

AKRONEX[™]

ADVANCED FIRE FIGHTING SOLUTION



HFC-227ea
Fire Suppression System




 **FM-200[®]**



Every Second Counts... in Fire

The once hard-built kingdom has vanished in split seconds. Flames of fire have destroyed all your belongings, leaving your company succumbing to critical losses of treasures that are left perished in fire. The destruction is even more heart-shattering in extreme fire cases as precious lives are swept away before any attempts to save them. It is going to take a long time to rebuild everything back from scratch.

Devastating as it is, your company's most valuable human resources, data, equipments and systems are all lost to fire. Unbearable truth of the aftermath is to face inoperable equipments, service interruptions and failure to produce necessary information for your customers' needs.



Ultimate Protection against Catastrophe

The best protection for high-value assets requires a product that could meet all the criteria necessary to minimize the risk of fire damages. Halon 1301 has been widely used as it proves to be an effective fire suppression agent, but Halon 1301 has significant environmental consequences due to its potential contribution to depleting the ozone layer.

The quest for a replacement resulted in the introduction of **HFC-227ea** to the marketplace. It has been designated as a replacement for CFC propellants in pharmaceutical metered dose inhalers in asthma medications.

Known as the world most widely accepted replacement for Halon 1301, **HFC-227ea** is considered as people-friendly and takes up less floor space than other systems. The U.S Environmental Protection Agency named it a non-ozone depleting agent for fire extinguishing systems installed in occupied places.

FM-200 Fire Suppression System



FM-200 fire suppression system is an ideal choice for all users as it utilizes the agent HFC-227ea to combat fire in the fastest time.

Exceptionally Fast and Protective

Once a developing fire in its initial stage is detected, **HFC-227ea** extinguishes it quickly by discharging in just 10 ± 1 seconds or lesser. **FM-200** fire suppression system effectively removes heat and breaks up the fire at molecular level. With fast and protective extinguishing action, sensitive components are not damaged. Toxicologically harmless, **HFC-227ea** discharges as gas and leaves no residue, thus there is no hassle for any clean-up cost, unlike sprinklers. Indeed, **FM-200** can provide greater coverage in the shortest time span than any other options. This is significant to minimize damages and interruptions for your business especially when your company relies heavily on the high availability of critical operating procedures.

Clean and Safer Choice

Colourless, odourless, and in gaseous form, **FM-200** extinguishes without leaving any residue. With speedy distribution throughout the room, **FM-200** is not erosive and electrically conductive thus causes no damage through short circuits. The function of **FM-200** is to deprive the heat and interrupt the combustion reaction.

Space Efficiency

FM-200 can be individually adapted to suit every area and desired corner in your company. Nozzle holes and container fill volumes are the result of object-specific calculations and characterize a system optimized down to the smallest detail. The charging pressures of up to 25 BAR depicts that multi-zone systems and longer pipe works can be designed. No separate space is needed for the supply of extinguishing agent; it can be located in the protected area itself. Equipped with environmental properties and good performance ratio, you will definitely get greater protection while utilizing less floor space.



7 different sizes of **FM-200** extinguishing cylinders. ▶

FM-200 Fire Suppression System

Clean Agent Decision Criteria

Excellent price / performance ratio	✓
Robust design, so low maintenance costs	✓
Compact and space-saving	✓
VdS approved	✓
Worldwide recognized and approved extinguishing agent	✓
Rapid extinguishing effect	✓
Safe for use in occupied areas	✓
No extinguishing agent residues	✓
Simple design and hydraulic calculation	✓
Higher operating pressure possible	✓

Extra Guaranteed Services

Professional advice	✓
Technical and maintenance support	✓

FM-200 System Application

FM-200 fire suppression system protects enclosed areas where there is a need for quick reaction to fire, where people may be present, where fire may strike anytime or where damage from conventional agents cannot be tolerated. Some examples of such areas are:

▶ Power Generation, Transmission & Distribution Facilities

- Power Plant
- Power Transmission
- Substation control room
- Substation switch room

▶ Telecommunications Facilities

- Telephone Exchanges
- Central & Remote Cellular Sites
- Communication Centres
- Satellite Ground Stations

▶ Commercial & Institutional Facilities

- Bank Vaults & Documents Storage
- Art Galleries & Archives Storage
- Medical Diagnosis Rooms
- Museums & Libraries
- Aviation & Marine Applications
- Insurance Industry

▶ Data Centres & Industrial Applications

- Computer Rooms & Electronics
- Server Rooms & Process Control Rooms



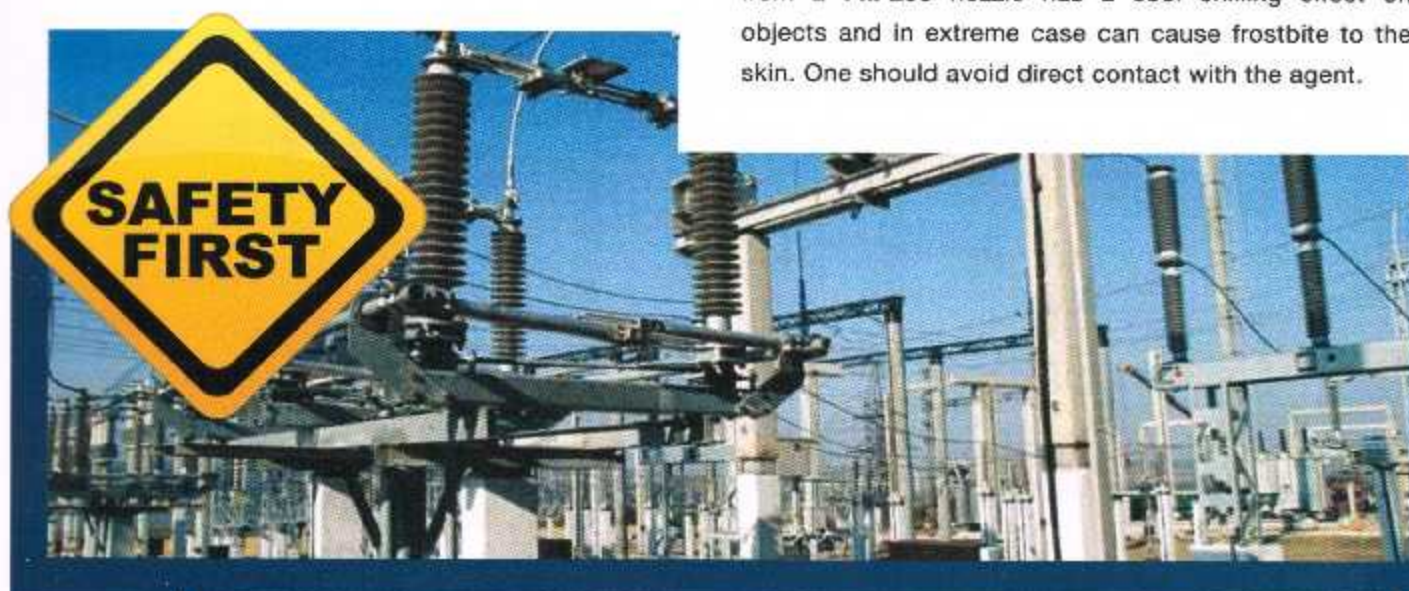
Safety and Precautions

Exposure to **FM-200** at the design concentration of 7% to 9% is not hazardous to health within a permissible period of time. According to Non Observed Adverse Effect Level (NOAEL), the maximum human exposure time shall not exceed 5 minutes with 9% concentration level.

It is recommended that unnecessary exposure to any agent be avoided and that personnel evacuate protected areas as quickly as possible to avoid the decomposition products of the clean agent.

FM-200 can decompose at high temperature or under fire to a form of halogen acids which is readily detected as a sharp, pungent odor even after fire extinguished or long before hazardous maximum exposure levels are reached. Ventilation and openings are required to clear the protected areas after **FM-200** discharged, no one is allowed to enter the areas during system discharge or before the area is totally ventilated and safe for occupancy again.

Direct contact with the vaporizing liquid discharge from a **FM-200** nozzle has a cool chilling effect on objects and in extreme case can cause frostbite to the skin. One should avoid direct contact with the agent.



FM-200 shall not be used on fires involving the following materials:

- ▶ Certain chemicals or mixtures of chemicals, such as cellulose nitrate and gunpowder, those 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 under going auto thermal decomposition, such as certain organic peroxides and hydrazine.

Knowing the Agent Characteristics



HFC-227ea is a gaseous halocarbon agent containing no particles; it leaves no oily residues on electronic equipment and can be removed from the protected space by ventilation. It is the first environmentally acceptable replacement for Halon 1301.

The present understanding of the functioning of **HFC-227ea** is that 80% of its fire fighting effectiveness is achieved through heat absorption and 20% through direct chemical means. **HFC-227ea** is stored as a liquefied compressed gas super pressurized with dry nitrogen to 25 BAR and is discharged into the protected area as a vapor.

Summary of Agent Physical Properties

Chemical Structure	CF ₃ CHFCF ₃
Chemical Name	1,1,1,2,3,3,3 - Heptafluoropropane
Molecular Weight	170 g/mol
Boiling Point at 1.013 Bar (abs)	-16.4°C (1.9°F)
Freezing Point	-131°C (-204°F)
Critical Temperature	101.7°C (214°F)
Critical Pressure	29.1Bar (422 psi)
Critical Volume	274 cc/mole (0.0258 cu.ft/lb)
Critical Density	621 kg/m ³ (38.76 lb/ft ³)
Specific Heat, Liquid at 25°C	1.184 kJ/kg°C
Specific Heat, 25°C Vapor at constant pressure 1 atm and 25°C	0.808 kJ/kg°C
Heat of Vaporization at Boiling Point	132.6 kJ/kg
Thermal Conductivity of Liquid @ 25°C	0.069 W/m°C
Viscosity, Liquid at Centipoise 25°C	0.184
Relative Dielectric Strength @ 1 atm	2
Solubility of Water in Agent @ 21°C	0.06% by weight
Saturated Vapor Density @ 20°C (68°F)	31.18 kg/m ³ (1.95 lb/ft ³)
Ozone Depletion (ODP)	0
Atmospheric Lifetime	36.5 yrs

FM-200 Fire Suppression System Approval



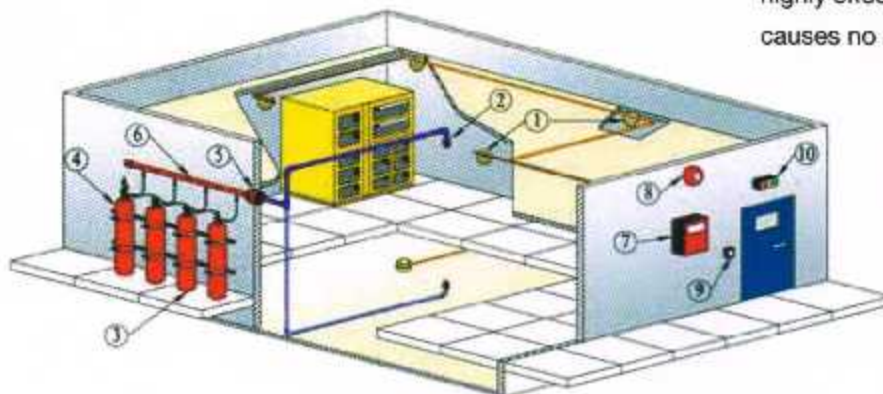
System Design and Operation

The **FM-200** fire suppression systems are designed, installed and maintained according to NFPA 2001 (Clean Agent Fire Extinguishing Systems).

FM-200 utilizes the halocarbon gas Heptafluoropropane (**HFC-227ea**) in NFPA 2001 and ISO 14520-1. The general requirements and design criteria are based on both NFPA 2001 and ISO 14520-1.

FM-200 is employed as a total flooding system and should not be used for local application system. **FM-200** suppresses fire by absorbing heat energy at its molecular level faster than the heat can be generated, so the fire cannot sustain itself.

It also forms free radicals to chemically interfere with the chain reaction of the combustion process. This makes it a highly effective fire fighting agent that is safe for people and causes no damage to equipment.



1. Smoke / Heat Detector
2. Nozzle
3. Slave Cylinders
4. Master Cylinder
5. Manifold
6. Control Panel
7. Alarm Bell
8. Manual Call Point (break glass)
9. Discharge Flashing Light
10. Control Panel

**Please refer to the System Components for more details (pg.7 - pg.13)*

Design Calculations

The required agent quantity is based on the volume of protected area at the lowest expected ambient temperature and concentration required. To obtain the minimum agent quantity required, use the following equation:

$$W = (V/S) \times (C/100-C)$$

W = Weight of Agent required

V = Volume of protected area

S = Specific vapour volume

$$S = 0.1269 + 0.000513 T$$

C = Required **HFC-227ea** Design Concentration (% by volume) at Design Temperature (t)

T = Design temperature in protected area (°C)

FM-200 Fire Suppression System Application



No.	Description	Material
1	Valve Assembly	Brass
2	Electromagnetic Release Device	Brass & Stainless Steel
3	Manual / Pneumatic Release Device	Brass & Stainless Steel
4	Pressure Gauge	Plastic
5	Discharge Hose	Wire Braided Rubber Hose With 2 High Tensite Steel Wire Braids Reinforcement
6	Check Valve	Gun Metal & Stainless Steel
7	Pilot Line Hose	Wire Braided Rubber Hose With 2 High Tensite Steel Wire Braids Reinforcement

FM-200 Fire Suppression System Cylinders



FM-200 Cylinder Specification

Materials	Chromium Molybdenum Steel
Filling	0.5kg/L up to maximum of 1kg/L
Filling Pressure	25 Bar @ 21°C
Test Pressure	50 Bar
Standard of Compliance	TPED 1999/36/Ce or acc. to International Standards
Colour	Red

Remarks: Each cylinder is fitted with a valve outlet cap.



WARNING:

The valve-outlet cap must always be fitted onto the cylinder, irrespective of whether the cylinder is full or empty, when it is not connected to the pipe network or manifold.

