

# HI-FOG® for Ro-Ro *and Special Category spaces*



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**The HI-FOG® Water Mist Fire Protection System for Ro-Ro decks and special category cargo spaces offers three important categories of benefits:**

**WATER-BASED**

- Harmless to people
- Harmless to the environment

**MAXIMUM SAFETY**

- Highly efficient fire suppression
- Immediate activation upon fire detection
- Re-ignition prevented by cooling
- Significantly reduced stability problems

**COST-EFFICIENT**

- Minimum damage thanks to fast activation
- No clean-up
- Pump unit and tubing integrated with other HI-FOG® systems
- No downtime for system recharging

*APPROVED IN ACCORDANCE WITH NEW IMO MSC.1/Circ. 1272*





Founded in 1985, Marioff Corporation Oy has grown to become the world's leading provider of water mist systems for fire protection at sea and on land.

## Chapter 1

# Introduction: why HI-FOG®?

Efficient fire fighting solutions are clearly needed in the Ro-Ro spaces of ships. The HI-FOG® Water Mist Fire Protection System offers the same or better fire suppression efficiency than “traditional” systems without the drawbacks. Most importantly, it kills the fire, not the people. It can be released immediately when a fire is detected. There is absolutely no reason to delay activation, allowing the fire to spread and cause damage. If there is a false alarm, the system is simply turned off and it is immediately ready for the next activation.

Traditional systems for fixed fire protection on the Ro-Ro decks and in the special category spaces of ships have been water-based drencher systems, gas-based systems such as CO<sub>2</sub> systems, or foam-based systems. All of these systems have major drawbacks.

### **Conventional drenching**

A conventional drencher system uses large amounts of water. This frequently results in water accumulating and running free on the deck, creating stability problems that require fire fighting to be interrupted. The large amount of water on deck may also spread liquid fuel and, consequently, help the fire to spread over a larger area.

### **CO<sub>2</sub> – useless when needed most**

A gas-based system such as a CO<sub>2</sub> system cannot be used during the period when most fires occur in Ro-Ro spaces, that is, during loading and unloading. This leads to a significant delay in fire fighting: fire fighting must be done manually by either the ship’s crew or the local fire brigade.

### **Foam – corrosive and messy**

Foam systems are sometimes used on Ro-Ro decks. Any vehicle exposed to foam is exposed to the risk of corrosion, and cleaning up the deck is laborious.

### **Plain water – the natural choice**

Following the introduction of the new IMO MSC.1/Circ. 1272 regulations in May 2008, HI-FOG® water mist technology is now available for Ro-Ro decks and special category spaces. Widely used to protect accommodation and machinery spaces, HI-FOG® is the preferred choice for passenger cruise vessels where safety is a paramount concern.

Using water mist as the extinguishing agent, HI-FOG® offers efficient fire suppression without the adverse side effects of other systems as described above. It also provides the added benefit of post-fire cooling, which prevents re-ignition.

### 1.1 Highly efficient water-based fire protection system for Ro-Ro and special category spaces

Unlike conventional drencher systems that use sea water, HI-FOG® uses fresh water to suppress fires. Using high pressure and the unique, patented HI-FOG® nozzles, the HI-FOG® system emits a very fine water mist at high velocity. The water mist is composed of micro-droplets which create a very large combined surface area using small amounts of water. The result is excellent penetration into the fire and fast vaporization, leading to efficient cooling.

The vaporization process absorbs heat and provides local oxygen depletion in the fire as a result of the expansion of the HI-FOG® water mist. The combination of cooling and oxygen depletion suppresses the fire more efficiently, using significantly less water, than conventional drencher systems. And because fresh water is used, the potential water damage to cargo and equipment is significantly reduced.

### 1.2 Safe for people – immediate activation

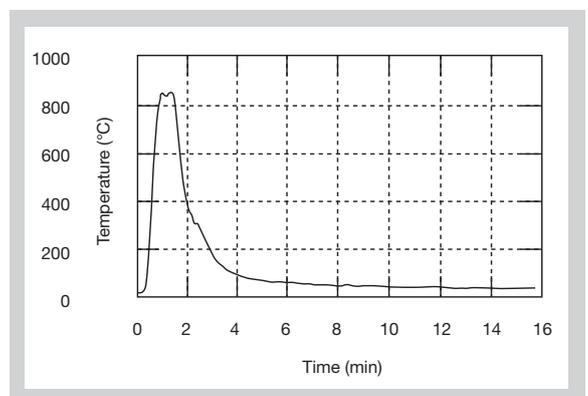
CO<sub>2</sub> and other oxygen-depleting gases are lethal and require an airtight enclosure. Such systems cannot be activated until the space has been completely evacuated, all openings have been closed, and the ventilation system has been shut down. Independent studies have shown that this takes an average of 20 minutes, during which time the fire can grow freely and cause major damage.

HI-FOG® is harmless to people. It can be activated the moment a fire is detected, minimizing damage.

### 1.3 Prevents re-ignition by cooling

Burning fuel quickly heats metal parts. With most fire fighting systems it can take hours, even days, to cool Ro-Ro and special category spaces after a fire. During this period re-ignition is a significant risk, especially when doors are opened and oxygen again enters the space. If this happens, gaseous systems will usually have been depleted (possibly after one redundancy shot), and total flooding protection is no longer available.

HI-FOG® uses an electric pump unit that can be run at full capacity for long periods of time. The HI-FOG® water mist cools down the space very quickly, preventing re-ignition.



#### **1.4 Significantly reduced stability problem**

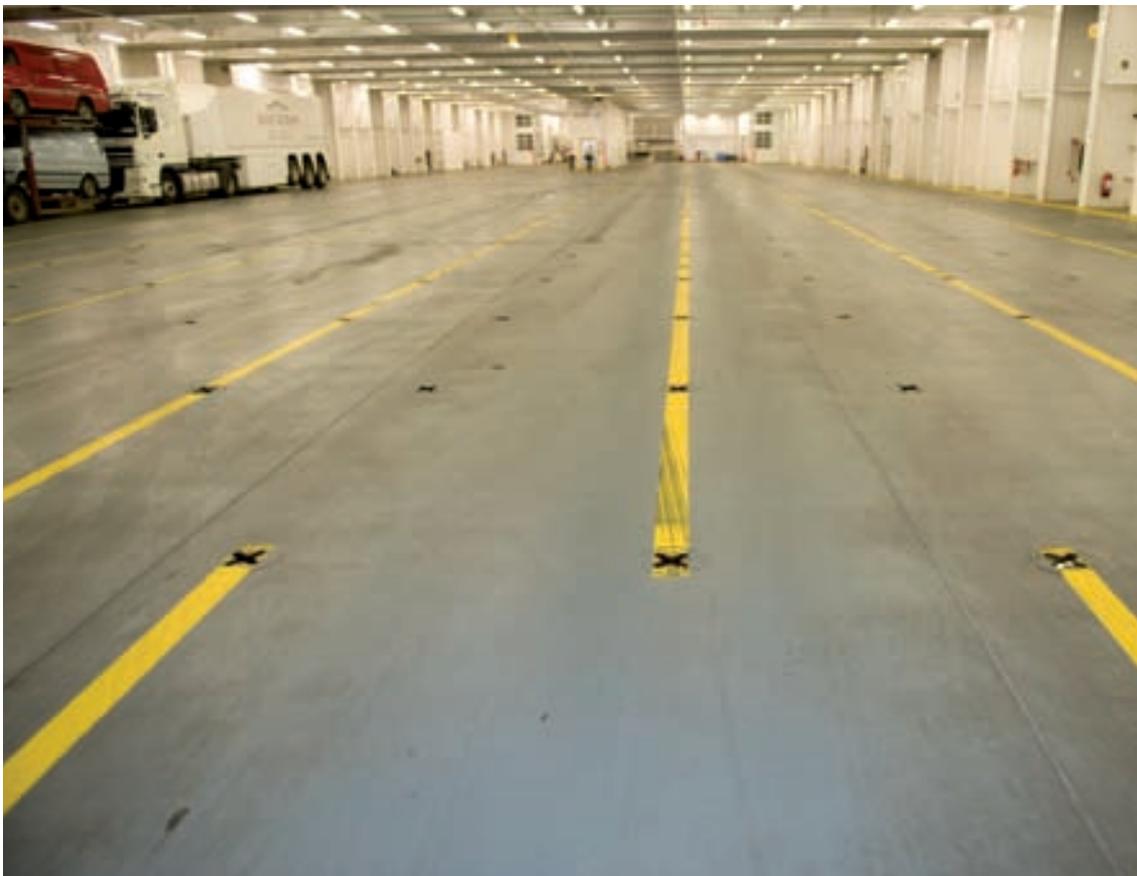
With a conventional drencher system, the volume of discharged water is often so large that it causes problems with the ship's stability. Because HI-FOG® systems use significantly less water than conventional drencher systems, this problem is significantly reduced.

#### **1.5 Harmless to the environment**

CO<sub>2</sub> has been proven to cause major environmental damage. HI-FOG® offers a viable, environmentally friendly alternative in the form of a plain water-based solution.

#### **1.6 Minimum post-fire work**

After HI-FOG® activation, the water evaporates quickly. There is no time-consuming clean-up of chemicals or extraction of gases.





**1.7 No depletion by activation**

Most other systems are depleted after one or two “shots”. After a fire, the ship’s ability to fight a new fire is severely limited until the fire protection system is replenished in port. HI-FOG®, on the other hand, is always ready for use: there is never a need to go to port for replenishment.

**1.8 Common pump unit for machinery, accommodation and Ro-Ro decks**

A single HI-FOG® pump unit can be used to protect all the spaces on the vessel. This means reduced costs thanks to unified spare part supply, service and installation.

**1.9 Does not require special extraction systems for storage spaces**

The requirements for the construction, outfitting and location of a CO<sub>2</sub>- protected storage space are stringent, leading to increased construction and equipment costs. HI-FOG®, on the other hand, can be installed in any space on the vessel and requires no special outfitting.

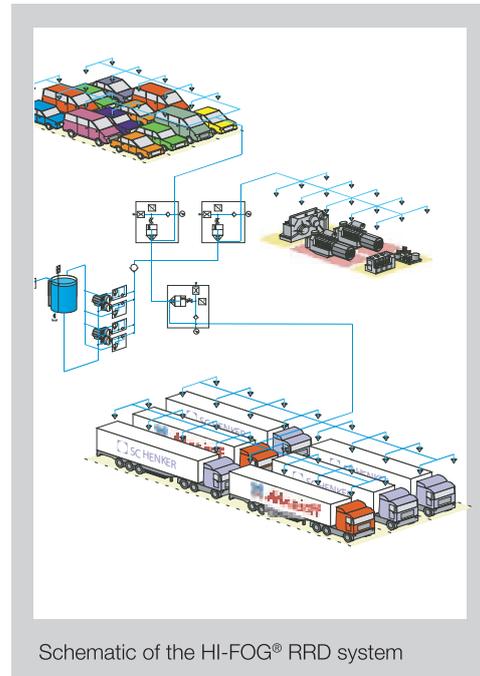
## Chapter 2

# System description

A Ro-Ro or special category space can be protected either by the high-pressure drencher system, HI-FOG® RRD for short, or the automatic high-pressure sprinkler system, HI-FOG® RRS for short. The basic technology of both systems is the same, but there are some differences in how they activate.

HI-FOG® RRD is a drencher system with section valves that are normally closed and dry piping behind the valves. This system uses

HI-FOG® nozzles of the open spray head type and it is released in sections. It can be activated manually or automatically by an external signal from a fire detection system.



HI-FOG® RRS is an automatic high-pressure sprinkler system that uses wet piping. This system uses HI-FOG® nozzles of the sprinkler type and it is activated automatically by a heat-sensitive bulb on the sprinkler head that triggers the system at a given temperature. When the sprinkler bulb breaks, the pressure in the system drops and creates a flow through the section valves. This starts the pump unit.

### 2.1 Electric pump unit

The HI-FOG® electric pump unit, referred to as an SPU, is a modular pump unit: each module contains one electrical motor running two high-pressure pumps. The number of modules depends on the size of the largest spaces that need to be protected. The unit is equipped with one redundancy motor, a stand-by pump, filters and a separator.

A stand-by pressure of about 25 bar is maintained in the system by a pneumatic pump.



## 2.2 Spray heads and sprinklers

The HI-FOG<sup>®</sup> nozzles (spray head type and sprinkler type) are precision-engineered components that deliver water mist so as to ensure fire suppression: mist velocity and plume shape are important factors in fire suppression efficiency. HI-FOG<sup>®</sup> spray heads are attached to the piping with an adapter.

The spray heads and sprinklers are available in different configurations and are selected based on the required flow and height of each protected section. HI-FOG<sup>®</sup> spray heads and sprinklers are fitted with a 300 µm filter to prevent any particles carried in the discharge network from clogging the discharge orifices.



1000-series HI-FOG<sup>®</sup>  
sprinkler head



1000-series HI-FOG<sup>®</sup>  
spray head

## 2.3 HI-FOG<sup>®</sup> tubes

HI-FOG<sup>®</sup> tubes are made of corrosion-resistant AISI 304 or 316 stainless steel according to DIN or equivalent standards, ensuring long system life and clean water.

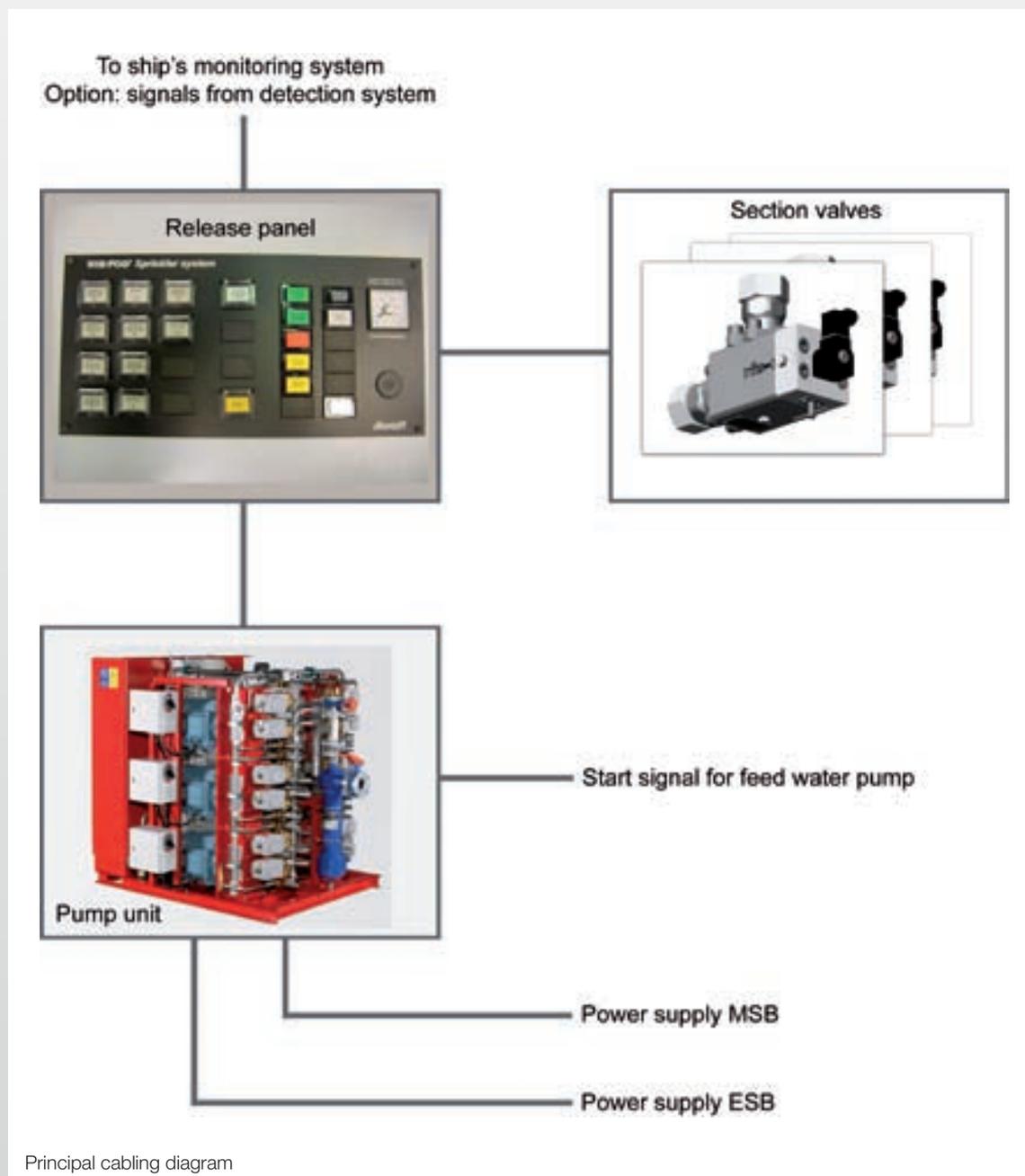
HI-FOG<sup>®</sup> tubes are coupled using S-class cutting ring couplings that are compliant with DIN 2352. They are over-dimensioned to ensure long-term tightness and can be dismantled easily when the tubing network needs to be cleaned or changed. The tube clamps are equipped with steel bottom and cover plates.



## Chapter 3

# Electrical and control systems

The HI-FOG® Water Mist Fire Protection System is supplied with electricity from the ship's Main Switch Board (MSB). The 24 VDC control system has a battery back-up for 12 hours of operation. The system functions are monitored at the release panel and at the pump unit. A relay unit controls the operation of the electric pump unit.



### **The release panel contains:**

- Push buttons for activation of the water network
- Indicator lights for active section valves
- A system pressure gauge
- An emergency start button to start the pump unit
- An alarm bell with reset button
- A lamp test button
- A reset button

### **The pump unit starter cabinet contains:**

- An amp meter for each motor
- Manual start-up switches for each motor
- An indicator light for the main power supply
- An indicator light for the emergency power supply
- A reset button
- A lamp test button
- A control power failure indicator light
- An earth fault 24 VDC indicator light
- A pump unit fault indicator light
- An out-of-fresh-water indicator light
- A running motor indicator light

## Chapter 4

# System operation

The HI-FOG® RRD system is activated by opening the section valve of the relevant section, either manually or electronically from the control panel. Upon activation, the stand-by pressure creates a flow of water through the section valve.

The HI-FOG® RRS system is activated by the flow created by the breaking of a detection bulb in one of the HI-FOG® sprinkler heads.

The pump unit is started automatically, either as a result of the water flow described above or by a pressure drop that exceeds 10 bar for more than 10 seconds. The pump motors are started automatically in sequence, with a few seconds between each, to prevent excessive peaks in the electrical system. The pressure in the relevant sections increases, and a pressure monitoring switch sends an indication signal to the control panel.

The discharge may be stopped at any time by closing the section valve.

### 4.1 Redundancy

HI-FOG® RRD and RRS systems are equipped with several redundancy features:

- The pump unit is equipped with one extra motor-pump module. If one of the electric motors malfunctions, the redundant motor starts automatically.
- Two different signals can independently start the pump unit:
  - A pressure switch detects a drop in system pressure, or
  - A flow monitor detects a flow.
- The system is connected to a sea water supply in case the fresh water supply is lost.
- If the stand-by pump cannot maintain the stand-by pressure, the high-pressure system is automatically activated.

### 4.2 Maintenance costs

The HI-FOG® RRD and RRS systems are low maintenance systems. Since the extinguishing medium is ordinary fresh water, there is no need to refill or exchange expensive and often dangerous chemicals or gases. There are no expensive containers that need to be inspected regularly. An accidental release is an annoying mishap at most, not a tragic accident that can be lethal in the worst-case scenario.

## Summary

The HI-FOG<sup>®</sup> Water Mist Fire Protection System is now available to protect Ro-Ro and special category spaces in full compliance with IMO MSC.1 / Circ. 1272. At the time of writing, the system has been approved by DNV and Germanischer Lloyd. More approvals are expected shortly.

The HI-FOG<sup>®</sup> system offers the same or better fire suppression efficiency than traditional systems but without the drawbacks. Most importantly, it can be released immediately when a fire is detected. If a false alarm occurs, the system is simply turned off and it is ready for the next activation.



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