af-x fireblocker

Design, Installation, Operation and Maintenance Manual

AF-X Fireblocker Nano Series

Date: 01-09-2020
Version: 3.5

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Please keep this user manual for future use. It will expire upon publication of a revised issue however, so please check when using this manual if you have the latest available version.
You can check with your distributor, dealer, AF-X Systems BV or on the website: www.af-x.com

kiwa certified GUIDELINE K23001 FIRE SAFETY

Design, Installation, Operation and Maintenance Manual AF-X Fireblocker Nano Series

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This manual is the manufacturer's design, installation, operating and maintenance instruction manual for detailed instructions for correct usage and maintenance.

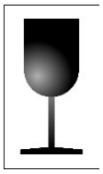
Please read this user manual carefully <u>before</u> installing AF-X Fireblocker fire extinguishers of the Nano Series.

The AF-X Systems BV general terms and conditions can be retrieved at the Chamber of Commerce, Amsterdam office, reference number 52010430

Design, Installation, Operation and Maintenance Manual

Contents

Signs to indicate prohibitions, mandatory actions and cautions used in this manual

PROHIBITION					
	Beware	No switching off	No switching on		
MANDATORY ACTION					
	Foot protection	respiratory protection			
MANDATORY ACTION					
	Attention / important	Eye protection	Head protection	Hand protection	Unplug / disconnect
CAUTION					
	Fragile	Fall danger	Hot surface	Damage	

Foreword

Trademarks

af-x®, af-x fireblocker® and af-x systems® are registered trade, word and figurative marks.

Patents

AF-X Systems BV has registered several patents, including the patent for 'Fire Extinguishing Composition' under number PCT/NL2012/050079.

Information on standards, directives and regulations

Various authorities issue directives regarding the use and installation of aerosol fire extinguishing systems. Examples are the Kiwa certification schemes BRL-K23001, K23003 and ISO15779, EN15276-2, NFPA 2010 and other NFPA Standards. Furthermore, there are often local directives, guidelines or regulations.

The standards in this user manual contain stipulations that, through the mere fact that they are being referred to, serve as this document's stipulations too. When this document went to print, the editions mentioned were in force. All standards can be subject to revision however; parties entering into agreements based on this document are therefore recommended to ascertain that they are using these standards' latest versions.

AF-X Fireblocker has been designed, developed and built in accordance with the guidelines of the following standards:

- International standards: ISO 15779
- European standards: CEN/TR 15276
- US standards: UL 2775 and NFPA 2010
- International Waters: IMO 1270
- Transport of Dangerous Goods: ADR, UN-No. 3268, Safety Devices, UN Class 9
- CE Marking: EU Pyrotechnic Directive 2013/29, category P1

The AF-X Fireblockers are delivered with the mandatory CE Marking according the Pyrotechnic Directive 2013/29. An AF-X Fireblocker must be installed, inspected and maintained by qualified personnel with a minimum age of 18 years in compliance with local laws and regulations for installation and use of aerosol units and fire extinguishing systems.

Information on general use of condensed aerosol generators

AF-X Fireblocker generators are intended for total flooding use where there is a fixed enclosure around the hazard in order to enable the required concentration to be achieved and maintained for the required period of time and therefor to ensure an effective extinguishment of a fire within the enclosure. They are intended for normally unoccupied applications.

1.0 Introduction

AF-X Fireblocker is designed to extinguish surface burning fires Class A&B. This manual is written in such a way that it covers most of the important aspects of the AF-X Fireblocker's functional use. Therefore, to ensure functional use of the AF-X Fireblocker, all instructions of this manual need to be followed closely.

Electrical installations, such as fire detection, control and alarm systems, need to be designed, installed and maintained by the systems supplier trained (certified) personnel according to this manual and instructions. Local or National standards, guidelines or other legislation regarding these matters are not included in this user manual.

The aerosol generated, may create a potential hazard for personnel and equipment in the protected area. While generating aerosol, there are high temperature products of the extinguishing media discharged and this characteristic should be evaluated before the generators are installed.

In case of incorrect use of the information in this manual AF-X Systems BV will not accept any responsibility for any damage caused by the AF-X Fireblocker system.

2.0 Scope

AF-X Fireblocker is based on a condensed aerosol and designed to be part of a total flooding fire extinguishing system. Precondition for powerful performance is the unit's connection to and activation by an effective fire detection system. Rapid detection and reaction are vital.

AF-X Fireblocker **can** be used in spaces that are normally unoccupied. Cylindrical generators can additionally be placed in motor compartments or otherwise vibrating environments.

AF-X Fireblocker and other aerosol extinguishants have been recognized as effective media for the extinction of Class A fires (solid surface burning fires) and Class B fires according to EN 2 but it should not be forgotten, in the planning of comprehensive schemes, that there can be hazards for which these mediums are not suitable, or that in certain circumstances or situations there can be dangers in their use requiring special precautions.

AF-X Fireblocker **cannot** be used with:

- Materials with non-surface burning fire potential, or possible chain reaction of the organic fuel, oxygen and temperature within the material(s), bulk smouldering fire potential, e.g. in cocoa beans, rubber;
- Oxygenic chemical compounds such as nitrocellulose and gunpowder;
- Reactive metals such as lithium, sodium, potassium, magnesium, titanium, zirconium, uranium and plutonium;
- Metal oxides;
- Organic peroxides and hydrazine

This list may not be exhaustive

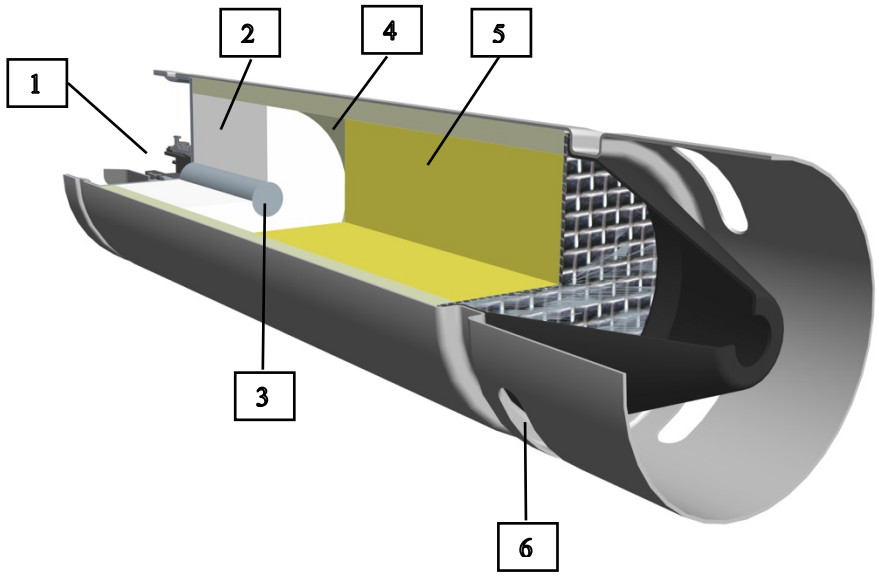
3.0 Design of the AF-X Fireblocker

General description of the AF-X Fireblocker:

1) The AF-X Fireblocker has a stainless-steel casing and comes in various shapes and sizes see annex 1.
2) The AF-X Fireblocker contains a solid, aerosol-forming compound ("SAFCO").
3) Each container is equipped with a special system for independent activation of the AF-X Fireblocker.
4) All types are equipped with a heat absorbing mechanism (insulation).

A tension of 6-36 V (Direct Current) on the AF-X Fireblocker and an electric current of at least 1,0 amperes for 1-2 seconds activates the extinguishing agent and convert it into dispersed nano particles. The aerosol is then cooled by the heat absorbing elements and discharged into the protected area, blocking the fire by stopping the combustion chain reaction. Activation simultaneously triggers other chemical reactions ensuring a final product that is harmless to man, matter and the environment.

Schematic illustration of the AF-X Fireblocker with its 6 key components:



1. Connector to ensure quick installation
2. Patented extinguishing agent to ensure rapid and effective fire extinguishing
3. Activator
4. Balanced space to ensure optimum action and interaction.
5. Thermodynamic cooling to ensure a controlled efflux temperature
6. Aerodynamic discharge opening to ensure a quick and optimum dispersal in the protected area

4.0 Precautions and safety instructions

Read this user manual carefully before putting the AF-X Fireblocker into use.

This user manual contains precaution and safety instructions to ensure a safe execution of the necessary steps. The term 'steps' may refer to all actions in the various product phases: transport, receipt, storage, assembly, connection of the product, mounting and/or installation, treatment and/or use, maintenance, visual inspection, repairs, decommissioning, disassembly, removal, disposal, waste, health, safety and the environment.

Warning: the AF-X Fireblocker may only be installed, maintained or serviced by technically qualified and trained persons and in accordance with the latest applicable local laws, regulations and standards.

When working with the AF-X Fireblocker it is **prohibited** to:

- open and/or dismantle extinguishing units;
- by any means apply force to the units that could result in distortion, physical or mechanical damage to the casing;
- carry out welding activities in the vicinity of the AF-X Fireblocker extinguishing units;
- smoke in the vicinity of the AF-X Fireblocker extinguishing units.

In case an extinguishing unit has fallen, it should be checked for damage to the activator's electric switch and/or other components. When damage and/or dysfunction cannot be ruled out with certainty, the unit cannot be used and must be returned to the authorised AF-X distributor or dealer.




Please see to it that all legal requirements, regulations and advice are adhered to. Pay attention to the risks involved in working at height. Be careful of your footing and use reliable tools and proper personal protective equipment. Should you have any queries, please consult your employer and/or qualified consultancy agencies.

To avoid unnecessary exposure of occupants to the discharged extinguishant, factors such as the time for egress and the risk to the occupants by the fire should be considered when determining the system discharge time delay. Where national standards require other precautions, these should be implemented

5.0 Design and installation of a standalone system with one generator

A standalone AF-X Fireblocker generator can be activated by means of a thermal circuit. For this the AF-X Bimetal Switch can be used. A standalone system cannot be larger than the max coverage volume of the generator.

Please note that equipment used for heating or welding, and other sources of energy, might provoke activation of the fire extinguishing generator if the self-activation temperature is of 300 ºC will be reached.

5.1 Design and installation of a multiple generator system

The fire extinguishing system's basic design determines which detection system and/or peripheral equipment will be chosen. Please be aware that local rules and regulations or a certifying authority may require specific equipment. For proper installation of the systems we expressly refer to the information in this DIOM and to the Fire detection and fire alarm systems manufacturers installation requirements.

The minimum standard requirements for an aerosol fire extinguishing **system** with multiple extinguishing generators are:

1. The Fire Extinguishing Control Panel **FECP** (whether or not connected to a Fire Alarm System, **FAS**) which connects, supplies power to, monitors and controls the various components of the extinguishing system must comply to CEN/TS 54-14, *Fire detection and fire alarm systems - Part 14: Guidelines for planning, design, installation, commissioning, use and maintenance* or to similar local legislation, guidelines and / or standards;
2. The Fire Extinguishing Control Panel FECP must be able to provide sufficient energy to activate all the generators in the system and as designed;
3. Unless otherwise specified in a standard, 72 h minimum standby sources of energy shall be used to provide for operation of the detection, signalling, control and actuation requirements of the system.
4. Fire detection and fire alarm system must be able to generate acoustical and optical signals to warn or inform people present in the protected area about the current status;
5. Wiring, components and connectors connecting the various parts of the system must meet the relevant part of EN54 or similar.

6. Automatic detection equipment feeding the FECP shall be by any method or device and shall be capable of early detection and indication of heat, flame, smoke, combustible vapours, or any abnormal condition in the hazard that is likely to produce fire, and meets the minimum requirements in the table below:

Type of application	Type of protection	Number of criteria	Detection of	Activation criteria
Room	Total flooding	3	CO, heat and smoke	2 detectors or 2 groups
Object / cabinet	Total flooding	2	CO and heat	
Specific	See protocol	See protocol	See protocol	
Note: Specific conditions and / or special applications shall always be verified by AF-X systems.				

There are many fire extinguishing systems on the market. When selecting a FECP it is important to consider the local rules and regulation concerning fire extinguishing systems in general and aerosol fire extinguishing systems in particular.

Note that the extinguishing generators are activated by a heating element with 1.3 – 3.2 Ohm resistance.
The required electric activation voltage is 6 -36 Volt DC; 1.0 Ampère (= 1000 mA) for 1-2 seconds.

5.2 AF-X MCU (Monitoring & Control Unit)

The extinguishing generators are activated by a heating element with 1.3 – 3.2 Ohm resistance. The required electric activation voltage is 6 -36 Volt DC; 1.0 Ampère (= 1000 mA) for 1-2 seconds.
In order to assure that the activation power of the Fire Extinguishing Control Panel FECP is distributed correctly throughout the multiple generator system, the monitoring and control units were developed.
The AF-X MCU provides connection from the Kentec XT, AX-T or the Honeywell Notifier RP1r-SURPA fire control panel to the AF-X Fireblockers.

- A maximum of 18 AF-X MCU's can be connected to each extinguishing line,
- A maximum of 2 AF-X Fireblockers on each MCU.

5.4 AF-X Fireblocker design parameters

For the correct design of an AF-X Fireblocker system, the following steps must be taken:

1. Calculation of the required quantity and type of extinguishing generators;
2. Projection of the extinguishing generators correct position in the area to be protected;
3. Determination of the extinguishing generators correct discharge direction.

5.5 AF-X Fireblocker Aerosol behaviour

For a correct design of an AF-X Fireblocker extinguishing system, it is important to consider several properties and behavioural aspects of the AF-X Fireblocker Aerosol in the area to be protected.

The aerosol formed by the AF-X Fireblocker leaves the generator at some speed. This can be observed as a spreading transparent-white cloud. The temperature of this cloud, consisting of extremely small nanoparticles, is usually somewhat higher than its surroundings. So, initially the aerosol cloud and the temperature in the enclosure will therefore seem to be slowly rising.

The particles are so small that gravity hardly affects them, and they can disperse in the air rapidly in a balanced fashion. The currents and whirls present in the area, either caused by fire or just by the active equipment, make that the tiny aerosol particles actively move through the area. The AF-X Fireblocker Aerosol has been designed to make maximum use of these currents. By consequence, the convection currents caused by the seat of the fire draw the particles into that seat. Even when the fire is just in its very early stages of development.

5.6 Calculation of quantity and type

When you have the protected volume at hand you can use the AF-X Fireblocker Density Calculation Sheet to determine the amount of extinguishant you need and which types of extinguishing generators to choose. This Calculation Sheet is available for trained technicians upon request with AF-X Systems at all times.

The capacity of the generators below is already implemented in the calculation sheet

Coverage Model and Temperature Curve	n-CS	n-CM	n-BM	n-BL
Minimum installation height (horizontally) in cm Area coverage based on density	30	30	100	100
Maximum installation height in cm Area coverage based on density	150	150	500	800
Outflow length in cm	150	150	500	600
Outflow length max. temperature 75°C in cm	< 100	< 150	150	200
Outflow length max. temperature 200°C in cm	Does not occur	Does not occur	< 50	150
Outflow length max. temperature 400°C in cm	Does not occur	Does not occur	Does not occur	< 100

Design density calculation

Manual calculation of the design density can be done using the following formula used in EN15276-2 and NFPA 2010:2015
The effective mass of aerosol in the system shall be at least sufficient for the largest single hazard or group of hazards that are to be protected against simultaneously.
The mass of extinguishant required to achieve the design application density shall be calculated from Formula:

$$M = \rho \times V$$

where
m is the total flooding quantity, in g;
ρ is design application density, in g/m3 (may need to be adjusted to compensate for any special conditions that would adversely affect the extinguishing efficiency, consult AF-X Systems);
V is protected volume, in m3 (may include adjacent connected hazards or work areas).

The design density is the extinguishing density multiplied by the mandatory safety factor of 1.3

In addition to these calculated total flooding quantities, additional quantities of extinguishant can be required by standards to compensate for any special conditions that would adversely affect the extinguishing efficiency or, if required, by the physical characteristics of the extinguishant. Consult AF-X Systems in case of special environmental conditions or applications.

AF-X Fireblocker generator size and quantity selection

In case of the need of more than one aerosol generator to protect a volume, preferably generators of the same family should be used. In all cases the design shall be realized according to the determined coverage tests of the AF-X Fireblocker generator(s) involved.
NOTE: As each condensed aerosol generator contains a distinct amount of the solid aerosol-forming compound, there can be a few options in regard to the unit size and number of the aerosol generators that would be adequate to achieve the required design quantity.

The selected unit sizes should conform to the maximum distance and area coverage and maximum or minimum protected height limitations as specified for each unit.

For example, in some applications such as cable ducts and trenches several smaller units of the same family evenly spread along the protected enclosure would provide better distribution and faster achievement of the minimum design application density throughout the area although one large unit can fulfil the agent quantity requirement.

Quantity of aerosol generator's units needed to protect a room can be increased in order not to exceed maximum coverage distance.
Same unit size formula:

n = M/Mg

where
n is the rounded up integer number of aerosol generators of one size;
M is the design quantity, in gram;
Mg is the mass of the aerosol-forming compound in one generator, in gram.

Different unit sizes:

The height of the protected enclosure should not exceed the maximum height limitation listed for the smallest unit size selected, unless uniformity of the aerosol distribution for the greater height has been proved by a discharge test.

5.7 Projection of the generators within the area

The following general criteria should apply:
- for locations, where personnel can be situated, the minimum thermal clearance should refer to the temperature not exceeding 75 °C;
- for locations, where combustible materials or equipment can be situated, the minimum thermal clearance should refer to the temperature not exceeding 200 °C;
- for locations, where non-combustible equipment can be situated, the minimum thermal clearance should refer to the temperature not exceeding 400 °C.

There are a number of rules which are helpful to determine the best positions for the generators in a design. These rules are based on standards and coverage tests, but each area is different. It is important to adhere to the standards as much as possible. Needless to say, the distribution of generators in the area should also be in accordance with local rules and regulations as well as the systems basic design.

a) Guidelines for the correct positioning and distribution in the area

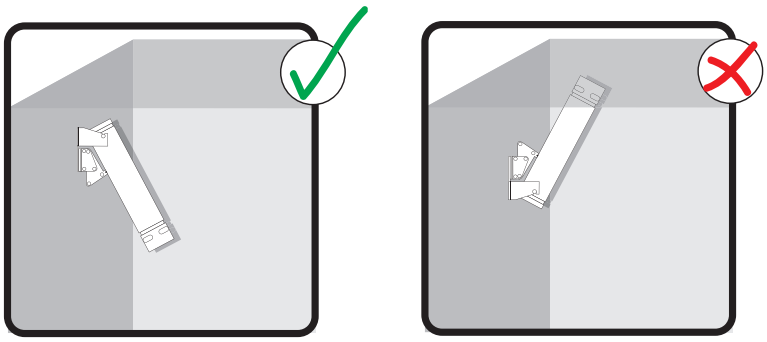
1. AF-X Fireblocker Generators need to be positioned in such a way that the discharged aerosol will be dispersed in the enclosures protected volume as quickly and homogenously as possible.

2. AF-X Fireblocker Generators are preferably mounted on the wall or at the ceiling, with the discharge opening pointing downwards at an angle from the ceiling or wall as shown below.

3. The units need to be evenly distributed in the area.
   One larger generator could be more effective than two smaller, the use of two generators could be more effective than using four, but there are no absolutes. The deciding factor should be whether the chosen number could fill the area with aerosol rapidly and evenly. After all, every nook and cranny must be filled with sufficient aerosol.
   When in doubt, do not hesitate to contact the AF-X experts.

b) Guidelines for the determination of the correct discharge direction

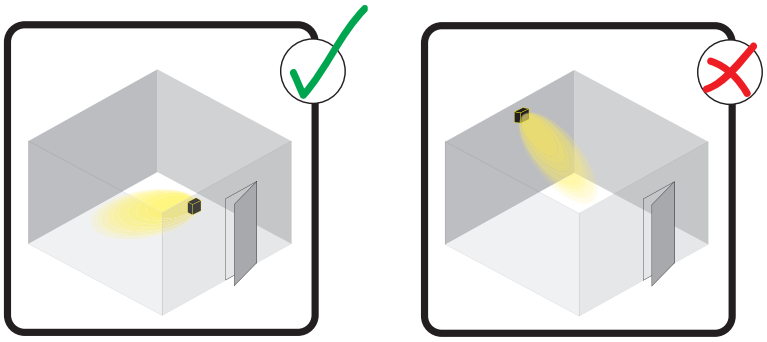
4. Preferably, generators are mounted to the wall just under the ceiling with the discharge opening directed downwards.



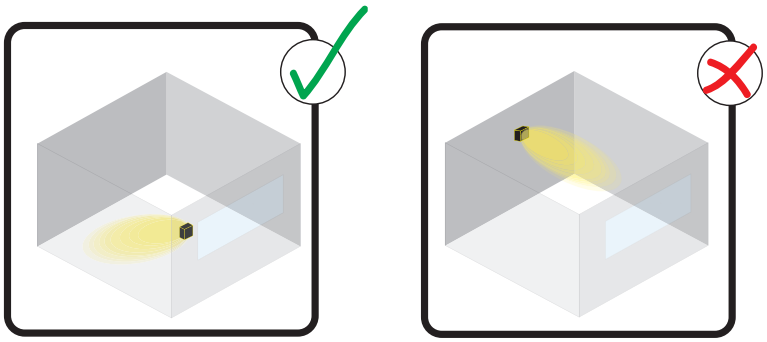
If a free downward outflow is not possible, the generators can be mounted on the ceiling, also with the discharge opening directed downwards.

5. Generators need to be positioned in such a way that all discharged aerosol is dispersed unhampered and in full in the area to be protected. This also implies that the generators always need to be projected towards unobstructed space, away from windows, doors, grates, vents, lids, valves, man-holes, transom windows or other openings. This includes openings that are usually closed or pushed closed with door-closers or automatically by the FECP before extinguishing starts.

Away from doors:

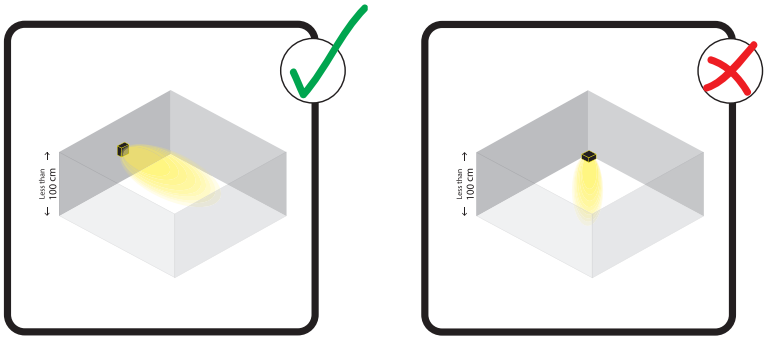


Away from windows or other potential openings:



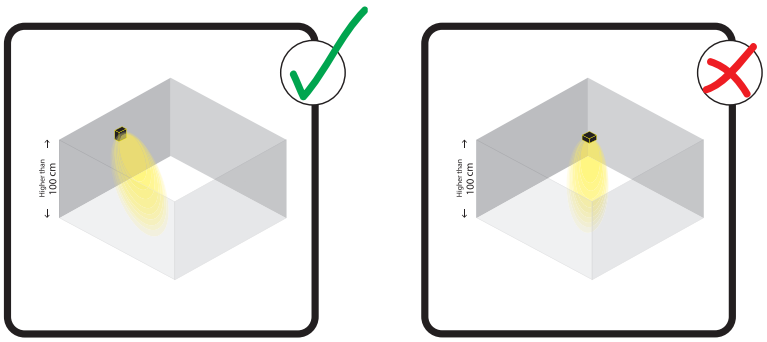
6. In an area with a height of less than 1m, generators should preferably discharge horizontally.

   Horizontal discharge in areas <u>lower</u> than 1m:



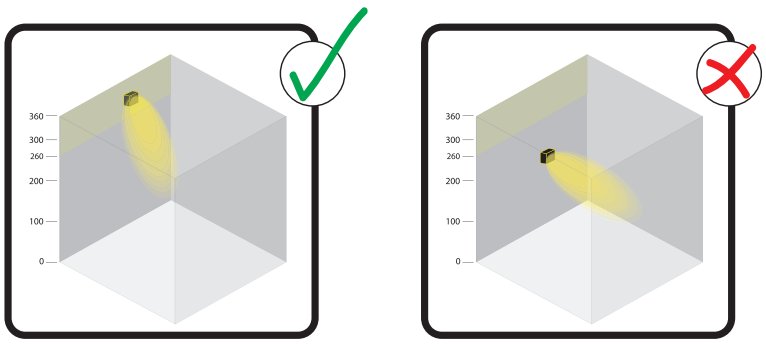
7. In an area higher than 1m, generators should preferably discharge downwards at an angle (cf. drawing).

   Downward discharge in areas <u>higher</u> than 1m:



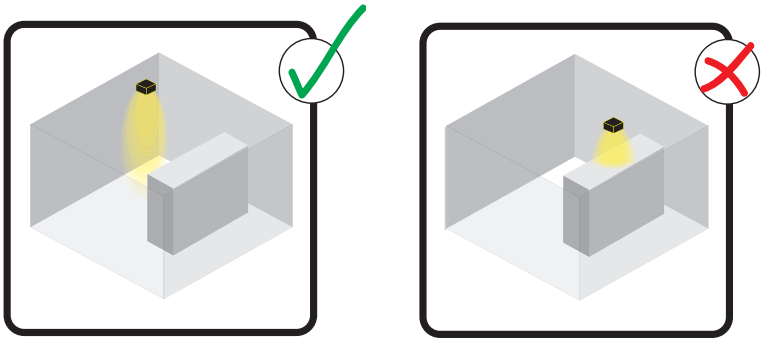
8. In areas up to a hight of 8 m, generators should be placed in the meter of space directly below the ceiling. For areas higher than 8 m, consult the AF-X Systems experts how to approach a design for a system for enclosures of such height.

   High areas placed within one meter below ceiling:



9. It is of the utmost importance that there are no obstacles in front of the discharge opening for a distance as specified in 5.6

   Avoid obstacles in front of discharge opening:



5.8 Mounting guidelines AF-X Fireblocker extinguishing generators

Please note that the AF-X Fireblocker Box units should be mounted under normal environmental conditions.

a) Please study the entire system's projection plan carefully before mounting any generators.

b) Systems with a fire extinguishing control panel should at all times contain a system isolating switch separating the extinguishing units from the control panel during installation as well as during maintenance activities.

c) For the installation of cables use the cables sold and/or advised by AF-X Systems only and make sure that they are installed according standard or local guidelines/legislation. Always follow the cable manufacturer's guidelines regarding the installation of cables.

d) Take the AF-X Fireblocker from its packaging. Check the product for visible faults or damage as a result of transport. Some generators are packed with nozzle protection brackets and stickers. Remove them carefully and completely to assure the free outflow of aerosol during activation.

e) De AF-X Fireblocker generators are standard equipped with an IP55 female connector chassis (see relevant product drawing). Using the proper tools, the installer must equip the control cable with a cable gland, a hood and a male inlay, that AF-X Systems supplies.

f) The AF-X Fireblocker is delivered with a short circuit safety between the poles 1 and 2 of the female inlay in the connector. This prevents unwanted currents in the activation unit. To assure a secure and safe installation of the generator, please keep the short circuit safety as long as possible in its safeguarding position.

g) The male insert is properly connected to the (massive core) control cable with a stripping length of 15mm to pole number 1 and pole number 2, using a maximum torque of 0,5 Nm. The AF-X Fireblocker is not earthed.

h) De AF-X Fireblocker generators must be mounted in isolation glands and rings (even if the basic design does not specify as such). Attach the mounting brackets, which need to comply with local rules and regulations, to the wall, ceiling or other location, using the insulation glands and rings in all mounting holes that connect the bracket to the mounting surface. Do this in such a way that the extinguishing units cannot move or get damaged inadvertently.

i) Attach the AF-X Fireblocker firmly to the mounting brackets with the clasp and ensure an unobstructed discharge. It is very important that there be no obstacle in the space immediately in front of the discharge for a distance of at least the length of the AF-X Fireblocker generator itself (cf. drawing above). Always maintain distance to cable ducts. Although the AF-X aerosol's discharge temperature should not be damaging to the cables, it is important that the discharge cannot be influenced.

j) **Before** attaching the AF-X Fireblocker connector, check

- whether the cables have been connected to the disabled system isolating switch, and whether the system isolating switch has been connected to the Fire extinguishing control panel correctly and;
- whether the electric circuit of the AF-X Fireblocker generators is intact with an ohmmeter with an accuracy of at least 2.5%. The resistance must be between 1.3 and 3.2 Ohm.
  - ✓ Any test current should not exceed 40 mA for a maximum of 300 seconds.

k) Connect the power supply to the appropriate parts of the fire extinguishing system.

l) Check whether the Fire extinguishing control panel functions properly.

m) Check whether all requirements in this manual have been met.

n) The final step is to switch the system isolating switch(es) to 'on/active'

5.9 Measures after activation of the extinguishing system

If the extinguishing panel activates the AF-X Fireblocker generators, the aerosol will present itself as a white cloud that is rapidly dispersed from the unit. This aerosol cloud will enter into stable connections on a molecular level with the free radicals that, as a catalyst, accelerate the fire reaction.

a) If extinguishing is in progress, indicated by alarm signals of the control panel or otherwise audible or visible, the protected area should be kept closed for a minimum of 30 minutes. Though longer is better, as it will allow for heated materials to cool down to safe temperatures. Allowing air (with new free radicals) to come into the protected area, might increase or restart the fire if temperatures are still (too) high.
b) After extinguishing please contact your dealer immediately so that proper advice on the reconditioning and restoring of the protected area and the fire extinguishing system can be followed directly.
c) On the cleaning and reconditioning of the protected area after extinguishing more can be found in chapter 8, though it is always recommended to organize restoring and cleaning work of electronics or other delicate equipment by specialized and trained organizations or staff.

6.0 Storage and transport

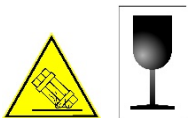
The AF-X Fireblocker are assigned to transport classification **Class 9.0** as SAFETY DEVICES, electrically initiated under UN number 3268

During transport and storage, the AF-X Fireblocker needs to be put up and protected against dirt, moisture and precipitation. Please be aware that heavy shocks might cause some dust to be expelled through narrow slots of the generator. This dust is not harmful for man and/or environment.

The AF-X Fireblocker needs to be stored in its original packaging in racks in warehouses (either heated or unheated, clean and well ventilated). Keep the AF-X Fireblocker away from heat sources such as radiators, stoves, electric heaters and other heating appliances.

Storage conditions:

Temperature:	between -20°C and +50°C, ideally storage conditions are between 18°C to 25°C. Please note that higher or lower storage temperatures will have consequences for the lifetime.
Humidity:	maximum 95 % (relative humidity)



Beware: Do not drop the AF-X extinguishing units during loading and unloading.
Make sure that the labels on the packaging are correct and visible.

7.0 Maintenance of the AF-X Fireblocker

For the duration of its use the AF-X Fireblocker must be subjected to the following inspections and maintenance, performed by trained and qualified, i.e. in accordance with local laws and standards, technical staff:

- **Activate the system isolating switch**
- Check the extinguishing unit for any damage
- Check whether the sticker on the discharge opening is still secure
- Check the log
- Measure the resistance between connector entrance #1 and #2
- Check whether the projection is in accordance with the basic design / as delivered condition
- Check the mounting brackets and attachment to the surface
- Check whether the label on the extinguishing unit is still securely fastened and readable
- Check the unit's production date and service life span

This list may not be exhaustive

Note that the entire system, including all parts/components, must be checked regularly in accordance with the supplier's guidelines and/or local laws. International guidelines recommend performing monthly checks on the following components, electric wiring, electric contacts, fixed bolts and generators casing.

Please be aware that the extinguishant contains materials that have a relatively low melting temperature. These materials increase the extinguishant's efficiency, but it is therefore important to always ensure that the AF-X Fireblocker is not exposed to temperatures that are outside the normal operating temperature range of -10 and + 50 degrees Celsius, as stipulated in this manual. The service life of the AF-X Fireblocker is monitored by the producer by testing product batches on a regular basis.

7.1 Maintenance task for the user of the AF-X Fireblocker system

The installer shall provide the user with an inspection programme for the system and components. The programme should include instructions on the action to be taken in respect of faults.

The user's inspection programme is intended to detect faults at an early stage to allow rectification before the system may have to operate. A suitable programme is as follows.

a) Weekly: Visually check the hazard and the integrity of the enclosure for changes which might reduce the efficiency of the system. Carry out a visual check that there is no obvious damage to cables and that all operating controls and components are properly set and undamaged.

b) Monthly: Check that all personnel who may have to operate the equipment or system are properly trained and authorised to do so and, in particular, that new employees have been instructed in its use.

WARNING — Always operate a system isolate switch prior to entering the protected enclosure if the unit is not designed for occupied spaces.

8.0 Residue removal, disassembly, waste and the environment

8.1 Introduction

Upon activation, the SAFCO converts into rapidly dispersing aerosols, consisting of solid nano and micro particles suspended in gas.

The concentration of solid particles suspended in the aerosol phase is a few milligrams per m^3. The particles are water and moisture-free and after some time settle as dust in the protected area. The dust can easily be removed before it absorbs moisture.

If thorough cleaning removes the aerosol particles before they can absorb moisture and combustion residue suspended in the air, the particles cannot react to electronic parts, metals, etc.

Should the aerosol particles remain on the surfaces for an extended period of time, they might absorb moisture, thus risking a reaction of the moisture to metals (particularly uncoated metals), possibly resulting in oxidation.

After activation it is recommended to have delicate metals and equipment cleaned by a specialised company.

8.2 Residue removal

See and follow chapter 7 of the SDS that is added as Annex 3 to this manual for necessary personal protection before entering the room.

- Although the aerosol in itself is harmless, ventilate the area for at least 30 minutes after activation. Do not enter the area until after it is sufficiently ventilated.
- To avoid any unwanted side effects, remove the residue (within a couple of hours).
- Vacuum the dry residue from the floor and metals using a vacuum cleaner.
- Dust the residue from electric parts using a fan or ventilator.
- Use special sprays or dry ice cleaning suitable to remove residue from electronic parts.

NB it is mandatory to wear a dust mask during cleaning activities because of particulates.

Always contact your distributor or dealer after AF-X Fireblocker activation; they will assist you in renewed projection as well as the correct reconditioning and cleaning methods of the area concerned

8.3 Disassembly after the AF-X Fireblocker has been activated

Please take the following steps when disassembling the activated AF-X Fireblocker:

Fully disconnect the unit from the fire detection system and make sure that it cannot be reconnected inadvertently;

Disconnect the AF-X Fireblocker power supply wires and make sure they cannot be reconnected;

After activation the AF-X Fireblocker may still be hot; it is therefore recommended to wear heat resistant gloves.

Be careful of your footing and observe local regulations concerning working at height;

Unscrew the bolts and nuts holding the AF-X Fireblocker in the mounting bracket;

Gently take the AF-X Fireblocker out of its mounting bracket and place it on a stable base;

Upon the AF-X Fireblocker(s)' disassembly, consult with the manager about reactivating the fire detection and alarm system;

8.4 Replacement of an AF-X Fireblocker unit.

Please take the following steps when replacing a AF-X Fireblocker unit when it has to be repositioned or removed in a new configuration design, or when it has surpassed its operational service life span.

a) **Before** any other activity, make sure that the maintenance switch is activated, and the system is in-active;
b) Disconnect the power supply cable from the unit;
c) Short-circuit the unit by connecting entrance #1 with entrance #2 in the connector.

A 1,5 mm^2 solid core wire may be used.
d) Gently remove the Fireblocker out of its mounting bracket and place it on a stable underground.
e) Further follow all instructions for packaging, storage and transport as described in chapter 6 and the Safety Data Sheet that is Annex 3 of this manual. Use original or similar packaging with foam blocks and necessary stickers.

8.5 Waste and the environment

After activation and subsequent disassembly, the AF-X Fireblocker can be handed in to a registered waste processing company in accordance with local laws and regulations. In case the extinguishing units have not been activated and the extinguishing agent is still present in the AF-X Fireblocker, the extinguishing units must be handled by the AF-X distributor or one of its dealers. Please follow all instructions for packaging, storage and transport as described in chapter 6 and the Safety Data Sheet that is Annex 2 of this manual. Use original or similar packaging with foam blocks and necessary stickers.

9.0 CE-Marking

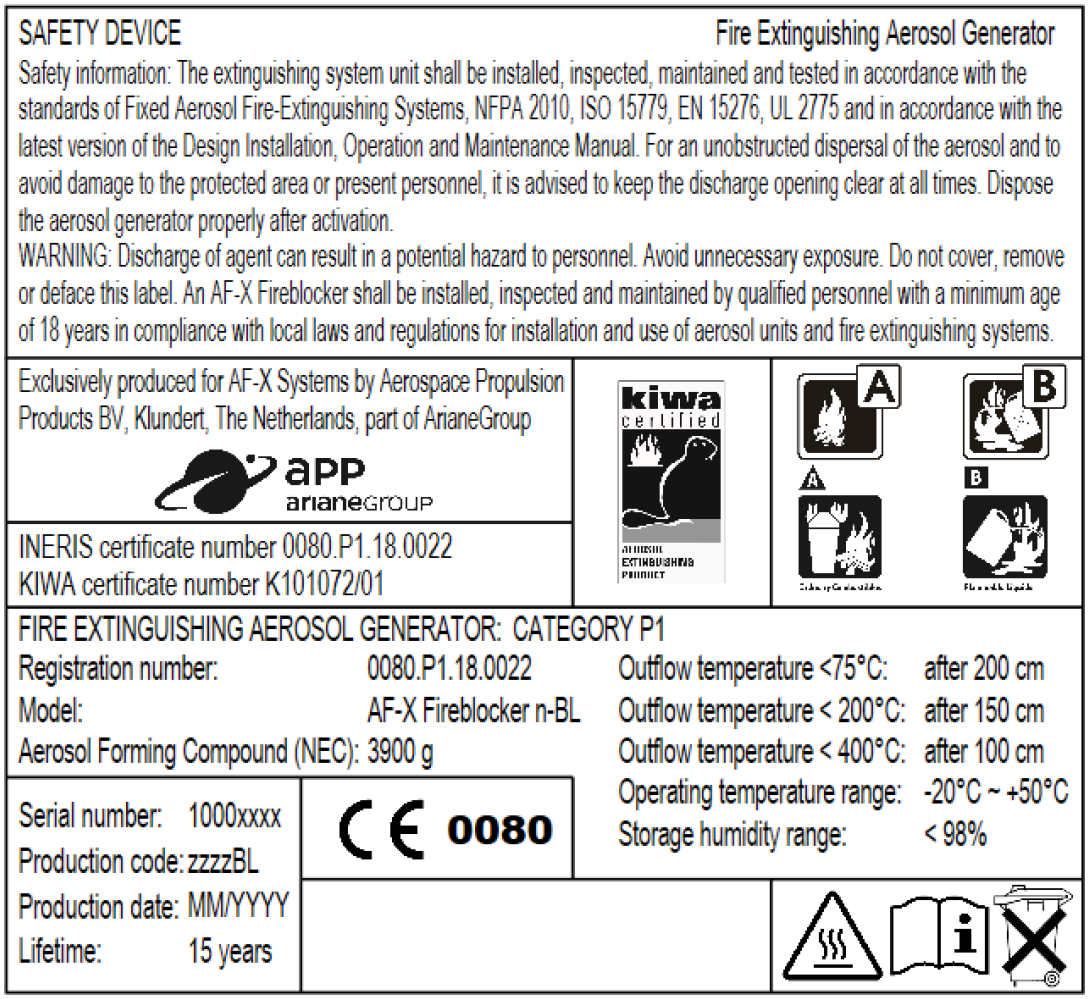
Declaration of Conformity of the AF-X Fireblocker aerosol generating fire extinguishers: We herewith declare under our responsibility that the product AF-X Fireblocker as exclusively produced for AF-X Systems BV by Aerospace Propulsion Products BV (part of Ariane Group), where to this statement (CE) refers, is in conformity to the Directives 2006/42/EG and 2013/29/EU of the European Parliament and of the Council. The CE marking and documentation requirements has been supervised and approved by INERIS by certification number 0080.P1.18.0022

Annex 1 General Technical Data

Model	CS	CM	BM	BL
Shape	cylindrical	cylindrical	Square	Square
Dimensions in mm	94⌀ x300	94⌀ x450	250x250x304	250x250x304
Gross weight in kilograms	2,5	3,8	21	18,6
Total weight including packaging in kilograms	4,0	5,3	22,5	20,1
Gross weight extinguishing agent in grams	150	450	2550	3900
Fire Classes	A & B			
Activation mechanism	heating element with 1,3 – 3,2 Ohm resistance			
Activation current	1,0 Ampere for 1 - 2 seconds, 6 -36 Volt DC			
Test current	0,04 Ampere within 5 minutes			
Service life	15 years			
Casing material	Type 316 grade stainless steel			
Ingress Protection Rating	IP55			
Discharge time in seconds	< 60			
Outflow Length in meters (projection)	1,5	1,5	5	5
Discharge openings	1	1	1	1
Minimum installation height (horizontally)	30 cm	30 cm	100 cm	100 cm
Maximum installation height	150 cm	150 cm	500 cm	800 cm
Outflow length max. temperature 75°C	< 50 cm	< 150 cm	150 cm	200 cm
Outflow length max. temperature 200°C	Does not occur	Does not occur	< 50 cm	150 cm
Outflow length max. temperature 400°C	Does not occur	Does not occur	Does not occur	< 100 cm

NB: The system design and applicability per m3 of the AF-X Fireblocker extinguishers are prescribed by the manufacturer, recorded in the systems log and cannot be changed by third parties without loss of warranty.

Annex 2 AF-X Fireblocker Production Label



All AF-X Fireblocker generators hold a production sticker like the one in this annex.
When making reference to a specific generator, please use the ***Serial number*** together with the ***Production code*** as referred to in the lower left corner of the label.

Annex 3 Safety Data Sheet

Safety Data Sheet

AF-X Fireblocker Generators of the Nano Series

0.1 Introduction

Please note that based on Commission Regulation (EU) 2015/830 of 28 May 2015 of the European Parliament, compiling a Safety data Sheet would be required for substances and mixtures, and is not specifically referring to completed products, such as the Aerosol Generator Extinguisher.

Reference in many languages available at:
(https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32015R0830)

0.2. General requirements for compiling a safety data sheet

0.2.1. The safety data sheet shall enable users to take the necessary measures relating to protection of human health and safety at the workplace, and protection of the environment. The writer of the safety data sheet shall consider that a safety data sheet must inform its audience of the hazards of a substance or a mixture and provide information on the safe storage, handling and disposal of the substance or the mixture.

As experience has learned that in the supply-chain (transportation and storage), entities involved frequently show the need to have more detailed technical information, AF-X provides the following user Safety Data Sheet information in the same sequence as required in accordance with Commission Regulation (EU) 2015/830.

For more detailed information relating to the raw materials (extinguishing agent) for the purpose of production and storage, please contact our technical staff at AF-X Systems in Amsterdam.

User Safety Data Sheet for an AF-X Fireblocker Generator of the Nano Series

SECTION 1: IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND THE COMPANY/ UNDERTAKING

1.1. Product identifier

Product form	:	White extinguishant tablets placed in extinguishing Unit
Trade name	:	**AF-X Fireblocker**
Composition	:	Tablets consisting of a Mixture of predominantly Potassium Nitrate and epoxy resin placed in extinguishing Units
Synonyms	:	**Fire Extinguisher unit**

1.2. Relevant identified uses of the substance or mixture and uses advised against

Main use category	:	Industrial use – professional use – consumer use
Use of substance/mixture	:	**Fire Extinguisher**
Remark relevant uses	:	Dry Fire Extinguisher, suitable for confined area's (e.g. engine rooms, technical areas, server rooms for computers, cargo compartments vehicles, storage facilities, etc.)

1.3. Details of the supplier of the safety data sheet

Name	:	AF-X Systems B.V.
Address	:	Grasweg 49
Zip code	:	1031 HX
Place	:	Amsterdam
Country	:	The Netherlands
Phone	:	+31-(0)20-20 50 484
E-mail	:	ralph@af-x.com / info@af-x.com

1.4 Emergency telephone number

Netherlands	:	Contact (English and Dutch) GMT+1 office hours 09.00h-17.00h Mon-Fri Emergency response phone number: (during office hours) +31 -(0)20-20 50 484 (out of office hours) +31 -(0)20-20 50 484 e-mail: ralph@af-x.com / info@af-x.com

SECTION 2: HAZARDS IDENTIFICATION

2.1. Classification of the substance or mixture

According to Regulation (EC) No1272/2008
Miscellaneous Dangerous Goods (Category 9)

According to European Directive 67/548/EEC as amended.
Miscellaneous Dangerous Goods

Emergency overview:
The pyrotechnic mixture is **a fire extinguishant**. If heated to temperatures of above 350 degrees Celsius the mixture will create a deflagration with heat radiation only in the immediate vicinity of the materials. The created "smoke" (aerosols) is the intended extinguishing agent.

2.2. Label elements

Signal word:	Danger
Hazard statement(s):	
H228	Flammable solid
Precautionary statement(s):	
P210	Keep away from heat/sparks/open flames/hot surfaces – No smoking
P280	Wear protective gloves/protective clothing/eye protection/face protection.
P370 + P380	In case of fire: Evacuate area.

2.3. Other hazards Extinguishing Agent Mixture and Generator

Risk of burn injuries in case of direct contact with the surface of the generator when heated by activation.
Unconsciousness due to inhaling aerosols when generator has been activated.
Do not handle device shortly after ignition because of heated device.

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

Provided information based on extinguishing agent tablets contained in the unit (before initiation). Note that the steel generator is constructed in such a way, that it can practically not be opened. Exposure to, and thus contact with the extinguishing agent is highly unlikely.

3.1 Device

The chemical part of the device contains the in this chapter mentioned components. Devices shall only be opened by destroying the whole entity. There is no risk to be exposed to the contents of the generator, except in cases of loss of tightness due to mechanical stress.

3.2 Mixtures

CAS-no.	REACH Registration No.	%	Name	Classification according to Regulation (EC) No 1278/2008 (CLP)
77XX-XX-X	Present	> 60	Oxidant	Ox. Sol. 3 – H272
13XX-XX-X	-	< 10	Metal hydroxide	-
4XX-XX-X	Present	5 - 25	Secondary fuel	-
2XXXX-XX-X	-	< 25	Phenol-formaldehyde resin	H315, H317, H319, H335, H411,

SECTION 4: FIRST AID MEASURES

Provided information based on extinguishing agent tablets contained in the unit (before initiation).

Note that the steel generator is constructed in such a way, that it cannot be opened. Exposure to, and thus contact with, the extinguishing agent in tablet form is highly unlikely. In case however of breaking or opening of a generator, evacuate people from the contaminated area and provide maximum ventilation.

If extinguisher unit is initiated, the generator releases the fire extinguishing aerosol mixture. Although only natural occurring and environmental neutral elements will be produced, the particle sizes in the direct environment will be microscopically small, and for that reason requires protection for the respiratory system.
Inhalation of small particles must be prevented as much as possible.

4.1. Description of first aid measures

In general, in case of doubt or if symptoms persist, always call a physician. Never give anything by mouth to an unconscious person.

In case of breaking or opening of a generator, evacuate people from the contaminated area and provide maximum ventilation.

If inhaled
Inhalation of gas after ignition:
- Bring victim to well ventilated area
- Ventilate area
- Consult a physician

If inhaled
Inhalation of dust:
- Bring victim to well ventilated area
- In case of difficult breathing, apply extra oxygen
- Consult a physician

In case of skin contact with chemical content
- Remove large particles
- Rinse and wash with soap and water

In case of eye contact with chemical content
- Rinse eyes with water for a minimum of 15 minutes
- Consult a physician

If swallowed of chemical content
- Rinse mouth immediately with water, in case the victim is conscious
- Consult a physician, and show this safety sheet

SECTION 5: FIREFIGHTING MEASURES

The unit itself is designed to extinguish fire!

IF MATERIAL IS HEATED TO THE SELF IGNITION TEMPERATURE OF 350 ^{0}C, THE MIXTURE WILL REACT INTO **A FIRE EXTINGUISHING AEROSOL THAT WILL PRESENT ITSELF AS A WHITE CLOUD.** THE AEROSOL CLOUD WILL ITSELF BE AN EXTINGUISHING MEDIA FOR SURROUNDING FIRES.

5.1. Extinguishing media

Suitable extinguishing media:

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.
Dry powder and dry sand are also suitable.

5.2. Special hazards arising from the substance or mixture inside the aerosol generating fire extinguisher

Fire hazard:

When ignited, fire-fighting extinguishant will be developed. The white aerosol cloud developed, may be confused with smoke but is actually the fire-extinguishing agent. The self-ignition temperature of the material is around 350 ºC.

Explosion hazard:

No direct explosion hazard in vicinity of product in powder and tablet form. The self-ignition temperature of the material is around 350 ºC.

5.3. Advice for firefighters

Precautionary measures:

Exposure to fire/heat: keep upwind, consider evacuation and have neighborhood close doors and windows.

Firefighting instructions:

Cool packages/tanks or loose product with water spray from safe distance (min. 5 Meters), and if possible remove them into safety. Do not move the load if already exposed to excessive heat. Exercise caution when fighting any chemical fire.

Protection during firefighting:

Do not breathe fumes. Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode. Clothing for fire-fighters (including helmets, protective boots and gloves) conforming to European standard EN 469 will provide a basic level of protection for chemical incidents.

Other information:

Avoid mechanical shocks.
Avoid high temperatures.
Use water spray to cool unopened packages.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Accidental release measures are presented when a generator has not ignited. Only by inappropriate handling the content of the device can be released.

6.1. Personal precautions, protective equipment and emergency procedures

General measures:

Always ensure your own safety first. Ensure adequate air ventilation.
Avoid contact with skin, clothing and eyes. Avoid raising dust.

Ensure a low relative humidity in the room. As the extinguishing particles are microscopically small, they might attract moist. Create a corrosion stop to protect sensitive electronical equipment if present. Also see 'Methods for cleaning up' under 6.3.

6.1.1. For *persons other than* emergency personnel

Evacuate personnel to safe areas.
For personal protection see section 8.

6.1.2. For *emergency responders*

Protective equipment: Wear suitable respiratory equipment in case of insufficient ventilation or in case of prolonged exposure.

6.2. Environmental precautions

Prevent contamination in sewers. Prevent uncontrolled discharges into the environment (rivers, water courses, sewers etc.). Prevent soil and water pollution. Stop leaks if possible.

6.3. Methods and material for containment and clean-up

For containment:
Minimize generation of dust. Stop leaks if safe to do so.

Methods for cleaning up:
First ensure that the relative humidity in the room stays below 30% to ensure a corrosion stop. Collect spillage (Vacuum clean, sweep up and shovel). Take up mechanically, placing in appropriate containers for recovery or disposal. E.g.: collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13). Keep in suitable, closed containers for disposal (transport/Handling).
Clean contaminated surfaces with an excess of water. Wash clothing and equipment after handling. Special cleaning advise for the dry or iced cleaning of sensitive electronics can be obtained at the AF-X Systems technical department.

Other information:
Do not wash out with water in a sensitive environment. Dispose the product, depending on the degree and type of contamination in an authorized waste disposal site.

6.4. Reference to other sections

See section 1 for emergency contact information.
See section 8 for information on appropriate personal protective equipment.
See section 13 for additional waste treatment information.

SECTION 7: HANDLING AND STORAGE

The content cannot be released under normal or reasonably foreseeable conditions of use including proper disposal if they are used in accordance with the manufacturer's recommendations.

7.1. Precautions for safe handling

The chemical content within the generator is safely contained in normal condition of use. Do not open, drill, incinerate, crush, immerse, or expose to temperatures above the operating temperature range reported for products. Keep the generator short-circuited when not in use.

Avoid raising dust. Avoid breathing dust. Use sufficient ventilation. Provide appropriate exhaust ventilation at places where dust is formed. In case of inadequate ventilation wear respiratory protection. Avoid contact with skin and eyes. Wear protective gloves/protective clothing/eye protection as advised in section 8. Protect from moisture. Keep away from sources of ignition.

Always wash hands after handling the product. Do not eat, drink or smoke when using this product. Wash contaminated clothing before reuse.

7.2. Conditions for safe storage

Technical measures:	Store in a dry and cool, well ventilated place away from sources of heat, ignition and direct sunlight.
Storage conditions:	Store in a dry, preferably in the original storage/transport packaging. Substance is hygroscopic.
Storage temperature:	between **-**20°C and 50°C, ideally 20°C
Heat and ignition sources:	Keep substance away from: ignition sources. heat sources.
Prohibitions on mixed storage:	Keep substances away from: strong bases, oxidizing agents, combustible materials, organic materials.
Storage area:	Avoid unnecessarily exposure to air to prevent absorption of moisture. Meet the legal requirements. Keep out of direct sunlight. No open flames, no sparks, and no smoking.
Special rules on packaging:	Meet the legal requirements. Keep packaging closed when not in use. Do not store in unlabeled containers.
7.3. Specific end use(s)	*Consult the identified uses in the User Manual of this product.*

SECTION 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

8.1. Control parameters (most critical National and International limits)

Not applicable.

8.2. Exposure controls

8.2.1. Appropriate engineering controls:

Good general ventilation should be sufficient to control worker exposure to airborne contaminants. Ensure that eyewash stations and safety showers are close to the workstation. **Handle in accordance with good industrial hygiene and safety practice.** Wash hands before breaks and at the end of workday.

8.2.2. Personal protective equipment:

Hand protection	:	In case of repeated or prolonged contact wear gloves (tested to EN 374). Take advice to gloves' supplier. The selected protective gloves have to satisfy the specifications of EU Directive 89/686/EEC
Material selection gloves	:	Good resistance gives: rubber, butyl rubber, natural rubber, neoprene. Nitrile rubber (NBR). Permeation time: minimum >480min long term exposure; material / thickness [mm]: Nitrile rubber (NBR) / 0,11 mm. Take advice to gloves' supplier.

Eye protection	:	Safety glasses. In case of dust production: protective goggles. Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).
Skin and body protection	:	Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands. Normal working clothes are suitable. *Body Protection*: Impervious clothing, the type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.
Respiratory protection	:	Carry operations in the open/under local exhaust/ ventilation or with respiratory protection to keep airborne levels below recommended exposure levels. Dust production: dust mask with filter type P2. Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).
Environmental exposure controls	:	Avoid release to the environment. Emissions from ventilation or work process equipment should be checked to ensure they comply with legislation. In some cases process modifications will be necessary to reduce emissions to acceptable levels.
Other information	:	Keep product away from foodstuffs and beverages. Do not eat, drink or smoke when using this product. Take off contaminated clothing and shoes immediately. After use: wash hands and apply hand or skin care cream. Training staff on good practice. Regular cleaning of equipment. Minimization of manual phases.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

9.1. Device

<u>Appearance</u>		
Form	:	Metal casing containing solid blocks
Colour	:	Metal

9.2. Content

Flammability	:	Content is a flammable solid
Incompatibility	:	See section 10.5
Relative density	:	±1745 kg/m3
Decomposition temperature	:	±350 ^{0}C
Decomposition materials	:	Aerosol and various gasses
Other Properties	:	When activated, the fire extinguishing aerosol appears with some force out of device as a white cloud

SECTION 10: STABILITY AND REACTIVITY

10.1. Reactivity

Stable under recommended storage conditions (section 7) and in correct usage as prescribed in the Users and Installation Manual of the product.

10.2. Chemical stability

Stable under recommended storage conditions (section 7) and in correct usage as prescribed in the Users and Installation Manual of the product.

10.3. Conditions to avoid

High humidity (above 95%), temperatures > 50 ^{0}C

10.3. Materials to avoid

Strong reducing agents, powdered metals, strong acids and bases.

10.4. Hazardous decomposition products

Hazardous decomposition products are formed when device is ignited: carbon dioxide, carbon monoxide, nitrogen monoxide, methane gas, gaseous ammonia, hydrogen cyanide.

10.5. Incompatible materials

Keep substance away from: Strong acids or bases, combustible materials.

SECTION 11: TOXICOLOGICAL INFORMATION
In case of escape/free extinguishing agent

11.1. Information on toxicological effects

Acute toxicity
LD50 Oral – Rat – 3.750 mg/kg (potassium nitrate)
LD50 Oral – Rat – >10000 mg/kg (cyanoguanidine)

Skin corrosion / irritation	:	Not data available
Serious eye damage / eye irritation	:	Not data available

Respiratory or skin sensitization	:	Not data available
Germ cell mutagenicity	:	Not classified
Carcinogenity	:	Not data available
Reproductive toxicity	:	Not data available
STOT – single exposure	:	Not data available
STOT – repeated exposure	:	Not data available
Aspiration hazard	:	Not data available

SECTION 12: ECOLOGICAL INFORMATION

12.1 Toxicity

Individual components of the content show toxicity to the environment.

12.2 Persistence and degradability
No data available.

12.3 Bio-accumulative potential
No data available.

12.4 Mobility in soil
No data available.

12.5 PBT and vPvB assessment
No data available.

12.6 Other adverse effects
No data available.

SECTION 13: DISPOSAL CONSIDERATIONS

13.1. Waste treatment methods

Product / packaging disposal	:	Treat product as chemical waste.
Waste treatment-relevant information	:	Observe all federal, state, and local environmental regulations. Contact a licensed professional waste disposal service to dispose of this material.
Sewage disposal-relevant information	:	Waste should not be disposed of by release to sewers.
Other disposal recommendations	:	Contaminated packaging should be treated and disposed of as an unused product.

SECTION 14: TRANSPORT INFORMATION

In accordance with the UN recommendations on the transport of dangerous goods Test and criteria and thus ADR / RID / ADNR / IMDG / ICAO / IATA

14.1. UN number

UN-No.	:	3268

14.2. UN proper shipping name

Proper Shipping Name	:	SAFETY DEVICES, electrically initiated

14.3. Transport hazard class

Class (UN)	:	9
Hazard labels (UN)	:	Not applicable

14.4. Packing group

Packing group (UN)	:	Not applicable

14.5. Environmental hazards

Other information	:	See section 12

14.6. Special precautions for user

The protective measures listed in section 6, 7 and 8 have to be considered.

14.7. Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

IBC code	:	Not Applicable

SECTION 15: REGULATORY INFORMATION In case of escape/free Extinguishing Agent

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

No data available

15.2 Chemical safety assessment

No data available

SECTION 16: OTHER INFORMATION

Version	:	3.1 USDS 271018
Abbreviations and acronyms	:	bw = body weight
	:	CLP = Classification, labeling and packaging
	:	DNEL= Derivative No Effect Level
	:	PNEC= Predicted No Effect Concentration
	:	REACH= Registration, evaluation and authorization of chemicals
	:	LD50= median Lethal Dose for 50% of subjects
Data sources	:	BIG-database
	:	ECHA website: Information on Registered Substances
	:	Handbook of Chemistry and Physics CRC Press Inc
	:	Information of the suppliers.

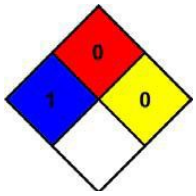
Text of H-code(s), R-phrase(s) and hazard codes mentioned in Section 3:

H228	Flammable solid.
P210	Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P280	Wear protective gloves/protective clothing/eye protection/face protection.
P370+380	In case of fire: Evacuate area.

Training advice	:	Before using/handling the product one must read carefully the MSDS and the User & Installation Manual. Preferably qualified personnel is allowed to work with aerosol fire extinguishing devices.
Adaptations	:	This safety data sheet is a general SDS and replaces all the individual SDSs of the products mentioned in SECTION 1.

Additional NFPA identification (US Federal Regulations):

NFPA health hazard	:	1 - Exposure could cause irritation but only minor residual injury even if no treatment is given.
NFPA fire hazard	:	0 - Materials that will not burn.
NFPA reactivity	:	0 - Normally stable, even under fire exposure conditions, and are not reactive with water.



HMIS III Rating:

Health	:	1 Slight Hazard - Irritation or minor reversible injury possible
Flammability	:	1 Slight Hazard
Physical	:	1 Slight Hazard
Personal Protection	:	F

The AF-X Fireblocker of the Nano Series is a product of AF-X Systems BV, Amsterdam, The Netherlands.

This Safety Data Sheet is prepared by AF-X Systems BV in close cooperation and based on the data as supplied by Aerospace Propulsion Products BV (part of Ariane Group).
Aerospace Propulsion Products BV produces this fire extinguishing gas generators exclusively for AF-X Systems BV. (Doc. reference: AER-SP-002, issue 2)

Email: ralph@af-x.com / info@af-x.com

Creation Date 27-October-2018 Disclaimer

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

- End SDS -