

TOTAL-FLOODING CLEAN AGENT SYSTEMS

ENGINEERED FIRE SUPPRESSION
SOLUTIONS



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TOTAL FLOODING FIRE SUPPRESSION SYSTEMS

System Overview

Orbis® Total Flooding Fire Suppression Systems are engineered solutions designed to protect enclosed volumes by rapidly discharging a calculated quantity of extinguishing agent to achieve and maintain a uniform concentration throughout the protected space.

The system delivers a controlled discharge that suppresses fire across the entire protected area, preventing re-ignition and limiting damage to critical assets and infrastructure.

These systems are widely deployed in mission-critical environments where continuity of operations, asset protection, and personnel safety are essential.

System Architecture

A total flooding system consists of integrated mechanical and electrical components engineered to operate as a single coordinated system:

Agent Storage Cylinders

High-pressure cylinders containing clean agent, inert gas, or CO₂, sized based on hazard volume and design concentration.

Valve & Actuation Assembly

Electrically or pneumatically actuated valves designed for rapid and reliable agent release.

Manifold & Discharge Network

Interconnected piping system distributing agent from one or multiple cylinders to the protected enclosure.

Nozzle Array

Precisely calibrated discharge nozzles ensuring uniform agent distribution and concentration.

Detection & Control System

Fire detection devices integrated with a control panel to initiate alarm, delay, and discharge sequences.

Auxiliary Devices

Including pressure switches, manual release stations, abort switches, and audible/visual alarms.

System Operation

Fire Detection

A fire condition is identified by smoke, heat, or flame detection devices installed within the protected enclosure.

Control Panel Activation

The fire alarm control panel processes the detection signal, initiates alarms, and applies a programmable time delay if required.

Valve Actuation

Upon confirmation, the system actuates the cylinder valve via electric solenoid or pneumatic release mechanism.

Agent Discharge

The extinguishing agent is released through the piping network and nozzles, achieving the required design concentration within the enclosure.

Fire Suppression

The agent suppresses the fire by heat absorption, oxygen displacement, or chemical interruption, depending on the selected agent type.

TOTAL FLOODING FIRE SUPPRESSION SYSTEMS

System Overview

The performance of a total flooding system is defined not only by the extinguishing agent, but by how that agent is stored, actuated, and discharged through the system hardware.

Orbis® systems utilize clean agents, inert gases, and CO₂, each integrated into engineered cylinder assemblies, valve mechanisms, and discharge networks to achieve controlled and repeatable suppression performance.

Agent & Storage Characteristics				
Parameter	FK5-1-12	HFC-227ea	Inert Gas	CO2
Agent Type	Clean Agent	Clean Agent	Inert Gas	Inert Gas
Storage State	Liquified gas	Liquified gas	Compressed gas	Liquified / compressed
Cylinder Pressure	~25 bar @ 21°C	~25 bar @ 21°C	200 / 300 bar	High-pressure / refrigerated
Suppression Method	Heat absorption	Heat absorption + chemical inhibition	Oxygen reduction	Oxygen displacement
Discharge Behavior	Rapid vaporization	Rapid vaporization	Controlled expansion	High-density discharge
Residue	None	None	None	None
Electrical Compatibility	Non-conductive	Non-conductive	Non-conductive	Non-conductive
Occupied Space Use	Permitted	Permitted	Permitted	Restricted

System Hardware Integration

Cylinder & Storage Configuration

- Clean agents such as FK-5-1-12 and HFC-227ea are stored in welded cylinders and super-pressurized with dry nitrogen (~25 bar @ 21°C)
- Inert gases are stored at significantly higher pressures, typically 200–300 bar, requiring manifolded cylinder banks
- Cylinders are available in multiple volumes and are configured in master-slave arrangements for simultaneous discharge

Valve Actuation Mechanism

- Discharge valves operate using a pressure differential piston mechanism, ensuring rapid and full bore opening upon activation
- Systems can be actuated via:
 - Electric solenoid (24V DC)
 - Pneumatic actuation (master-to-slave cylinder triggering)
 - Manual actuator with safety pin protection

Discharge and Distribution

- Agent discharge is routed through a manifolded piping network, allowing multiple cylinders to discharge into a common distribution system
- Check valves are installed to prevent backflow or loss of agent in multi-cylinder configurations
- Discharge nozzles (180° / 360°) are selected based on flow rate and enclosure geometry to ensure uniform agent distribution

System Behavior by Agent Type



Clean Agent Systems

Provide rapid concentration buildup through liquid-to-gas expansion, enabling fast suppression with minimal thermal or mechanical impact on equipment.



Inert Gas Systems

Deliver controlled discharge over longer durations, reducing oxygen concentration while maintaining visibility and minimizing turbulence.



CO2 Systems

Produce dense discharge patterns with strong penetration characteristics, suitable for industrial hazards but requiring strict safety protocols due to oxygen displacement.

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Primary System Components

01 Cylinder Assembly



- DOT / TPED Compliant steel cylinders
- For clean agents, inert gases, and CO₂
- Configured in master and slave arrangements for simultaneous discharge

02 Discharge Valve Assembly



- Factory-fitted to cylinder assemblies
- Pressure differential operation
- Rapid, full-bore discharge

03 Actuation Devices



- Electric Actuator (24V DC)
- Pneumatic actuator (master to slave)
- Manual Actuator with safety pin
- Redundant actuation methods available

04 Check Valves



- Prevent reverse flow or agent loss
- Ensure system integrity
- Required for multi-cylinder configurations

05 Discharge Nozzles



- Precision-engineered brass nozzles
- 180° and 360° discharge patterns

06 Detection & Control System



- Fire detection (smoke, heat, flame)
- Programming delays and alarm sequences
- Interfaces with actuators and auxiliary devices
- Monitoring and system status feedback

07 Auxiliary Devices



- Pressure Gauges and switches
- Manual release stations
- Abort Switches
- Audible and visual alarms

08 Manifold Assembly



- Connects multiple cylinders into a common network
- Enables simultaneous discharge
- Supports expansion for large-scale systems

Key Design Concentrations



Enclosure Volume
Determines agent quantity and system configuration



Design Concentration
Based on agent type and applicable standards



Discharge Time
Engineered for rapid and effective suppression



Enclosure Volume
Determines agent quantity and system configuration



Design Concentration
Based on agent type and applicable standards

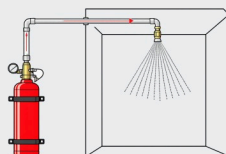


Discharge Time
Engineered for rapid and effective suppression

System Configurations

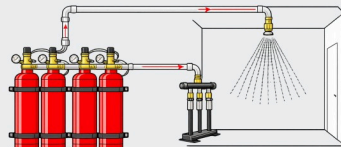
01 Single Cylinder System

- Compact system design
- Suitable for small enclosures
- Direct discharge configuration



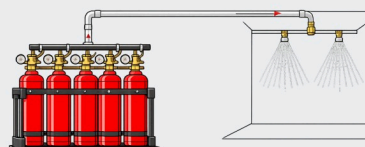
02 Manifold Multi-Cylinder System

- Increased agent capacity
- Simultaneous discharge
- Engineered for medium to large enclosures



03 Cylinder Bank / Rack System

- High-capacity storage
- Scalable architecture
- Designed for large infrastructure protection



TOTAL FLOODING FIRE SUPPRESSION SYSTEMS

Key Features



Engineered System Design

Systems are designed based on enclosure volume, hazard classification, and applicable fire protection standards to ensure compliant and predictable performance.



Modular Cylinder Architecture

Configurable from single-cylinder systems to manifolded multi-cylinder banks, allowing scalability across a wide range of applications.



Integrated Actuation Options

Supports electric, pneumatic, and manual actuation methods, enabling flexible system design and redundancy.



Residue-Free Suppression

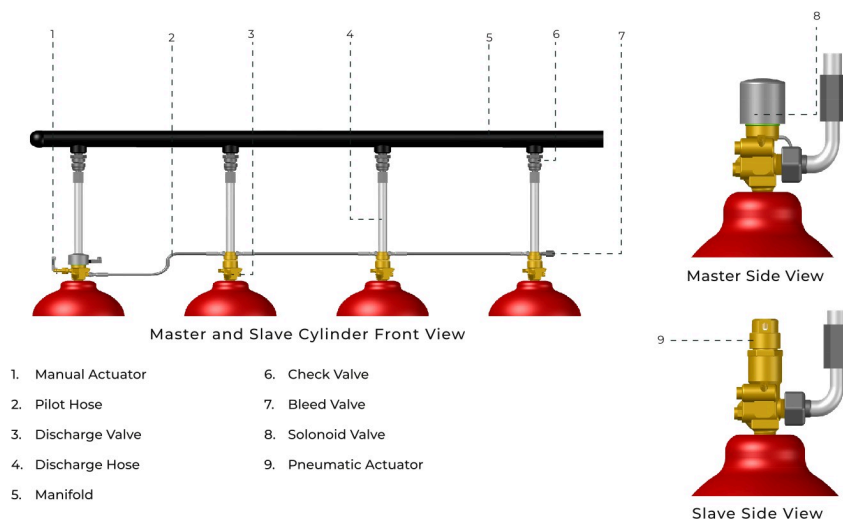
Clean agents and inert gases discharge without leaving residue, minimizing equipment damage and post-discharge cleanup.



System Integration

Compatible with fire detection and control systems for coordinated alarm, delay, and discharge sequencing.

Typical Installation Diagram



Applicable Standards



NFPA 2001

Standard on Clean Agent Fire Suppression Systems



UL 2166

Standard for Halocarbon Clean Agent Systems



NFPA 12

Standard for CO2 Suppression Systems



FM Approved

Component Tested and Approved



ISO 14520

Gaseous Fire Extinguishing Systems



DOT Certified

Certified for Transportation



TOTAL FLOODING FIRE SUPPRESSION SYSTEMS

Typical Applications

Critical Infrastructure

- Data Centers & Server Rooms
- Control Rooms & SCADA Systems
- Telecommunications Facilities



Electrical & Power Systems

- Electrical Switchgear Rooms
- UPS & Battery Rooms
- Transformer & Substation Enclosures



Industrial & Manufacturing

- Process Control Rooms
- Machinery & Equipment Enclosures
- Flammable Liquid Storage Areas



Energy & Heavy Industry

- Turbine Enclosures
- Generator Rooms
- Oil & Gas Facilities



Marine & Transportation

- Engine Rooms
- Cargo Holds & Machinery Spaces
- Offshore Platforms



Commercial & Institutional

- Archives & Document Storage
- Museums & Cultural Assets
- Laboratories & Research Facilities

