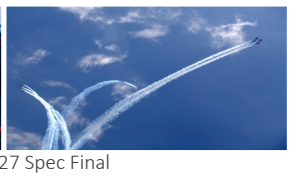
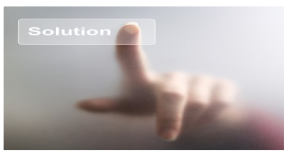
Chemical Gaseous Suppression System Specification Document





Introduction

This guide has been created by FSL as an aid to be used by those who have the responsibility for specifying and designing active fire protection systems incorporating gaseous suppression systems.

This intention is that this guide is used as a guide to good practice. This guide is not exhaustive to all design standards and codes.

For any queries concerning technical matters, please contact the FSL support team.

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All information given in this guide is done so in good faith. FSL cannot be held responsible for any errors or omissions.

FSL (Firetec Systems Ltd.) was launched in April 2013 and is a member of the NITIN GROUP COMPANIES.

Our fledgling organisation, backed by a long-standing international specialist company, NITIN FIRE aims to set itself apart from competitors by providing a more - flexible, personal service and higher level of customer care.

FSL brings a fresh outlook to the market place and a wish to make life easier for customers; through the provision of a full range of suppression systems complemented by our detection and alarm products.

FSL is the independent option for trade organisations seeking gaseous suppression systems, detection and alarm.

The FSL team is backed by longstanding specialist organisation, Nitin Fire Protection Industries Ltd. (NFPIL). With over 25 years of experience in the Fire Protection Industry it is hardly surprising that NFPIL is one of the leading organisations in Fire Protection Systems in India with a presence in United Arab Emirates, South Asia & Europe.

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CLEAN AGENT CHEMICAL SUPPRESSION SYSTEM

ENGINEERING SPECIFICATION

Contents

PART 1: GENERAL

1.01 Introduction

The system provides a clean agent chemical Total Flooding gaseous fire suppression system (using FM-200, HFC227ea and 3M™ Novec™ 1230) in accordance with NFPA 2001 or BS EN 15004-5:2008

Clean Agent Chemical Suppression Systems may be used in the protection of the following types of facilities:

- Data processing
- Process control rooms
- Telecommunications facilities
- High value assets

Clean Agent Chemical Suppression Systems are ***NOT*** suitable for:

- Certain chemicals or mixtures of chemicals, such as cellulose nitrate and gunpowder, that are capable of rapid oxidation in the absence of air
- Reactive metals such as lithium, sodium, potassium, magnesium, titanium, zirconium, uranium, and plutonium
- Metal hydrides
- Chemicals capable of undergoing automatic thermal decomposition, such as certain organic peroxides or hydrazine.

These systems require fast detection and discharge to minimise the fire damage. Do not delay the extinguishant discharge longer than is necessary to evacuate the protected space.

The FSL chemical clean agent total flooding gaseous fire suppression system is manufactured by Firetec Systems Limited (FSL), Unit 6, the Business Centre, Molly Millars Lane, Wokingham, RG41 2QZ, UK.

1.02 Applicable publications

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference there to (latest edition):

National Fire Protection Association (NFPA) Standards:
- No. 2001 Clean Agent Fire Extinguishing Systems
- BS EN 15004-5:2008

Loss Prevention Certification Board (LPCB)
- LPCB red book live www.redbooklive.com

Industrial Risk Insurers Interpretive Guide (Detection & Controls)

U.S. Environmental Protection Agency, Protection of Stratospheric Ozone
- 59 FR 13044, March 18, 1994 (Final SNAP Ruling)

Requirements of the Authority Having Jurisdiction (AHJ)

1.03 Requirements

This installation shall be made in strict accordance with the drawings, specifications and applicable standards. All equipment and devices used shall be listed in the LPCB red Book.

1.04 General

Furnish all engineering design and materials for a complete fire FSL clean agent suppression system including charged storage cylinders, pipe network, nozzles and all other equipment necessary for a complete operational system.

Major system components shall be produced by FSL (no alternatives) and shall be installed by an authorized FSL distributor certified for the design and installation and service of FSL clean agent suppression systems.

1.05 Submittal

The following shall be submitted for approval prior to delivery of materials:

Material and equipment information shall include manufacturer's technical data sheet for each component or device used in the system. This shall include, but not be limited to, the following:

Agent storage cylinders
Mounting brackets
Discharge Nozzles
Piping isometrics
Flow calculations

Provide information outlining the operation and maintenance procedures that will be required of the owner. This information shall explain any special knowledge or tools the owner will be required to employ and all spare parts that should be readily available.

Drawings shall indicate locations, installation details and operation details of all equipment associated with the FSL clean agent system. Floor plans shall be provided showing equipment locations, piping, point-to-point wiring and other details as required. Isometric piping layouts shall be provided with the drawings. In addition, point-to-point electrical layout drawings shall be provided.

Sequence of operation, electrical schematics and connection diagrams shall be provided to completely describe the operation of the FSL clean agent system controls.

PART 2: PRODUCTS

2.01 System Description and Operation

Systems shall be designed, installed and maintained in accordance internationally recognised standards:

NFPA 2001, Standard on clean agent fire extinguishing systems
ISO 14520, Gaseous fire-extinguishing systems.
BS EN 15004, Fixed fire fighting system – Gas extinguishing systems

FSL systems must be designed, installed, commissioned and maintained by qualified and competent personnel who have the relevant training and experience.

PART 3: SYSTEM ARRANGEMENT

3.01 Chemical Gas Physical Properties

HFC227ea (CF_3CHFCF_3-heptaflouropropane) & FK-5-1-12 ($CF_3CF_2C(0)CF(CF_3)_2$) are colourless, odourless and electrically non-conductive. They leave no residue and have acceptable toxicity for use in occupied spaces. Clean agent total flooding systems may be used for extinguishing fires of all classes within the limits specified in NFPA 2001 and BS EN 15004.

Clean agent chemical systems suppress a fire by a combination of Chemical (principally heat absorption) and physical mechanisms. System should be designed to discharge within 10 seconds.

Clean agent chemical systems are clean, efficient, environmentally acceptable, and leave no residue, thus minimizing any downtime after a fire. Most materials contained in areas protected by an FSL clean agent system such as aluminium, brass, rubber, plastics, steel, and electronic components, are unaffected when exposed.

Clean agent chemical systems are stored as liquid in steel containers and super pressurized with nitrogen to 25 bar or 42 bar to increase its discharge flow characteristics. When discharged, the agent will vaporize at the discharge nozzles and effectively mix with the air throughout the protected area.

Clean agent chemical systems are suitable for extinguishing Class A, B and C type risks.

3.02 Flow Calculations

A. Computerized verification of flow calculations shall be submitted for each FSL fire suppression system and include the following data as a minimum:

- Quantity of agent per nozzle
- Orifice union/nipple and nozzle orifice diameters
- Pressure at nozzle (psi)
- Nozzle body nominal pipe size (inch)
- Number and size of cylinders
- Total agent
- Pipe size per pipe section
- Pipe schedule per pipe section
- Number, size and type of fitting per pipe section
- Actual length per pipe section (feet)
- Equivalent length per pipe section (feet)
- Discharge time (seconds)

Only use the FSL calculation program. This program will:

- Calculate the quantity of extinguishant based on the space volumes and temperature.
- Calculate the optimum pipe sizes based on the input schematic.
- Calculate the nozzle orifice size.

Containers, fills, valves, pipes and nozzles must be installed exactly as input to and specified by the program or the flow distribution and discharge time will not be accurate.

PART 4: EQUIPMENT AND MATERIAL (MECHANICAL)

FSL clean agent chemical systems are intended to be used to suppress fires involving equipment or specific hazards. It is very effective where an electrically non-conductive agent is required, or when clean-up of other agents presents a problem.

Each clean agent chemical systems is specifically designed to accommodate the individual demands of the areas to be protected. The wide range of configurations of the components provides the flexibility necessary for this custom design.

An Engineered system requires that hydraulic flow calculations are undertaken to size the pipe work and discharge nozzles. Only the FSL calculation program shall be used. Normal system design shall be at 21°C.

4.01 Cylinder/Container Assembly

FSL clean agent chemical systems use specially designed cylinder assemblies. Cylinders are available in various sizes. All cylinders are super pressurized with dry nitrogen to a pressure of 25 bar or 42 bar at 21°C. Each cylinder is equipped with an identification nameplate indicating the quantity of clean agent, pressurisation level and filling station.

25 bar cylinder capacity should be available in sizes 15litre, 30 litre, 50litre, 80 litre, 120litre, 150 litre and 180 litre
*42 bar cylinder capacity should be available in sizes 80litre and 150 litre *(not valid for FK-5-1-12)

Containers/cylinders shall be constructed to National Standards and be independently certified for use in the region of use. Note that the 25 bar system (and 42 bar systems – FK-5-1-12) will require different container working pressures. Acceptable standards for use:

Europe are EN 13322-1 Transportable cylinders – welded, EN 1964-2 transportable cylinders – seamless, Transportable Pressure equipment Directive (TPED 99/36 EC) and the carriage of dangerous goods by road regulations (ADR).
USA is DOT 4BW500.

Cylinder: The steel cylinders/containers are manufactured to the requirements various National Standards appropriate with their country of use. The fill range shall be 0.4 to 1.12 kg/litre- for HFC227ea & 1.4kg/litre for FK-5-1-12. Note that the maximum fill range should only be used in conjunction with short pipe runs.

Dip Tube: The dip/siphon tube extends from the discharge valve to a closely controlled distance from the base of the container. (The minimum distance between the flat inlet to the dip tube and the base of the container, taking into account the worst case tolerance of the dip tube and container internal depth shall be 50% of the bore diameter of the dip tube). Maximum gap shall be the dip tube bore. This ensures a full liquid discharge of agent. Dip tubes are screwed into the valve and retained with a thread sealant.

Cylinder Valve: A pressure operated cylinder valve having a forged brass body and cap is attached to the cylinder neck and serves to control the flow of agent from the cylinder.

The cylinder valve has five connections:

Top mounted Actuator connection.
Integrated electrical actuator. (Dependent on valve version)
Pressure Gauge/Pressure switch Connection: This is a threaded connection housing a check valve and must be fitted with supplier approved devices to function correctly.
Outlet with JIC Male connection.

Discharge pressure connection to pressure actuate slave cylinders or operate a discharge pressure switch.
Rupture disc to discharge the top gas chamber of the container should the working pressure of the container be exceeded. Rupture discs are supplied rated for the charge pressure and the maximum working pressure of the container. Refer to the stamping on the disc holder. Do NOT attempt to dismantle the rupture disc assembly while pressurised.

Cylinders shall only be mounted with the valve uppermost and secured with the supplied straps to sound wall or secured racking.

The minimum flow cross sectional area is compatible with the valve outlet sizes of 33 (855mm^2) and 49mm (1886mm^2). The actual flow characteristics are built into the FSL flow calculation program which must be used for all system calculations.

Each valve is fitted with an over pressure relief disc which is set to protect the pressure vessel from excessive pressure.

4.02 Discharge Valve Actuation

In addition to the integral electrical actuator the cylinder valve can be fitted with a pneumatic actuator, pneumatic/manual actuator and an electrical solenoid actuator, providing the following methods of actuation.

Pneumatic
Pneumatic/manual
Electric - Integrated in Valves Operating Voltage 24Vdc ±10%, 0.25A ±10%
Electric - Detachable actuator 'Electromagnetic Tripping Mechanism'. 24Vdc ±15%, 0.5A ±10% for 2 seconds.
Electric/manual - Combination of above
Electric/manual/pneumatic - Combination of above
The pressure gauge, pressure gauge with limit signal generator or pressure switch are connected to the valve via the M10x1 connection port. There are 2 ports on either side of the valve which can be used. Any unused port must have the plug fitted.
Only fit FSL products to ensure correct safe operation and to prevent leakage.
The Gauges and Switches can be mounted and removed with the valve pressurised.

4.03 Discharge Nozzles

The discharge nozzle plays an important role in the system in that it controls the flow of extinguishant and distribution of extinguishant into the protected space.

2 types of nozzle are available namely 180 Degree for side wall mounting and 360 degree for centre space mounting. Both nozzles may be used for 25 bar and 42 bar systems. The minimum nozzle pressure shall be 5 bar unless the FSL calculation software specifies a higher pressure.

The nozzle orifice is calculated by the FSL systems calculation program to discharge the agent within 10s. Where the nozzle orifice drilling is less than 2mm then an additional inline strainer must be fitted to the nozzle inlet.

The discharge nozzles shall be installed as directed by the installation drawing in a manner so that they will not potentially cause injury to personnel. When discharged from the nozzle, the agent should not directly impinge on areas where personnel might be found in the normal work area. The agent shall not impinge on any loose objects on shelves, cabinet tops, or similar surfaces where loose objects could be present and become missiles.

4.04 Venting Considerations

Venting of an enclosure may be necessary to relieve the under pressure due to the chilling of the air within the space and the following over pressure due to the extra volume being added to the space. The FSL CG^2 calculation program will calculate the minimum free vent area based on the maximum pressure that the protected space can withstand. Refer to the buildings structural engineer.

The protected space structure including the windows needs to be of adequate strength to withstand these under and over pressures.

After discharge the agent must be retained for a sufficient period of time to allow the cooling of the ignition source to prevent re-ignition. Refer to NFPA 2001 & BS EN 15004 for guidance on the period.

To ensure that the retention time is achieved a room integrity test must be carried out in accordance with the standards.

4.05 Discharge Piping

Only discharge piping as specified in NFPA 2001 or BS EN 15004 shall be used while taking into account the system pressure and any potentially closed sections (between selector valves if fitted) and national regulations. All closed sections of pipe work shall be protected by a relief valve.

Piping must be non-combustible and be able to withstand the protected pressures during discharge. The 25 (and 42 bar – FK-5-1-12) systems will develop different pressures namely 34 and 53bar respectively at 50°C. Suitable standards for use in Europe are EN 10241 2000 Pipe fittings and EN 10255 2004 Tubes.

In corrosive environments the pipe work shall be protected. In general all steel pipe work should be galvanised or zinc plated.

All pipe size reductions must be made with reducing fittings, concentric reducers, and reducing couplings.

All pipes must be adequately fixed as dictated by the standards. Particular attention must be paid to the bracing of all piping changes in direction and nozzles.

No changes to the pipe work layout are permitted without the authority of the system designer. Any changes in lengths, pipe diameter and number of fittings will have a significant impact on the flow calculations.

All pipe sizes, flow rates and pressure drops shall be calculated using the FSL calculation program. This takes into consideration pipe work and fitting friction pressure losses and changes in elevation as well as the minimum and maximum flow rate to ensure turbulent flow. Refer to the following table for an estimate of these.

4.06 Hangers and Bracing

All system piping, both vertical and horizontal must be suitably supported with hangers. Pipe hangers shall be capable of supporting the pipe under all conditions of operation and service. They shall allow the expansion and contraction of the piping, and prevent excessive stress resulting from transmitted weight being induced into the connected equipment. Pipes must be anchored to the building structure such as beams, columns, concrete walls etc., in order to prevent longitudinal or lateral movement or sway. Where practical, riser piping shall be supported independently of the connected horizontal piping. The piping must not be hung or supported from other piping systems (i.e. water, air pipes, etc.)

Generally no section of pipe should be without a hanger or brace. Maximum recommended spacing between hangers are given in NFPA 2001 and BS EN 15004.

PART 5: WARRANTY

5.01 Warranty

All FSL system components furnished under this contract shall be guaranteed against defect in design, material and workmanship for the full warranty time, which is standard with the manufacturer and/or supplier but not less than one (1) year from the date of system acceptance. In addition, the installing contractor must guarantee the system

PART 6: MAINTENANCE

6.01 Periodic Maintenance

At least semi-annually, the FSL system shall be inspected by an FSL authorised and trained distributor.

6.02 Maintenance Procedures

The following shall be done at least semi-annually by an authorised FSL distributor certified for the design and installation and service of FSL suppression systems:

> Agent quantity and pressure of each cylinder shall be checked using a separate, calibrated device. If the agent cylinder shows a loss in pressure (adjusted for temperature) of more than 5 percent, it shall be refilled or replaced.

A written report shall be submitted to the system owner upon completion of each FSL system inspection. It shall include the following:

> 1. System location and size.
> 2. Results of Inspection and Maintenance Procedures (Pass/Fail).
> 3. A record of any system defects discovered.
> 4. A record of any structural conditions in the protected hazard that have the potential to adversely affect system performance.

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