Land System Data Sheet LS0170

Total compartment protection of combustion turbines, machinery spaces and special hazard machinery spaces with volumes up to and including 750 m³

Gas Driven Pump Unit (GPU) System (FM approved)

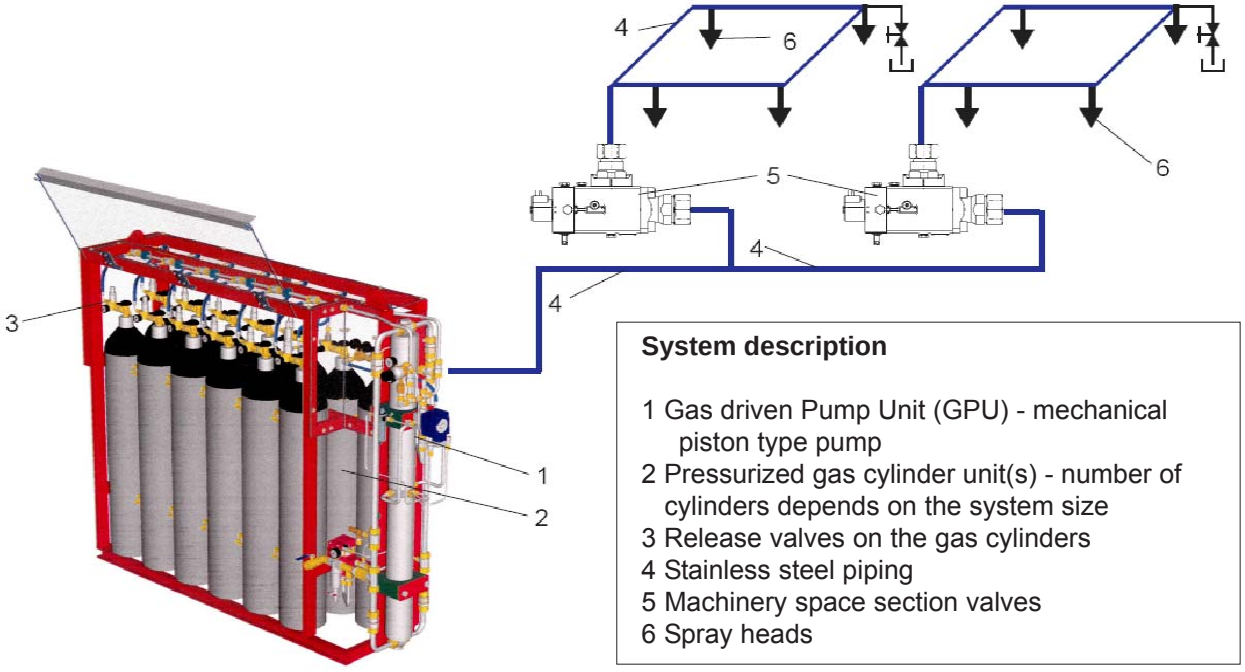
18 Sep 2009

1. General

The HI-FOG® water mist fire protection systems described in this data sheet are of twin fluid, single-pipe type employing water as the suppressant and nitrogen as the atomizing medium. While water is the primary extinguishing agent, nitrogen is used to enhance extinguishing capability in the case of small fires. The system design ensures that the oxygen level in protected spaces is maintained within a range that is safe for people.

Each system arrangement is configured using a water and gas supply to provide total flooding based protection for at least 30 minutes for the required amount of spray heads.

The basic GPU driven system consists of the following main components:



System description

1 Gas driven Pump Unit (GPU) - mechanical piston type pump
2 Pressurized gas cylinder unit(s) - number of cylinders depends on the system size
3 Release valves on the gas cylinders
4 Stainless steel piping
5 Machinery space section valves
6 Spray heads

The system operation does not require any electrical power. Electrical power is applied for controlling, monitoring, and signalling of the system performance as described in the Client's contract specific requirements. A stand-by pressure of about 25 bar up to the machinery section valves is maintained in the system by a pneumatic pump.

The discharge is actuated when a section valve is opened manually or, optionally, electrically from a control panel. The section valves can be connected to a fire detection system for automatic activation. At activation, the stand-by pressure creates a flow of water through the relevant control valve. The water flrow induces a pressure drop that opens the hydraulically operating notrogen cylinder primary valve that starts the pump and opens the pneumatic valves of the first bank of cylinders. The discharge may be interrupted at any time by closing the shut-off valve.

2. System approvals

Factory Mutual Approval Report, Project ID. 3026250, Class 5560, 10 November, 2006

FM APPROVED

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HI-FOG® water mist fire protection

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3. System applications

Typical applications include gas turbine enclosures and their auxiliary rooms, engine spaces and their auxiliary rooms, rooms for fuel or lubricating oil pumps, tanks or filtering systems, lubricating oil skids, gearboxes, generators, compressors, and transformers.

The applications are found in single cycle, combined cycle and cogen power generation facilities, in oil and gas production and transportation and in various process industry facilities. Marioff Corporation will provide more information on specific application upon request.

4. System requirements

The water used for the HI-FOG® systems shall be the equivalent of a potable supply. In all cases the fill line must be routed through a < 100 µm filter (supplied with the system). Chlorine concentration shall not exceed 50 ppm (= 50 mg/l).

The system is supplied with water from an external supply unless the Client's contract specific requirements involve a self-contained system. The water supply must be supervised at all times. The minimum supply pressure is 2 bar and the nominal flow depends on the system output.

The system shall be stored and operated in the temperature range +4 – +54 °C. This may require customized heating or cooling facilities subject to the application and storage conditions.

5. Maximum allowed total wall opening

The maximum allowed total wall opening factor is 0.02 $m^{1/2}$. The total opening factor is the sum of individual opening factors

$$\frac{A_v\sqrt{H_v}}{A_t}$$ *with,*

A_v = area of the ventilation opening
H_v = height of the ventilation opening
A_t = total surface area of the enclosure including the vents but excluding the floor

Any additional ventilation openings or any forced ventilation arrangements shall be capable of automatic closure or shutdown prior to system discharge.

6. Gas cylinder dimensioning

The number of gas cylinders = $1000 \times \frac{N \times t}{V \times p}$

where *N* is the number of spray heads, *t* is the required protection time in minutes, *V* the volume in liters and *p* the pressure of the gas cylinders in bars.

The total number of cylinders is divided into two equal-sized discharges. One independent gas cylinder or another external gas source with a regular pressure regulator is applied to operate the stand-by pump.

The systems are suitable for operation by gas storage cylinders of a minimum nominal capacity of 49 liters and having nominal storage pressures in the range of 170 – 200 bar at 15°C. The proposed gas operating pressure must be identified at the time of system design and assembly.

For more information on the GPU installation, see the corresponding Marioff GPU Technical Data Sheets.

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7. Spray heads

The spray heads must be installed so that possible obstructions do not prevent effective water mist distribution. Similarly, a maximum distance of 3.5 m from walls is acceptable only if the maximum coverage area and volume are not exceeded.

Spray head type 4S 1MC 8MB 1000 must be installed at upper corners of the opening, 1.0 m above and 0.75 m in from the lintel with 1.0 m maximum horizontal spacing, spraying vertically down.

For more information, see Data Sheets TC0160 and TC0170.

Sprinkler type	4S 1MC 8MB 1000	4S 1MC 8MC 1000
Max. spacing (m)	5	5
Max. ceiling height (m)	7,5	5
Max. distance from walls (m)	2,5	2,5
Max. coverage area per spray head (m²)	20	25
Max. coverage volume per spray head (m³)	150	125
Peak water flow rate (lpm)	12,5	12,5

8. Piping

The spray heads are coupled to purpose designed mounting adapters that are fitted at the time of distribution network installation. Tube and fitting standards shall be in accordance with the recommendations of the current edition of NFPA 750 and Marioff requirements.

The piping is made of corrosion resistant stainless steel AISI316, ensuring a long lifetime and clean water. The connections are usually ferrule type DIN2353 joints or SAE518J flange joints, which are type approved by naval classification societies. The couplings are made of stainless steel or brass and are designed with a minimum safety factor of 4.

The maximum operating pressure at the pump unit is about 90 bar. Due to the operating principles of the GPU short peaks are generated at regular intervals. The strength calculations of the pipes shall meet the requirements and regulations of the authority having jurisdiction. Normally the system is designed with a safety factor of 4 on the minimum burst pressure.

The pipings defined for the system are intended to accomodate a maximum length of piping so dimentioned that the pressure loss from the GPU to the farthermost spray head calculated with the known average gas-water mixture density does not exceed 15 bar. The systems shall be dimensioned using the highest relevant flow rate. The pressure drop calculations shall be carried out using the Darcy-Weisbach calculation method for high pressure systems, as presented in NFPA 750.

9. Machinery space section valves

The control valves can be manually operated or electrically remote operated valves. The electric valves can be connected to a fire detection system for automatic activation. The valves are closed in stand-by mode. Each valve is pressure tested to 1.5 times the maximum working pressure before delivery from the factory.

For more information, see Data Sheets TD3020, TD3021, TD4020, TD5020, and TD5050.

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10. External connections

Electric power

The system operation as such does not require electrical poser. A 24 VDC/1A electrical signal from a fire detection system connected to the section valves may be used for system release. The automatic fire detection system requires an electrical power supply.

Air

An external gas source with regular pressure regulator can be applied to operate the stand-by pump as an alternative to one independent gas cylinder. The supply pressure is 4 – 7 bar and the nominal flow is 150 l/min.

Water

The system is supplied with water from an external water supply unless the Client's contract specific requirements involve a self-contained system. The minimum supply is 2 bar and the nominal flow depends on the system output.

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