendant light fitting.



Maximum Pipe Lengths

The total pipe length from the pump to the furthest nozzle should not exceed 45m. Please note 45m is not the cumulative pipe work length for the whole system it only applies to the distance from the pump to the furthest nozzle along the route that the water would travel. There is no restriction on the cumulative pipework length for the whole system.



Example

Pipework

Flexible hose should only be used behind a fire rated barrier or the flexible pipework should be run outside of the fire risk.

Stainless steel tubing should be used for any areas where pipework is exposed inside the fire risk. Only stainless steel fittings are to be used on stainless steel pipework.

Nozzles for exposed pipework should not be positioned more than 300mm below the slab

Pipework, fittings and nozzles should never come into contact with any other services

Protection from Freezing

System components should never be exposed to temperatures below 4°C.

Example Equipment List

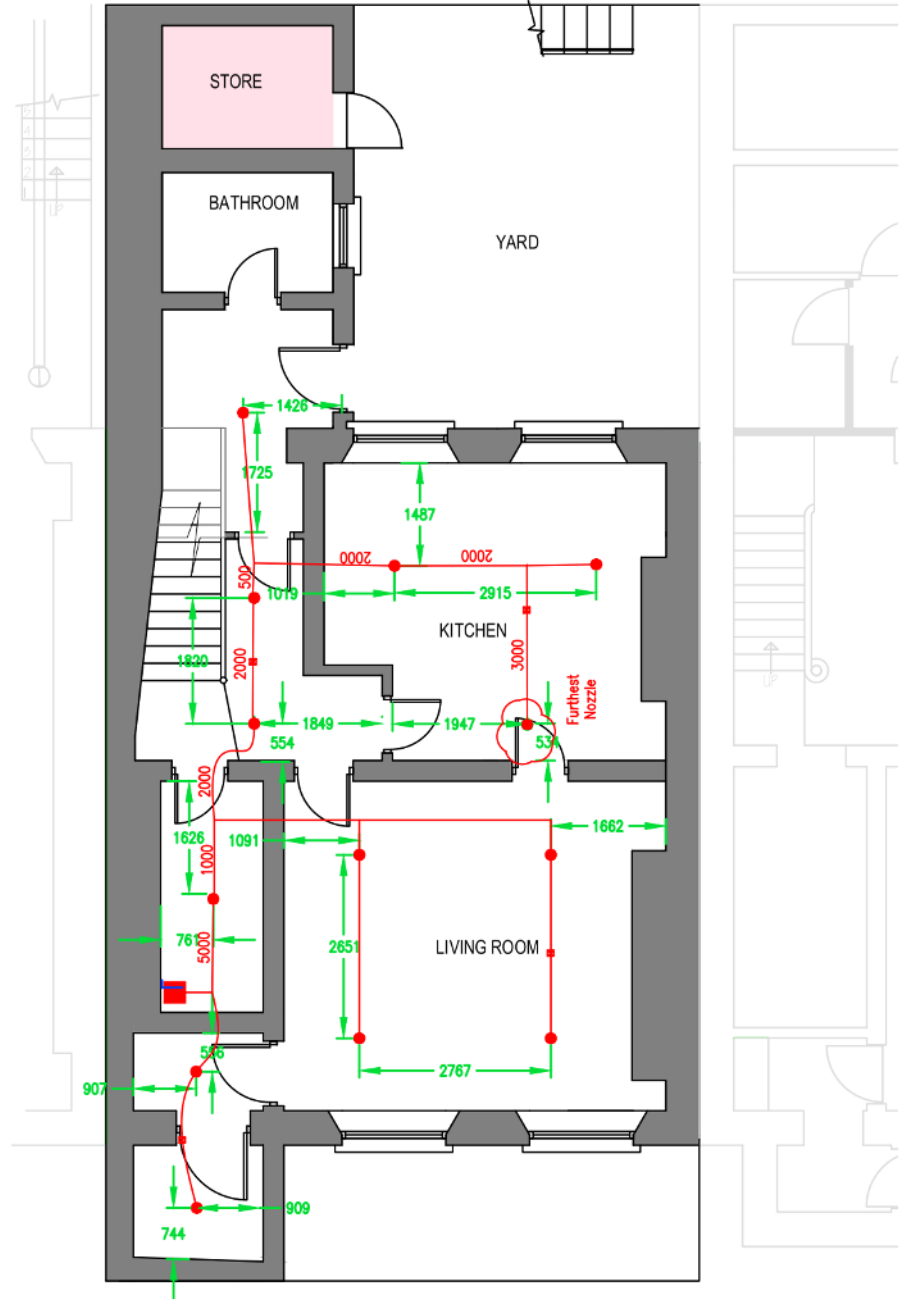
Component	ICO Part Number	Product supplied by	Qty
WRAS Approved check valve		Distributor	1
1/2" Lockable isolation valve		Distributor	1
Copper pipe and fittings		Distributor	As required
1/2" Strainer 500 micron	PU_0042	ICO / Distributor	1
Mains Water Low Pressure Monitoring	PU_0072	ICO	1
Fire Rated Cable		Distributor	As required
Flexible connector		Distributor	1
ICO Pump Unit (V2)	PU_0001	ICO	1
Pump Outlet Manifold	PU_0071	ICO	As required
Hydraulic Hose & fittings		Distributor/ICO	As required
ICO 3/8" connector Nozzles	PU_0034	ICO	As required
Priority Demand Valve		ICO / Distributor	1




Minimum Drawing Requirements

All drawings must display the following information as a minimum.

- Project Name
- Project Address
- Description of the area covered
- Revision
- Status of Drawing
- Date of Issue
- Scale
- Nozzle positions dimensioned from the wall
- Indicative pipework route
- Pump position
- Pipework calculation
- Location of all straight connectors

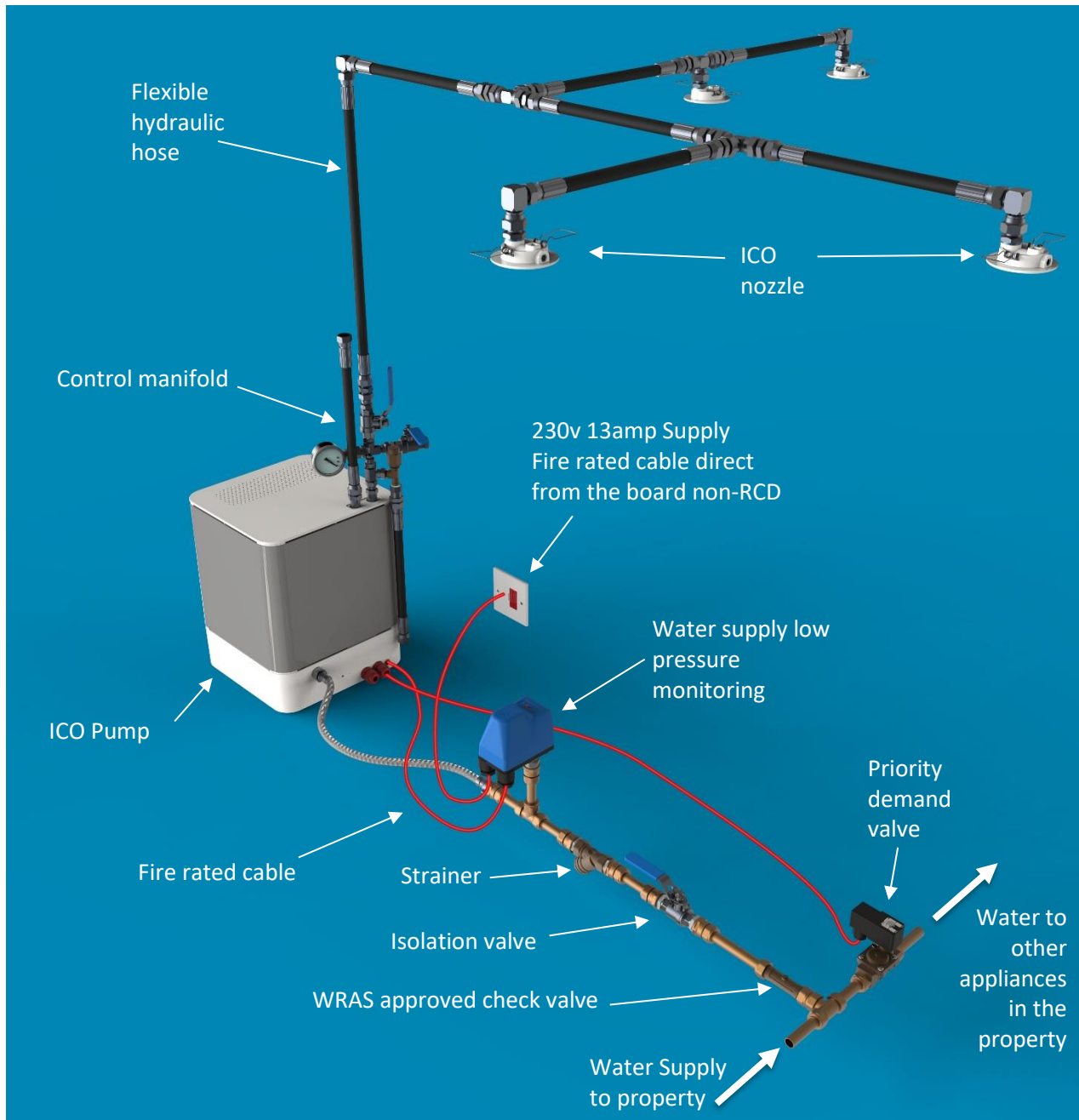
SYSTEM INFORMATION	
NUMBER OF NOZZLES	13
TOTAL PIPE LENGTH TO FURTHEST NOZZLE	17.5m
MAXIMUM PERMITTED LENGTH	45M



SYMBOL KEY	
	PUCK PUMP
	NOZZLE
	FLEXIBLE HOSE
	STAINLESS STEEL TUBE
	PIPE CONNECTOR

02	RECORD DRAWING	01/09/17
01	CONSTRUCTION ISSUE	01/01/17
Rev	Description	Issue Date
Status of Drawing		
RECORD DRAWING		
Engineer	ENGINEER_NAME	
Project Name	32_BELVUE_MEWS_LONDON_N16EF	
Drawing Title		
LOWER GROUND FLOOR FIRE SUPPRESSION		
YOUR_COMPANY_LOGO_HERE		
Drawing No.	FA_1000321	Scale @A1
Rev.	02	1:100

INSTALLATION & COMMISSIONING



WARNING Mains voltage electricity and high pressure water are present within this product. Care should be taken when installing the product. Installation should only be carried out by trained engineers.

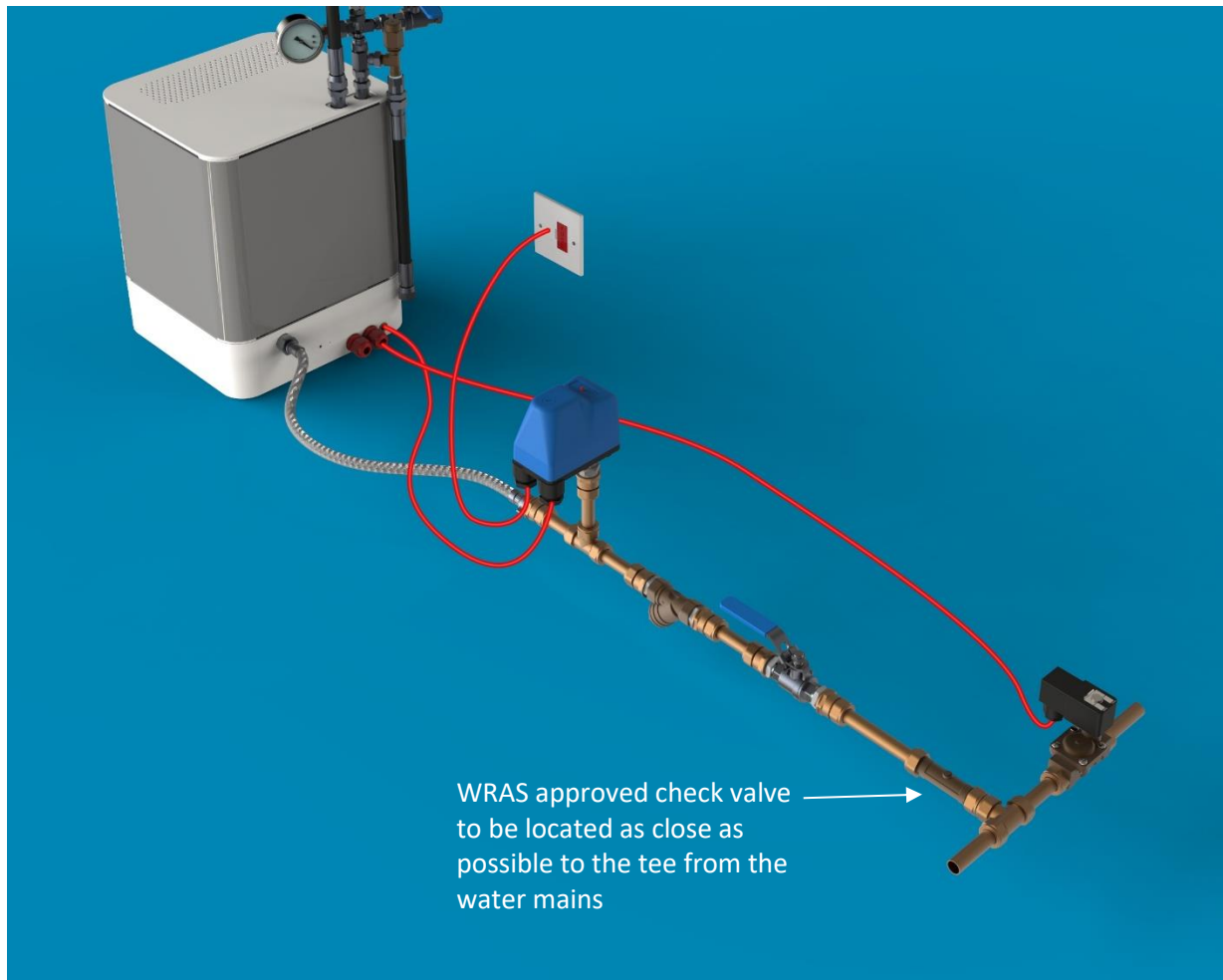
Appropriate PPE (eye protection, gloves, safety boots, hard hat etc) should be worn at all times when installing the product. Eye protection, gloves, safety boots and hard hat.

Water Supply Pipes

If the water supply pipe runs through the protected area the supply pipe to the pump should be run in copper or pipework of a similar fire and heat resistance.

If plastic pipework is used for the water supply to the pump it should be installed behind and appropriate fire resisting barrier.

Dead legs are not permitted in plumbing systems as this can permit a build-up of bacteria that can be harmful to health. Where teeing off to the ICO system ensure a WRAS approved double check valve is installed at the closest point to the tee.



Pipework Installation – Hydraulic Hose

Note: All flexible hose should be installed behind a fire rated barrier such as plaster board, any exposed pipe should be installed in steel pipework. Pipework and other system components must never be exposed to temperatures below 4 °C. Flexible hose should be kept away from all heat sources such as central heating pipes or lights. Pipework, fittings and nozzles should never come into contact with any other services.

Flexible Hydraulic Hoses should be provided in accordance with the specifications below.

- Hose – 3/8” Thermoplastic Hose, 9.7mm internal diameter, 160bar working pressure, SAE 100 R7



- Hose connection - Swaged 3/8” BSP swivel connection or Swaged 3/8” BSP male connection. (Swaged insert must not to be less than 5mm internal diameter)



- Tee or elbow fittings - 3/8” bsp male hydraulic fittings or 3/8” BSP swivel fittings. Sealed with a hydraulic gasket seal and thread lock such as Bondloc 542



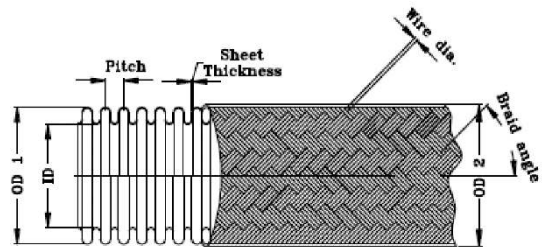
Note: No internal diameters after the pump valve set should be restricted below 5mm. The hose must be thermoplastic not rubber. Thermoplastic hose is listed by most manufacturers as having unlimited shelf life, rubber hose has a limited shelf life so should not be used. Please refer to manufacturers data for installation instructions and restrictions.

Pipework Installation – Stainless Steel Hose & Stainless Steel Fittings

Corrugated flexible hoses are widely accepted in the fire industry having been used on 3rd party approved flexible drops in commercial sprinklers for many years.

The fully stainless steel construction makes the hose completely heat and fire resistant. It does not rely on a fire resisting barrier to maintain its performance. This provides a significant advantage over the CPVC pipework traditionally used by the residential sprinkler industry.

The hose tails are welded so do not rely on crimping and are 100% factory pressure tested to eliminate the possibility of any leaks. The stainless steel tube and fittings provide the highest level of corrosion resistance resulting in an extended product lifespan.



Fitting size	3/8"
Fitting thread	3/8" BSP Male
Seal type	60 degree cone
Nominal size of Hose	3/8" / 10mm
Hose I.D.	10.3mm
Hose O.D.	14.3mm
Hose Weight per meter	0.112
Wire Diameter	0.25
Static bend radius	38mm
Flexing bend radius	140mm
Working Pressure kg/cm ²	90
Test Pressure kg/cm ²	135
Burst Pressure kg/cm ²	360



Note: the specifications above should be taken as approximate only



Anti-galling lubricant should always be used when using stainless steel fittings. Fittings should be tightened to a torque of xx-xx Nm. Always maintain a clearance of at least 50mm between firefighting equipment and any other service.



The specification below is approximate

Weight per meter empty	0.214
Number of wires	8
Carriers	24
Braid Angle	90 (+/-2)
Braid % Coverage	94
Thickness of strip mm	0.16mm
Wire weight per m	0.102
Hose + SWB O.D.	15.5 +/-0.5
Corrugation per meter	385 (+/-10)

Pipework Support – Hydraulic/Stainless Steel Hose

Where retrofitted it is acceptable to run pipework over the top of plasterboard.

Where it is a new install the 1st fix pipework should be bracketed with rubber lined clips such that it does not fall down to below the ceiling level. Pipe clips should be spaced at approximately 1m intervals.

Pipe clips should be provided before each change of direction.

Pipework Installation – Stainless Steel

Note: All flexible pipework should be installed behind a fire rated barrier such as plaster board, any exposed pipe should be installed in steel pipework. Pipework must never be exposed to temperatures below 4 °C. Pipework, fittings and nozzles should never come into contact with any other services

The following stainless steel pipework is suitable for use with our system. Please ensure that you check with your supplier that the pipework is suitable for the pressures involved in the system.

- 10mm x 1mm



For stainless steel pipework we would recommend using DIN 2353 stainless steel compression fittings assembled in accordance with DIN 3859-2 or specific manufacturer's recommendations.



Other branded compression fittings may also be used. Ensure you consult the manufacturer's installation instructions before use.

Pipework Support - Stainless Steel

Where stainless steel pipework is used we would recommend that it is supported with DIN 3015-1 aluminium pipe clamps in accordance with the specification below. However any appropriate

steel pipe support is acceptable providing that it is of fire resistant construction i.e. does not contain plastic components.

- DIN 3015-1
- Cover Plate: Galvanized Carbon steel(mild steel) / stainless steel(304/316)
- Welded Plate: Galvanized Carbon steel / stainless steel (304/316)
- Bolts: Galvanized carbon steel / stainless steel (304/316)
- Clamp Body: Aluminium



Pipe clamps should be spaced at not more than 1m between supports.

Pipe clamps should be provided within 300mm of any tee or change in direction.



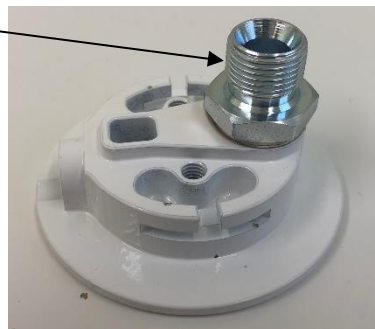
Nozzle Installation

Use a 57mm hole saw to create the holes in the ceiling for fitting the nozzles.

Take extra care when handling and storing the nozzles. Impact from dropping or mishandling can cause microfractures in the bulbs which could lead to failure. Any nozzles that have been dropped or miss handled should be discarded. Do not store the nozzles in temperatures above 40°C.

The nozzles come with the adaptor thread locked into place to prevent the internal components from moving around. This should not be removed. If the adaptor is removed or loosened discard the nozzle, do not reinsert the adaptor. Ensure that spanners are held on the adaptor body and the nut. Do not force against the body of the nozzle.

Do not remove adaptor



Spanners to be used on the nut and body of the fitting. Do not force against the body of the nozzle.

Install retention springs to the nozzle body using the loops provided. Fit to ceiling by bending the springs up towards the pipework until they can pass through the hole in the provided in the ceiling.



Pressure Testing

The distribution pipework should be pressure tested to not more than 105bar for 1hr to confirm that there are no leaks on the system. The pump should be fitted with a calibrated gauge.

We would recommend using the Sarum Hydraulics Mircopac test pump MP-A-12-6-N-W-R-G-R-05.

12cc per double stroke to 400 bar, 625mm handle nitrile/ptfe/uhmwp seals for use on water, fitted hold release valve, 63mm gauge to 200 bar.

Sarum Hydraulics Ltd
Unit 1 Danebury Court

Old Sarum Park
Old Sarum
Salisbury
Wiltshire
SP4 6EB
John Foster
T: +44(0)1722 328 388
E: pumpsales@sarum-hydraulics.co.uk



Before pressure testing ensure that any air is bled from the pipework. This can be done by slowly loosening the nozzle at the end of each run to allow any trapped air to escape. Allow any excess water to drain into a bucket. When all of the air has escaped remake the seal.

Pump Installation

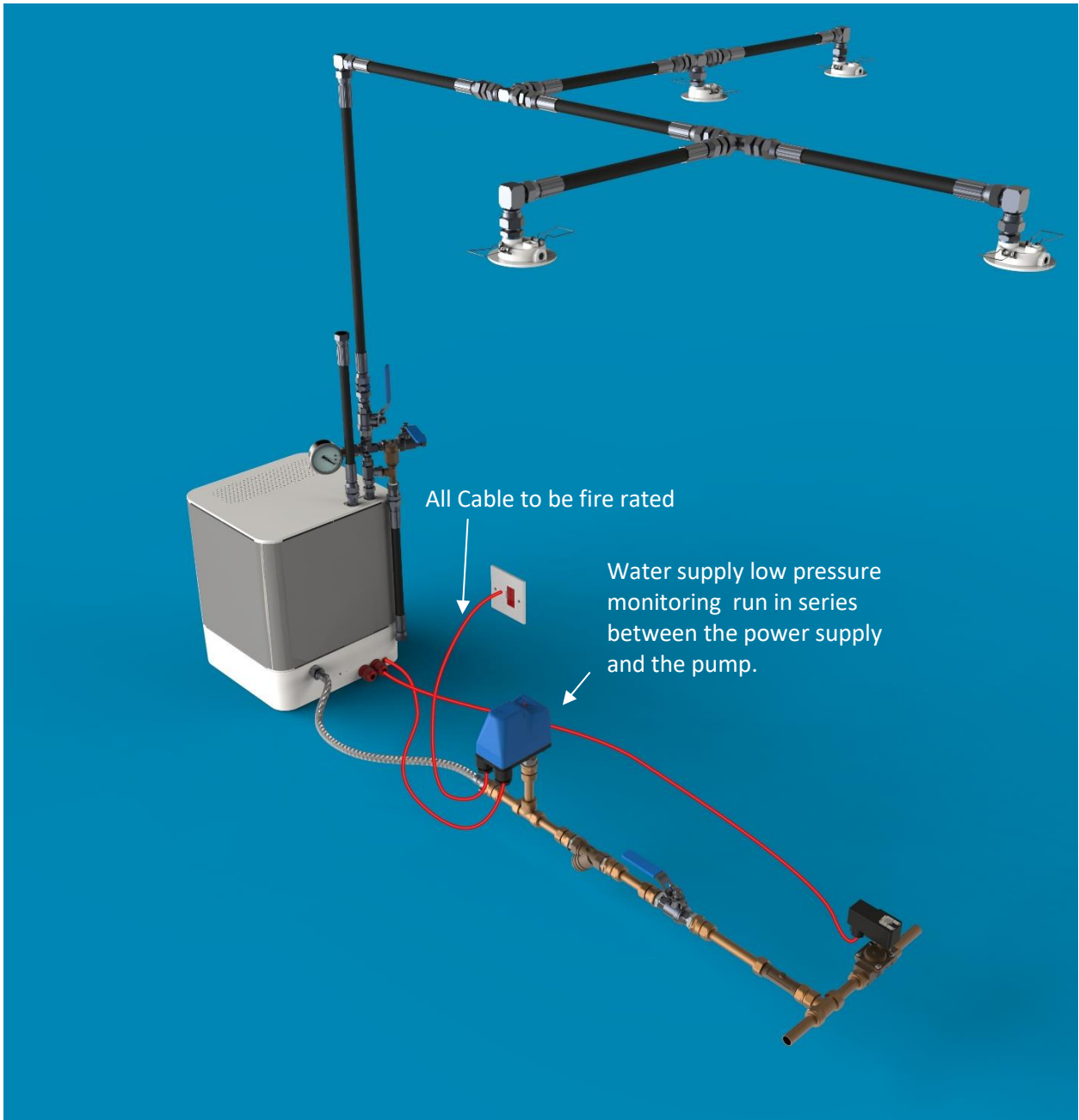
1. Install a 240v, fused supply with a 16A lockable isolator or fed from dedicated supply from the NON RCD side of the board in fire rated cable.



2. Connect check valve, strainer, mains low pressure switch, and flexible hose to the mains water (ensure mains water is switched off before breaking into the water supply).
3. Verify the water supply flow by running it into a bucket to confirm the correct flow.



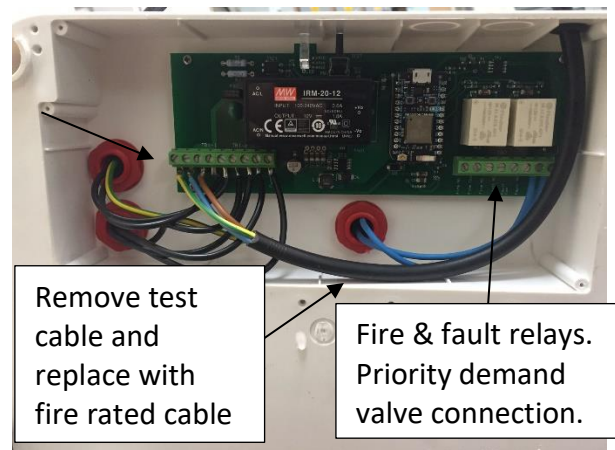
4. Ensure the water supply isolation valve in the inlet manifold is set to the closed position.
5. Make connections for the power supply, fire and fault relays and priority demand valve as required. Ensure the power cable is run through the mains low pressure switch in series before running into the pump monitoring board, this will prevent the pump from running dry in the event that the water is switched off.



Access can be gained to the electronic monitoring board by removing the screws on the lid on the underside of the pump. Cable glands should be installed in the knockouts provided for connection to third party equipment. These can be removed with a flat head screw driver.

It is recommended to run any signal or priority demand valve cable in fire rate cable where possible.

WARNING The pump unit must be completely powered down before opening the electronics enclosure



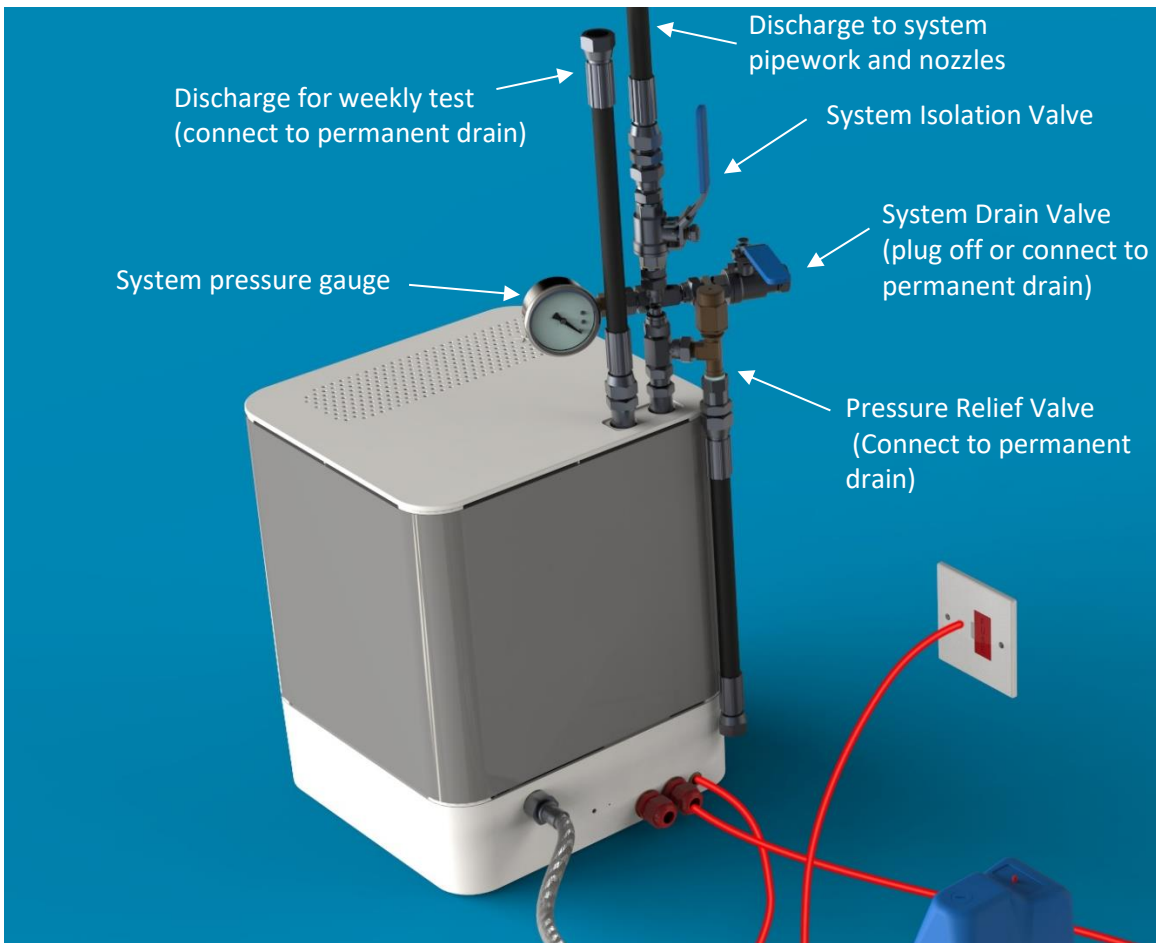
6. Refit lid to the electronics and position the pump at its final location. The pump must be situated in a well ventilated area with no less than 100mm of free space around all sides of the unit. The top of the pump unit must stay clear of any objects to allow for proper airflow and performance. The pump must be located in a position above 4°C.

If the pump is situated within the fire risk it is recommended that this is installed at low level within a cupboard.

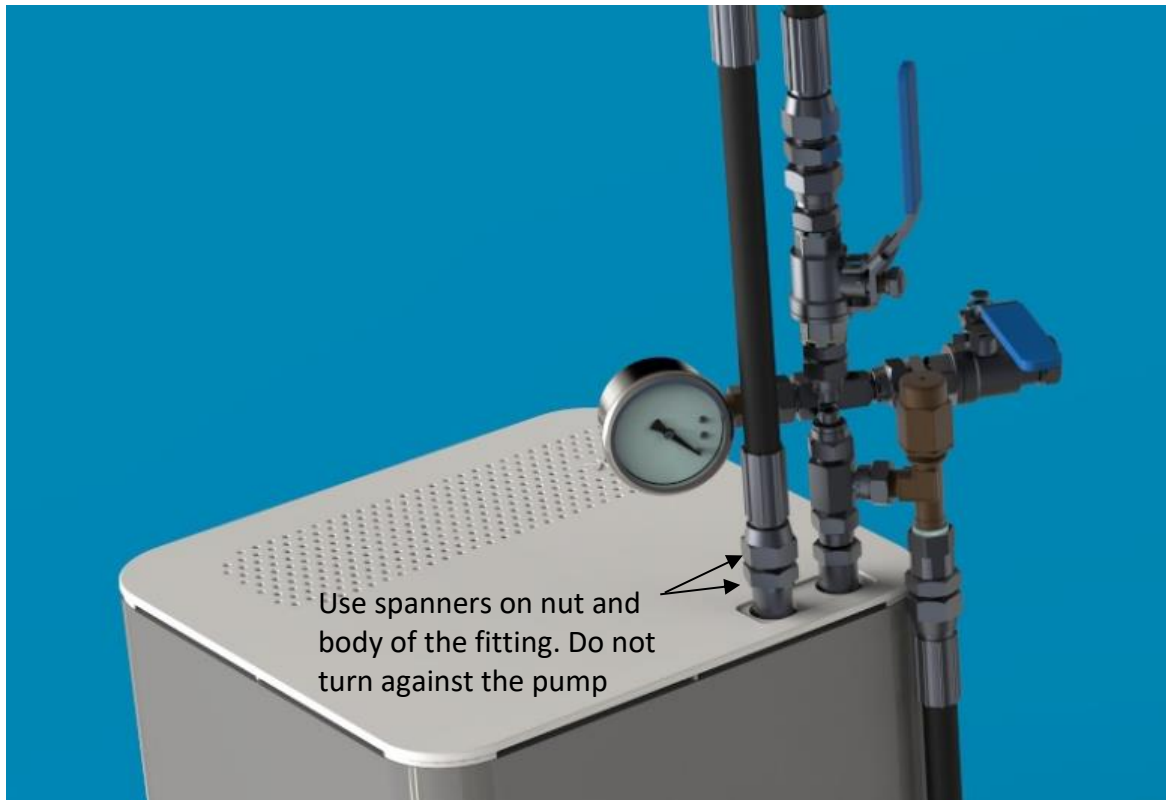
7. Connect power cable to un-switched spur ensuring that the power remains switched off at all times. **Warning: Do not run the pump without water running through it. This will damage the pumps. We would recommend installing water mains low pressure monitoring to protect the pumps.**
8. Use a flexible connector to connect the water supply to the bottom section of the pump. **Warning: This fitting should only need to be hand tight if this does not create a seal tighten very slightly with a spanner. Overtightening will damage the internal components.**



9. Install pressure relief arrangement to the top of the pump ensuring it is correctly orientated and connect the drain from the pressure relief manifold to the waste pipe. **Do not adjust the pre-set pressure relief valve.**



When making connections to the top of pump take care to use spanners on both the body of the fitting and the manifold. Do not turn the against the pump as this will damage the internal components.



Pump Commissioning

Ensuring that the pipe network is complete open isolation valve on the inlet manifold to allow mains pressure water into the system.

After ensuring that there are no leaks power up the pump to charge the system.

Within 1 minute of powering up the system and charging the pipework the pump will perform an automatic self-test. Do not operate the pump before it has carried out its initial self-test. From that point forward the pump will perform a self-test at that same time every week.

Leave to stand at system pressure for 1 hour to ensure that there are no leaks.

The pumps may operate for up to 1 second to a day to make up for any small losses in pressure in the system. The pipe network should not be subject to significant leaks. The pumps should not operate more than once a day to make up loss of pressure or it could affect the life span of the components. Any leaks should be repaired immediately to avoid risk of damage to equipment.

When satisfied that there are no leaks power the pump down, shut off the water supply and put the nozzles into position using the retention springs.

Switch water supply and power back on to re-enable the system

Legionella

Legionnaires' disease is caused by any type of Legionella bacteria which exists in all mains water. If treating the water we would recommend spraying chlorine dioxide into the system strainer, the inlet to the pump and the outlet to the system. You should bleed the system at the most remote point and test the concentration to confirm it is 5 parts per million.

Chlorine dioxide will only degrade when exposed to UV. Therefore, the chlorine dioxide sealed in the pipe should remain effective unless disturbed. During maintenance the system should be tested to ensure there is at least 1ppm which is the minimum required to kill Legionella bacteria.

Links are provided to the relevant products below.

<http://www.tristel.com/tristel-products>

http://www.farmchem.co.uk/residual-chlorine-dioxide-test-strips-5097-p.asp?=&variantid=5376&gclid=EA1aIQobChMIxKDa9YKV1QIVDhIbCh3udQNDEAQYAiABEgI09fD_BwE

This process of treating the water is only to protect the maintenance engineers. During an activation the system may run for an extended period time however the risk of Legionnaires disease is considered to be less than the risk of fire. This is the same risk posed by traditional sprinkler systems for which there are no treatment requirements.

SYSTEM MONITORING

The system monitoring can board is accessible by removing the screws and lid on the bottom of the pump enclosure. **WARNING:** Be sure to power down the pump before accessing the enclosure. Mains voltage is present.

Do not interfere with the mains voltage connections to the pumps and pressure switch on the left hand side of the board. Doing so will invalidate the warranty.

Fire and Fault Connections

There are normally open / normally closed fire and fault relays on the left had side of the monitoring board for connection to 3rd party equipment. See below for connection details.

Cable glands should be installed in the knockouts provided for connection to third party equipment. These can be removed with a flat head screw driver.

The fault relay is normally energised and will de-energise on power failure.

Priority Demand Valve

There are connections on the far right hand side for connecting a 12V priority demand solenoid valve

Normal Condition

In normal state the LED on the front of the pump will be blue. This will indicate that the system is pressurised and power is available.

Automatic Test

Within 1 minute of powering up the system and charging the pipework the pump will perform an automatic self-test. Do not operate the pump before it has carried out its initial self-test.

From that point forward the pump will perform a self-test at that same time every week.

Manual Test

By pressing the button on the front of the unit once for less than 2 seconds the system will carry out a manual pump test.

Failed test

In the event of a failed test the LED will turn yellow and the fault relay will operate.

Fire Condition

After the pump has run for 20-30 seconds the fire relay will activate and the LED at the front of the pump unit will turn red.

Pump Cut Out

After 45minutes running the pumps will cut out however the nozzle will still run at mains water pressure

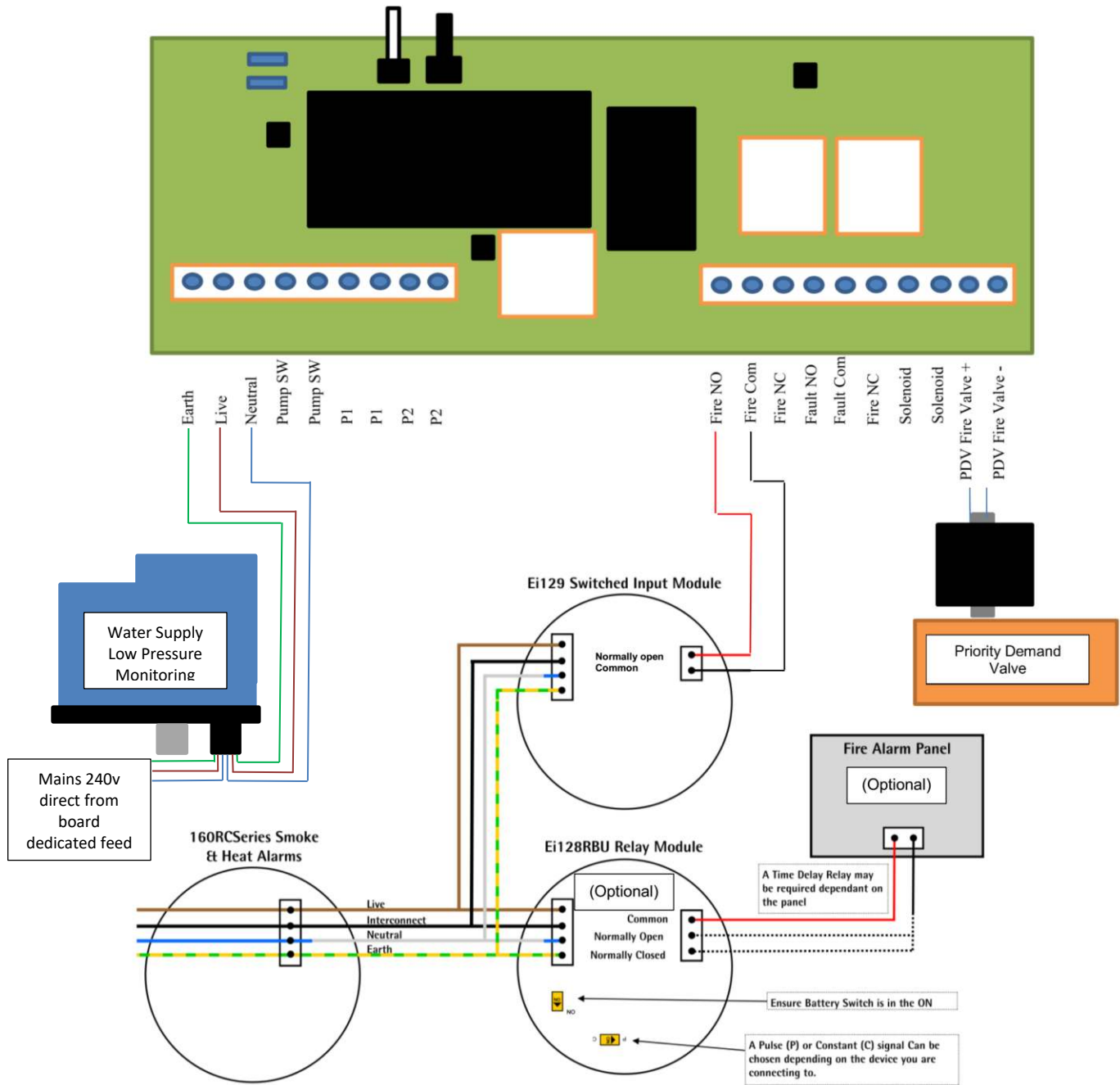
Fault

In the event of a failed test or if power is cut to the pump the fault relay will operate.

Reset

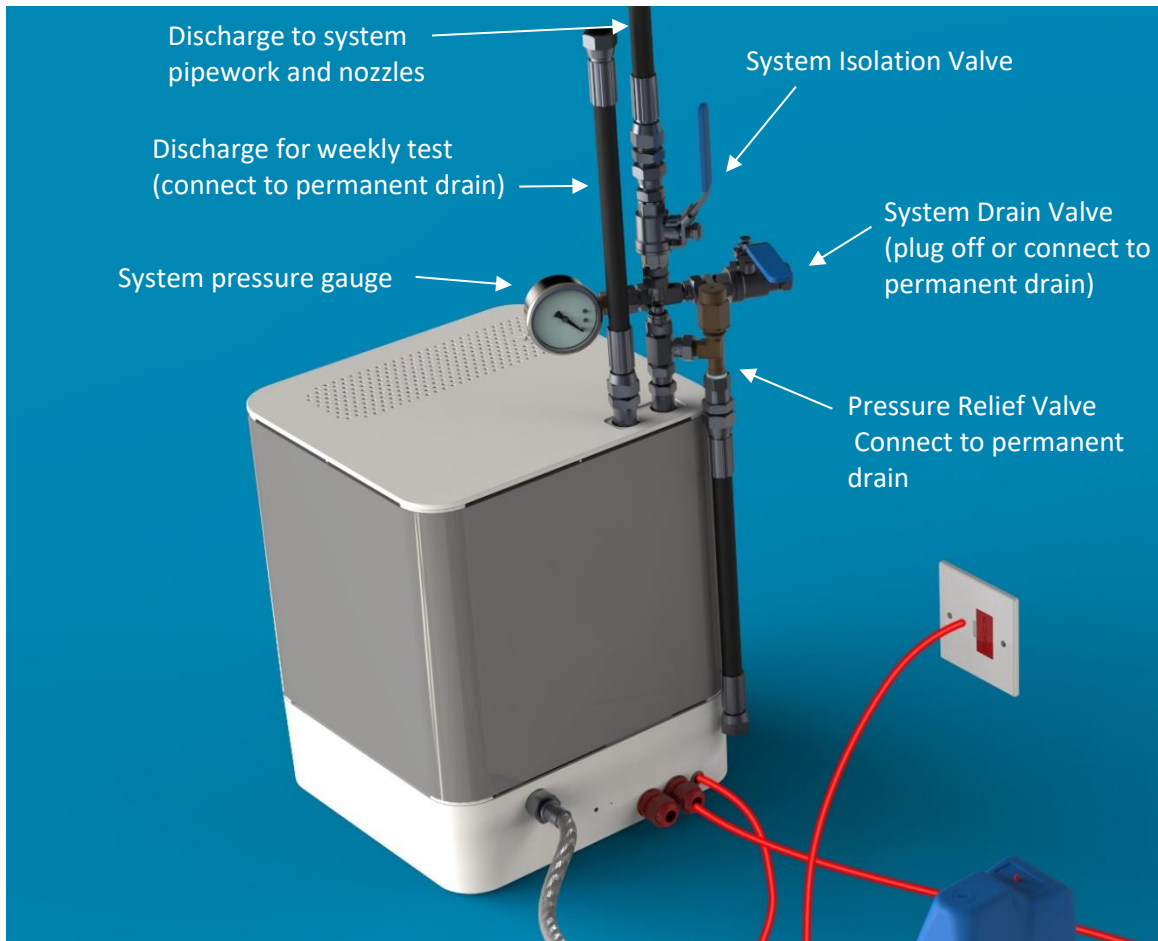
To reset the board or pump following a fire or fault power down the pump at the mains and power up again. This will return the pump to its normal condition.

Control & Monitoring Board - Connection to Alarm System



ACTIONS FOLLOWING A SYSTEM ACTIVATION

1. Close the system isolation valve. This will stop the pump from running.



2. Switch power off to the pump
3. Close water supply valve on the inlet manifold
4. Replace activated nozzle
5. Open isolation valves
6. Bleed any trapped air out of the system

7. Switch power back on

COMPLETION CERTIFICATES

All systems should be supplied with a commissioning certificate in the name of the installing company. Below is an example of the minimum commissioning requirements.

Fire Suppression Installation Completion Certificate	
Pump Serial Number	12345
Installation Address	33a Marlborough Rd Hertfordshire SL1 VVK UK
Client Contact Name	James Lee
Category of system	Domestic occupancy
Options for Domestic Occupancy	Individual maisonette
Nozzles are not painted and are free from obstruction	Yes
Nozzles are spaced in accordance with manufacturers design guide	Yes
Each nozzle has been checked prior to installation to ensure the bulb is in good condition.	Yes
Stop valves have been exercised to confirm correct operation	Yes
Pipework is not damaged and is in good condition	Yes
All flexible tubing is behind an appropriate fire rated barrier	Yes
All relevant areas of the property are protected	Yes
Power supply provided in fire rated cable direct from the board non-RCD side	Yes
Water supply is adequate for the property (see manual for details)	Yes
The pump has completed its initialisation period after being switched on and the automatic self test was passed	Yes
After the pump initialisation is complete the pump has been tested using the manual test button on the pump or by opening a manual test valve at the point furthest from the pump	Yes
The fire and fault relays operate correctly	Yes
Priority demand valve operates correctly (if installed)	Yes
Pump casing is in good condition	Yes
Pump is positioned at low level in a well ventilated cupboard with at least 100mm of space around top and sides.	Yes
Inlet filter is clear of obstructions	Yes
Description of third party connections	Connection to AOV Connection to fire alarm
If applicable third party connections have been tested	Yes
Further comments	Powered down at clients request until project handover
Installation Company	Installer 1
Installation Company Contact Email	
Installer Name	Installer 1
Installer Position	System installer
Date of Installation	2018-08-20

Acceptance - As the competent person responsible for the design, installation and commissioning of the fire suppression system identified above, I CERTIFY that the said work for which I have been responsible complies to the best of my knowledge and belief with the following standards where applicable BS8458, BS9251, BS7671 and manufacturer's recommendations *except for the variations, as listed in the design specification and/or the attached schedule (delete if not applicable).	Yes
--	-----

Maintenance Certificate

All systems should be supplied with a maintenance certificate following the annual maintenance which should be provided in the name of the installing company. Below is an example of the minimum maintenance requirements.

System Maintenance Certificate	
Pump Serial Number	0000
Installation Address	Enter Address
Ensure nozzles are not painted and are free from obstruction	Yes
Check nozzles are spaced in accordance with manufacturer's recommendations	Yes
Where possible ensure pipework in not damaged and in good condition	Yes
Check that all relevant areas of the property are protected	Yes
Verify water supply is adequate for the property	Yes
Self-test the pump by pressing test button or opening a manual test valve	Yes
Confirm operate of fire and fault relays	Yes
Confirm operation of priority demand valve if provided	Yes
Check pump casing is in condition	Yes
Ensure pump is positioned in a well ventilated cupboard with at least 100mm of spare around top and sides	Yes
Check filter is clear	Yes
Exercise stop valves to confirm correct operation	Yes
Comments & Recommendations	Enter comments
Email	
Name	Enter Technician's Name
Confirm you have maintained the system in accordance with the relevant standards and manufacturer's recommendations.	Yes
Maintenance Date	0007-05-05

Building Regulation Approval

The purpose of this section is to provide guidance on building regulation approval for fire suppression systems in England, Scotland and Wales.

Throughout this section we make reference to the relevant sections of the approved documents or technical standards and provide the relevant information in relation to compliance

England

Extract from Building Regulations - Approved Document B. Volume 1.

Residential sprinklers

0.16 Sprinkler systems installed in dwelling houses can reduce the risk to life and significantly reduce the degree of damage by fire. Sprinkler protection can also sometimes be used as a compensatory feature where the provisions of this Approved Document are varied in some way.

0.17 Where a sprinkler system is recommended within this document it should be designed and installed in accordance with BS 9251:2005 Sprinkler systems for residential and domestic occupancies – Code of practice and DD 252:2002 Components for residential sprinkler systems - Specification and test methods for residential sprinklers.

Where sprinklers are provided, it is normal practice to provide sprinkler protection throughout the building. However, where the sprinklers are being installed as a compensatory feature to address a specific risk or hazard it may be acceptable to protect only part of a building.

0.18 There are many alternative or innovative fire suppression system available. Where these are used it is necessary to ensure that such systems have been designed and tested for use in domestic buildings and are fit for their intended purpose.

We demonstrate that our systems have been designed and tested for use in domestic buildings and are fit for their intended purpose by our system performance fire tests carried out to BS8458 (Fixed fire protection systems. Residential and domestic water mist systems. Code of practice for design and installation) and BS9252:2011 (Components for residential sprinkler systems. Specification and test methods for residential sprinklers) carried out by a UKAS accredited laboratory, Exova Warrington Fire.

Note: There are no traditional sprinklers available on the market that have been successfully tested to BS9252. The sprinkler industry instead use an American UL test.

Scotland

Extract from Scottish Technical handbook - Domestic

2.15.1 Automatic fire suppression systems

The term automatic life safety fire suppression system includes sprinkler systems but provides the opportunity for designers to propose other systems which may be just as effective. The key characteristics of the system are:

- *it must be automatic and not require people to initiate its activation*
- *it must be designed primarily to protect lives, rather than property, which means it should*
- *be fitted with faster responding sprinkler heads, and it must be a fire suppression system, one designed specifically to deal with fires rather than other hazards.*

Alternative suppression systems - there are many alternative or innovative fire suppression systems available including systems utilising domestic plumbing and watermist systems. Verifiers should satisfy themselves that such systems have been designed and tested for use in domestic buildings and are fit for their intended purpose (see Section 0).

Alternative approaches in a particular case may or may not be compensated by an automatic fire suppression system.

We demonstrate that our systems have been designed and tested for use in domestic buildings and are fit for their intended purpose by our system performance fire tests carried out to BS8458 (Fixed fire protection systems. Residential and domestic water mist systems. Code of practice for design and installation) and BS9252:2011 (Components for residential sprinkler systems. Specification and test methods for residential sprinklers) carried out by a UKAS accredited laboratory, Exova Warrington Fire.

Note: There are no traditional sprinklers available on the market that have been successfully tested to BS9252. The sprinkler industry instead uses an American UL test.

Wales

Extract from Welsh Building Regulations - Approved Document B. Volume 1. (2006 edition incorporating 2010 and 2016 amendments)

Section 2: Residential Automatic Fire Suppression Systems

Introduction

2.2 Regulation 37A brings in a mandatory requirement for automatic fire suppression systems in all new premises of Purpose Groups 1a, 1b, 1c, 2a

General

2.3 Where an automatic fire suppression system is required or recommended within this document it should be a system which is, designed and installed in accordance with an appropriate, fully implemented, technical standard such as BS9251:2014 Sprinkler systems for domestic and residential occupancies - Code of practice or an equivalent technical standard.

The components of the automatic fire suppression systems should be in accordance with an appropriate, fully implemented, technical standard such as BS 9252:2011 Components for residential sprinkler systems – Specification and test methods for residential sprinklers or an equivalent technical standard.

Where an alternative technical standard (to BS 9251 or BS 9252) is used the guidance of Section 2.5 and Appendix A should be followed.

2.5 There are many alternative or innovative fire suppression systems available. Where these are used it is necessary to ensure that such systems have been designed and tested for use in domestic buildings and are fit for their intended purpose.

We refer to Appendix A which is required to be followed if an alternative standard, such as BS 8458 or UL, is used.

Appendix A: Performance of materials, products and structures.

Much of the guidance in this document is given in terms of performance in relation to British or European Standards for products or methods of test or design or in terms of European Technical Approvals. In such cases the material, product or structure should:

1.a. *be in accordance with a specification or design which has been shown by test to be capable of meeting that performance; or*

Note: *For this purpose, laboratories accredited by the United Kingdom Accreditation Service (UKAS) for conducting the relevant tests would be expected to have the necessary expertise.*

b. *have been assessed from test evidence against appropriate standards, or by using relevant design guides, as meeting that performance; or*

Note: *For this purpose, laboratories accredited by UKAS for conducting the relevant tests and suitably qualified fire safety engineers might be expected to have the necessary expertise.*

We demonstrate that our systems have been designed and tested for use in domestic buildings and are fit for their intended purpose by our system performance fire tests carried out to BS8458 (Fixed fire protection systems. Residential and domestic watermist systems. Code of practice for design and installation) and BS9252:2011 (Components for residential sprinkler systems. Specification and test methods for residential sprinklers) carried out by a UKAS accredited laboratory, Exova Warrington Fire.

Note: There are no traditional sprinklers available on the market that have been successfully tested to BS9252. The sprinkler industry in the UK uses an American UL test which is not a laboratory accredited by UKAS

Installation Compliance

In relation to 3rd party installer accreditations approved document B for Wales states the following.

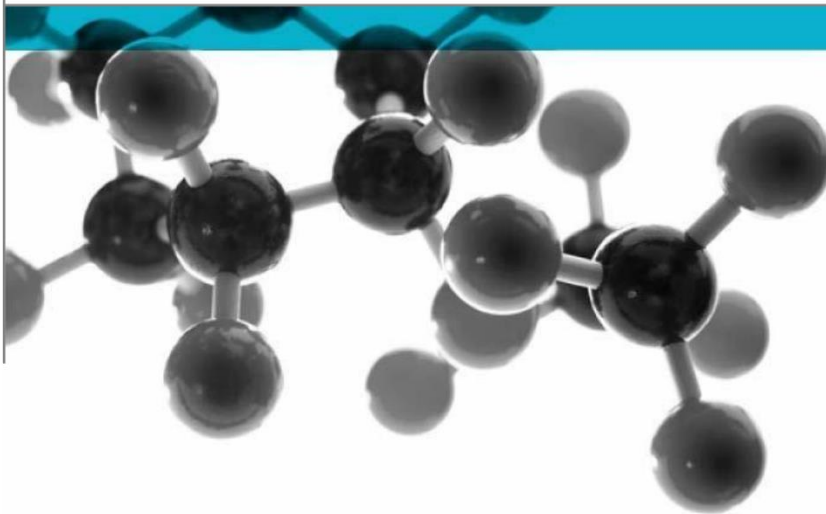
2.6 *The recommendations of Section 1.23 also apply to residential automatic fire suppression systems. It is essential that automatic fire suppression systems are properly designed, installed and maintained. Where the automatic fire suppression system is installed, an installation and commissioning certificate should be provided. Third party certification schemes for fire protection products and related services are an effective means of providing the fullest possible assurances, offering a level of quality, reliability and safety.*

Approved document B states that 3rd party installer certifications are an 'effective means' it does not state that it is the only means.

A typical traditional sprinkler system is made up of a number of components purchased from different suppliers and is installed by contractors that often have little or no association with the manufacturer. Traditional sprinkler materials can also be purchased by almost anyone so in this instance third party approvals such as FIRAS would seem an appropriate measure to ensure quality and compliance.

ICO products are only supplied to trained and approved installers.

BS 8458:2015: Annex C



Method for Measuring the Capability of a Watermist System to Control a Fire – “Room Fire Test for Watermist Systems with Automatic Nozzles”

A Report To: Knox Fire & Security Ltd

Document Reference: 357740

Date: 23rd March 2016

Issue No.: 1

Page 1

**Testing
Advising
Assuring**

Executive Summary

Objective To demonstrate the capability of a watermist system to control a fire when tested in accordance with BS 8458:2015: Annex C.

Generic Description	Product reference	Thickness / diameter / angle	Weight per unit area or density
Residential & domestic water mist fire suppression system	"PUCK 01"	Not applicable	Not applicable
Individual components used to manufacture the system:			
Nozzle	"PU002-00"	Unwilling to provide	Not applicable
Glass bulb	Unwilling to provide	Not applicable	Not applicable
Pipe	"PU005-00"	External: Ø 3/8"	Not stated
Pump	"PU001-00"	Not applicable	Not applicable
Please see page 6 of this test report for the full description of the system tested			

Test Sponsor Knox Fire & Security Ltd, Unit 405, The ScreenWorks, 22 Highbury Grove, London, N5 2ER

Test Results:

Thermocouple location	Maximum temperature °C (as per BS 8458:2015: Annex C.4 paragraph 3)					
	Test 1	Test 2	Test 3	Test 4	Test 5	Test 6
75mm below the underside of the ceiling	116	85	116	64	214	50
1.6m above the floor, furthest from fire	35	29	44	36	30	23
1.6m above the floor, centre (if applicable)	35	27	46	33	28	26
1.6m above the floor, close to fire (if applicable)	29	35	N/A	N/A	28	N/A

Key:

Test 1 – Corner.

Test 2 – Between two nozzles.

Test 3 – Beneath a nozzle.

Test 4 – Beneath a nozzle ventilation test.

Test 5 – Corner open room test.

Test 6 – Beneath a nozzle open room test.

Where the thermocouples were positioned at 1.6m above the floor, the temperatures did not exceed 55°C for any 120 s interval, during test 1, 2, 3, 4, 5 & 6.

During tests 1, 2, 3, & 4 the external nozzle did not activate.

Conclusion



The temperatures in the case of all the tests were all declining 2 minutes after the nozzle operation (See Figures 1 and 2).

The watermist system suppressed the fuel packages and met all the criteria specified in Clause 6.1 (a), (b) & (c) of BS 8458:2015 for domestic and residential purposes at a maximum of 80m².

Date of Test

17th and 18th February 2016

Signatories

	
Responsible Officer T. Kinder * Technical Officer	Authorised T. Mort * Senior Technical Officer


* For and on behalf of **Exova Warringtonfire**.

Report Issued: 23rd March 2016

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Description of system

The description of the system given below has been prepared from information provided by the sponsor of the test. All values quoted are nominal, unless tolerances are given.

General description		Residential & domestic water mist fire suppression system
System reference		"PUCK 01"
Name of manufacturer		PUCK
Detailed description		BS 8458 fire suppression system with ceiling mounted bulb activated nozzles
Nozzle	Product reference	"PU002-00"
	General description	Residential & domestic water mist fire suppression nozzle
	Name of manufacturer	PUCK
	Angle	See Note 1 below
	Nozzle positions	2m from walls, 4m between nozzles
	Distance between the ceiling and nozzle orifice	<1mm
	Colour reference	"Black"
	Photograph	
Glass bulb	Product reference	See Note 1 below
	General description	57°C
	Name of manufacturer	JOB
	Colour reference	"Orange"
Pipe	Product reference	"PU005-00"
	Generic type	Flexible tubing
	Name of manufacturer	PUCK
	External diameter	3/8"
	Wall thickness	See Note 1 below
	Length	30m
	Density	See Note 2 below
	Colour reference	"Black"
Flame retardant details	See Note 2 below	

Pump	Product reference	"PU001-00"
	General description	Fire suppression water pump
	Name of manufacturer	See Note 1 below
	Photograph	
Brief description of manufacturing process		See Note 1 below

Note 1. The sponsor was unwilling to provide this information.

Note 2. The sponsor was unable to provide this information.

Test Results

Applicability of test results

The test results relate only to the behaviour of the system under the particular conditions of test, they are not intended to be the sole criterion for assessing the potential fire hazard of the system in use.

The test results relate only to the system in the form in which it was tested. Small differences in the composition of the system may significantly affect the performance during the test and may therefore invalidate the test results. Care should be taken to ensure that any system which is supplied or used is fully represented by the system which was tested.

Test results

Thermocouple location	Maximum temperature °C (as per BS 8458:2015: Annex C.4 paragraph 3)					
	Test 1	Test 2	Test 3	Test 4	Test 5	Test 6
75mm below the underside of the ceiling	116	85	116	64	214	50
1.6m above the floor, furthest from fire	35	29	44	36	30	23
1.6m above the floor, centre (if applicable)	35	27	46	33	28	26
1.6m above the floor, close to fire (if applicable)	29	35	N/A	N/A	28	N/A

Key:

- Test 1 – Corner.
- Test 2 – Between two nozzles.
- Test 3 – Beneath a nozzle.
- Test 4 – Beneath a nozzle ventilation test.
- Test 5 – Corner open room test.
- Test 6 – Beneath a nozzle open room test.

Where the thermocouples were positioned at 1.6m above the floor, the temperatures did not exceed 55°C for any 120 s interval, during test 1, 2, 3, 4, 5 & 6.

During tests 1, 2, 3, & 4 the external nozzle did not activate.

Conclusion

The temperatures in the case of all the tests were all declining 2 minutes after the nozzle operation (See Figures 1 and 2).

The watermist system suppressed the fuel packages and met all the criteria specified in Clause 6.1 (a), (b) & (c) of BS 8458:2015 for domestic and residential purposes at a maximum of 80m².

Temperatures The temperatures logged and calculated average for every 30 seconds during the tests are presented in Figures 1, 2, 3, 4, 5 and 6.

Fire test layout Diagrams detailing the fire test layouts are presented in Figures 7, 8, 9, 10, 11 and 12.

Validity The specification and interpretation of fire test methods are the subject of ongoing development and refinement. Changes in associated legislation may also occur. For these reasons it is recommended that the relevance of test reports over five years old should be considered by the user. The laboratory that issued the report will be able to offer, on behalf of the legal owner, a review of the procedures adopted for a particular test to ensure that they are consistent with current practices, and if required may endorse the test report.

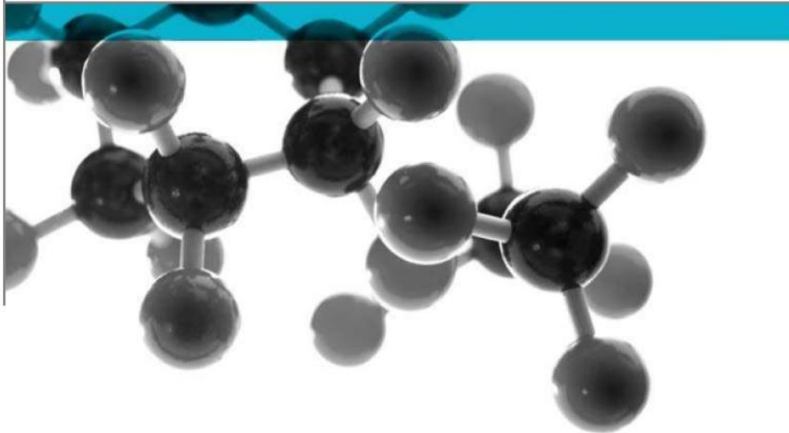
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Test on a watermist system utilising the principles of the procedure defined in BS 9252: 2011: Annex S



**Specification and test methods for residential sprinklers:
Fire tests**

A Report To: Knox Fire & Security Ltd

Document Reference: 370489

Date: 18th August 2016

Issue No.: 1

Page 1

**Testing
Advising
Assuring**

Rev.14

Registered Office: Exova (UK) Ltd, Lochend Industrial Estate, Newbridge, Midlothian EH28 8PL United Kingdom. Reg No.SC 70429
This report is issued in accordance with our terms and conditions, a copy of which is available on request.

Page 60 of 111

<http://www.ico-products.com>

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Executive Summary

Objective To demonstrate the capability of a water mist system to control a fire utilising the principles of the test procedure defined in BS 9252:2011: Annex S

Generic Description	Product reference	Thickness / diameter / angle	Weight per unit area or density
Residential & domestic water mist fire suppression system	"PUCK 01"	Not applicable	Not applicable
Individual components used to manufacture the system:			
Nozzle	"PU002-00"	Unwilling to provide	Not applicable
Glass bulb	Unwilling to provide	Not applicable	Not applicable
Pipe	"PU005-00"	External: Ø 3/8"	Not stated
Pump	"PU001-00"	Not applicable	Not applicable
Please see page 6 of this test report for the full description of the system tested			

Test Sponsor Knox Fire & Security Ltd, Unit 405, The ScreenWorks, 22 Highbury Grove, London, N5 2ER

Test Results:



Thermocouple location	Maximum temperature °C	
	Corner Test	Centre Test
75mm below the underside of the ceiling	119	291
6.5mm above underside ceiling	45	103
1.6m above the floor, furthest from fire	39	42
1.6m above the floor, centre (if applicable)	N/A	63
1.6m above the floor, close to fire (if applicable)	30	51

Where the thermocouples were positioned at 1.6m above the floor, the temperatures did not exceed 55°C for any 120 second interval.

During tests 1 & 2 the replicated third sprinkler did not activate.

Date of Test 17th and 18th February 2016

Signatories

	
Responsible Officer T. Kinder * Technical Officer	Authorised S. Deeming * Business Unit Head

* For and on behalf of **Exova Warringtonfire**.

Report Issued: 18th August 2016

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Test Details

Introduction

The sponsor, Knox Fire & Security Ltd produce watermist systems, designed to control fires in similar situations to which sprinkler system would usually be used. The sponsor approached **Exova Warringtonfire** with such a watermist system and asked that its performance under fire conditions be assessed.

The corner test data utilised in the preparation of this report has also been utilised for similar purposes in the case of the **Exova Warringtonfire** report EWF No. 357740.

The **Exova Warringtonfire** report EWF No. 357740 utilises the data to evaluate and categorise the same product against the requirements of BS 8458:2015: Annex C (Method for Measuring the Capability of a Watermist System to Control a Fire – “Room Fire Test for Watermist Systems with Automatic Nozzles”).

Purpose of test

To determine the performance of a watermist system when it is subjected to the conditions of the tests specified in BS 9252: 2011 “Components for residential sprinkler systems – Specification and test methods for residential sprinklers” Annex S “Fire tests”

The test was performed in accordance with the principles of the procedure specified in BS 9252: 2011: Annex S (please note the deviations from this as detailed in the ‘Deviation from test standard’ section below) and this report should be read in conjunction with that Standard.


Scope of test

BS 9252: 2011 specifies requirements for the fire performance of sprinklers which are operated by a change of state of an element or bursting of a glass bulb under the influence of heat. Annex S to this Standard details a test procedure for measuring the temperature within a test room, to determine if a system has the capabilities to control the test fires for a period of 10 min (measured from sprinkler operation) without the operation of a third sprinkler in the system. The temperature measurements recorded throughout the test are used to determine compliance with the criteria given in BS 9252: 2011 Table 5 and the requirements specified in this table are detailed in Appendix 2.

Deviation from test standard	<p>BS 9252: 2011 is a specification which details the performance requirements for components of residential sprinkler systems.</p> <p>The system under test and described in this report is a watermist system, and as such does not fall into the category of sprinkler system as covered by this test standard.</p> <p>In all other respects, the procedures defined in the test standards (fire loads, positions etc) were applicable.</p> <p>The deviation from the test standard as detailed here should be considered carefully when assessing the results obtained against specific requirements.</p>
Instruction to test	<p>The test was conducted on the 17th and 18th February 2016 at the request of Knox Fire & Security Ltd, the sponsor of the test.</p>
Provision of the system to test	<p>The system was supplied by the sponsor of the test. Exova Warringtonfire was not involved in any selection or sampling procedure.</p>
Conditioning of ignition and fuel packages	<p>The plywood sheets, sacrificial boards, wooden frames, foam sheets and wood crib sticks were conditioned to constant mass at a temperature of $23 \pm 2^{\circ}\text{C}$ and a relative humidity of $50 \pm 5\%$ prior to testing.</p> <p>The cribs were conditioned, such that the moisture content was $10 \pm 2\%$ at 3mm below the wood stick surface prior to testing.</p>
Ignition package	<p>Ignition packages as detailed in Annex S.1.3 were used.</p>
Fuel package	<p>Fuel packages as detailed in Annex S.1.4 were used.</p>
Test room	<p>The test room was erected, as detailed in Annex S.1.1.</p>
Operating pressure	<p>The systems operating pressure was 40 bar (when one nozzle activated) and dropped to 20 bar (when both nozzles activated).</p> <p>The operating pressures throughout the tests are presented in Figures 1 and 2.</p>
Water flow rate	<p>The systems water flow rate at operation was 12 l/min.</p>
Detection/actuation method	<p>The system utilised glass bulb nozzle detection that automatically activated the system on detection of the fire.</p>
Additives, propellants and atomizing media used	<p>No additives, propellants or atomizing media were used in the system.</p>

Description of system

The description of the system given below has been prepared from information provided by the sponsor of the test. All values quoted are nominal, unless tolerances are given.

General description		Residential & domestic water mist fire suppression system
System reference		"PUCK 01"
Name of manufacturer		PUCK
Detailed description		BS 8458 fire suppression system with ceiling mounted bulb activated nozzles
Nozzle	Product reference	"PU002-00"
	General description	Residential & domestic water mist fire suppression nozzle
	Name of manufacturer	PUCK
	Angle	See Note 1 below
	Nozzle positions	2m from walls, 4m between nozzles
	Distance between the ceiling and nozzle orifice	<1mm
	Colour reference	"Black"
	Photograph	
Glass bulb	Product reference	See Note 1 below
	General description	57°C
	Name of manufacturer	JOB
	Colour reference	"Orange"
Pipe	Product reference	"PU005-00"
	Generic type	Flexible tubing
	Name of manufacturer	PUCK
	External diameter	3/8"
	Wall thickness	See Note 1 below
	Length	30m
	Density	See Note 2 below
	Colour reference	"Black"
Flame retardant details	See Note 2 below	

Continued on next page

Pump	Product reference	"PU001-00"
	General description	Fire suppression water pump
	Name of manufacturer	See Note 1 below
	Photograph	
Brief description of manufacturing process		See Note 1 below

Note 1. The sponsor was unwilling to provide this information.

Note 2. The sponsor was unable to provide this information.

Test Results

Applicability of test results

The test results relate only to the behaviour of the system under the particular conditions of test, they are not intended to be the sole criterion for assessing the potential fire hazard of the system in use.

The test results relate only to the system in the form in which it was tested. Small differences in the composition of the system may significantly affect the performance during the test and may therefore invalidate the test results. Care should be taken to ensure that any system which is supplied or used is fully represented by the system which was tested.

Test results

BS 9252: 2011 requires that testing is conducted in both a 'corner' configuration and a 'centre' configuration and readings are taken throughout the test by thermocouples sited at fixed positions such that the maximum temperature reached at each position can be determined. The maximum temperatures recorded at each of the positions are as detailed in the table below:

Thermocouple location	Maximum temperature °C	
	Corner Test	Centre Test
75mm below the underside of the ceiling	119	291
6.5mm above underside ceiling	45	103
1.6m above the floor, furthest from fire	39	42
1.6m above the floor, centre (if applicable)	N/A	63
1.6m above the floor, close to fire (if applicable)	30	51

Where the thermocouples were positioned at 1.6m above the floor, the temperatures did not exceed 55°C for any 120 second interval.

During tests 1 & 2 the replicated third sprinkler did not activate.

Observations

The visual observations taken during the tests are shown in Appendix 1.

Temperatures

The temperatures logged during the tests are presented in Figures 1, 2, 3 and 4.

Fire test layout

Diagrams detailing the fire test layouts are presented in Figures 5, 6, 7 and 8.

Validity

The specification and interpretation of fire test methods are the subject of ongoing development and refinement. Changes in associated legislation may also occur. For these reasons it is recommended that the relevance of test reports over five years old should be considered by the user. The laboratory that issued the report will be able to offer, on behalf of the legal owner, a review of the procedures adopted for a particular test to ensure that they are consistent with current practices, and if required may endorse the test report.

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EU Declaration of Conformity (No. PU-0001-1)

In accordance with of European Parliament and Council Decision No 768/2008/EC Annex III

1. *Product model / product:*

Product Fire suppression mist system
Model/type Puck
Batch/serial no. PU-0001-1

2. *Manufacturer*

Name HiPro Industries Ltd
Address Park House, 10 Park Street, Bristol, United Kingdom, BS1 5HX

3. *This declaration is issued under the sole responsibility of the manufacturer.*

4. *Object of the declaration:*

Product Water pump and nozzles for fire protection via water misting, with wireless communication and companion app
Specification 240 V AC, 13Amp, 10-90 bar, 12lpm,

5. *The object of the declaration described above is in conformity with the relevant Union harmonisation legislation:*

2006/42/EC The Machinery Directive
2014/53/EU The Radio Equipment Directive
2011/65/EU The Restriction of Hazardous Substances Directive

6. *References to the relevant harmonised standards used or references to the other technical specifications in relation to which conformity is declared:*

Reference & Date Title

Article 3.1(a) – Safety

EN 60204-1:2006 + A1:2009 *Safety of machinery - Electrical equipment of machines - Part 1: General requirements*
EN 809:1998+A1:2009 *Pumps and pump units for liquids - Common safety requirements*

Article 3.1(b) – Electromagnetic Compatibility

BS EN 55014-1:2006 + A2:2011 *Electromagnetic compatibility. Requirements for household appliances, electric tools and similar apparatus. Emission*
BS EN 55014-2:1997 + A2:2008 *Electromagnetic compatibility. Requirements for household appliances, electric tools and similar apparatus. Immunity.*

Article 3.2 – Spectrum efficiency

EN 301 489-1 V1.9.2 (2011-09) *Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services;Part 1: Common technical requirements*
EN 301 489-17 V2.2.1 (2012-09) *ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 17: Specific conditions for Broadband Data Transmission Systems;*
EN 300 328 V1.9.1 (2015-02) *Electromagnetic compatibility and Radio spectrum Matters (ERM); Wideband transmission systems; Data transmission equipment operating in the 2,4 GHz ISM band and using wide band modulation techniques*
EN 62311: 2008 *Assessment of electronic and electrical equipment related to human exposure restrictions for electromagnetic fields (0 Hz - 300 GHz)*

Article 3.3 – Other requirements

BS 8458:2015 *Fixed fire protection systems. Residential and domestic watermist systems. Code of practice for design and installation*

EU Declaration of Conformity (No. PU-0001-1)

In accordance with of European Parliament and Council⁽¹⁾ Decision No 768/2008/EC Annex III

1. *Product model / product:*

Product	Fire suppression mist system
Model/type	ICO
Batch/serial no.	PU-0001-1

2. *Manufacturer*

Name	HiPro Industries Ltd
Address	Park House, 10 Park Street, Bristol, United Kingdom, BS1 5HX

3. *This declaration is issued under the sole responsibility of the manufacturer.*

4. *Object of the declaration:*

Product	Water pump and nozzles for fire protection via water misting, with wireless communication and companion app
Specification	240 V AC, 13Amp, 10-90 bar, 12lpm,

5. *The object of the declaration described above is in conformity with the relevant Union harmonisation legislation:*

2006/42/EC	The Machinery Directive
2014/53/EU	The Radio Equipment Directive
2011/65/EU	The Restriction of Hazardous Substances Directive

6. *References to the relevant harmonised standards used or references to the other technical specifications in relation to which conformity is declared:*

Reference & Date	Title
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Article 3.1(a) – Safety

EN 60204-1:2006 + A1:2009	Safety of machinery - Electrical equipment of machines - Part 1: General requirements
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EN 809:1998+A1:2009	Pumps and pump units for liquids - Common safety requirements
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Article 3.1(b) – Electromagnetic Compatibility

BS EN 55014-1:2006 + A2:2011	Electromagnetic compatibility. Requirements for household appliances, electric tools and similar apparatus. Emission
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BS EN 55014-2:1997 + A2:2008	Electromagnetic compatibility. Requirements for household appliances, electric tools and similar apparatus. Immunity.
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Article 3.2 – Spectrum efficiency


- EN 301 489-1 V1.9.2 (2011-09) *Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services;Part 1: Common technical requirements*
- EN 301 489-17 V2.2.1 (2012-09) *ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 17: Specific conditions for Broadband Data Transmission Systems;*
- EN 300 328 V1.9.1 (2015-02) *Electromagnetic compatibility and Radio spectrum Matters (ERM); Wideband transmission systems; Data transmission equipment operating in the 2,4 GHz ISM band and using wide band modulation techniques*
- EN 62311: 2008 *Assessment of electronic and electrical equipment related to human exposure restrictions for electromagnetic fields (0 Hz - 300 GHz)*

Article 3.3 – Other requirements

- BS 8458:2015 Fixed fire protection systems. Residential and domestic watermist systems. Code of practice for design and installation*

7. Additional information:

The technical documentation for the machinery is available from the address above.

Signed for and on behalf of: HiPro Industries Ltd
Place of issue: London UK, SL73ND
Date of issue: 29th July 2017
Name: Steve Lloyd-Jones
Function: Director
Signature: 

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