DNV·GL

Certificate No:
MEDB00003SE

EC-TYPE EXAMINATION CERTIFICATE (MODULE B)

Application of: Directive 2014/90/EU of 23 July 2014 on marine equipment (MED), issued as "Forskrift om Skipsutstyr" by the Norwegian Maritime Authority. This Certificate is issued by DNV GL AS under the authority of the Government of Norway.

This is to certify:

That the Nozzles for equivalent water-mist fire extinguishing systems for machinery spaces and cargo pump rooms

with type designation(s)
HI-FOG (GPU)

Issued to
MARIOFF CORPORATION OY
VANTAA, Finland

is found to comply with the requirements in the following Regulations/Standards:
Regulation **(EU) 2017/306,**
item No. MED/3.39. SOLAS 74, Regulation II-2/10 & X/3, 2000 HSC Code 7, FSS Code 7, IMO MSC.1/Circ.1313, IMO MSC.1/Circ.1458 and IMO MSC/Circ.1165 as amended

Further details of the equipment and conditions for certification are given overleaf.

This Certificate is valid until **2023-02-08**.

Issued at **Høvik** on **2018-02-09**

DNV GL local station:
Helsinki

Approval Engineer:
Helge Bjørnarå

Notified Body
No.: **0575**

for **DNV GL AS**

Roald Vårheim
Head of Notified Body

The mark of conformity may only be affixed to the above type approved equipment and a Manufacturer's Declaration of Conformity issued when the production-surveillance module (D, E or F) of Annex B of the MED is fully complied with and controlled by a written inspection agreement with a Notified Body. The product liability rests with the manufacturer or his representative in accordance with Directive 2014/90/EU.
This certificate is valid for equipment, which is conform to the approved type. The manufacturer shall inform DNV GL AS of any changes to the approved equipment. This certificate remains valid unless suspended, withdrawn, recalled or cancelled.
Should the specified regulations or standards be amended during the validity of this certificate, the product is to be re-approved before being placed on board a vessel to which the amended regulations or standards apply.

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Job Id: **344.1-000388-16**
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Product description

"HI-FOG (GPU)"
is a high-pressure gas driven water mist system composed of spray heads, stainless steel piping, sections valves, control system, pump, water reservoir and compressed gas cylinders (nitrogen or compressed air).

The system is to be designed in accordance with IMO MSC/Circ.1165 "Revised Guidelines for the Approval of Equivalent Water-Based Fire-Extinguishing Systems for Machinery Spaces and Cargo Pump-Rooms" as amended.

Only the spray heads are type approved by this certificate. Pipes, couplings, valves and other systems components are subject to case by case approval.

The spray heads are produced by Marioff at Vantaa, Finland.

Application/Limitation

The spray heads are to be installed in accordance with the following specifications:

Volume and height of protected spaces	
Maximum ceiling height of protected space 1):	7.5 m
Maximum volume of protected space 2):	1500 m^3
Notes: 1) Standard casings need in general not to be considered when assessing this height limitation. 2) This will in general be accepted as the maximum net volume for any protected space (corresponding to a typical gross volume of 1760 m^3). The volume shall include bilges, casings, etc.	

Ceiling mounted spray heads (4S 1MC 8MC 1000)	
Maximum horizontal spacing:	4.3 m x 4.3 m
Nominal horizontal spacing 1):	3.6 m x 3.6 m
Maximum distance to bulkhead:	2.5 m
Maximum average area per spray head:	18.2 m^2
Spray head type	4S 1MC 8MC 1000
The spray heads are to be installed approximately 0.1 - 0.5 m below the deck head, in a downward direction. Casings and areas under platforms and other similar obstruction shall be protected by spray heads. For areas of limited height, spray heads with lower installation height is recommended used.	
A separate system for the bilges, approved according to IMO MSC/Circ.1165, is to be provided.	
Note: 1) The spray heads shall in addition to the spacing and area limitations be installed in a staggered pattern. The nominal spacing is thus only indicative; see the design manual from maker for examples.	

Gas Pump Unit (GPU)	
Number of gas pumps:	2 (designed as 2 x 100%)
Gas media:	Air or nitrogen
Number of gas cylinders 1):	Minimum 2.9 times number of installed spray heads
The gas is applied in two shots. The second shot is discharge when the pressure has decreased to approximately 80 bar (typically 6 minutes after the initial release).	
Note: 1) This is based on the spray head 4S 1MC 8MC 1000 and cylinders of 50 L and 200 bar. If other spray heads are used for special applications (low ceiling height, etc.) or if gas cylinders of other volumes and pressures are applied, the number of cylinders should be adjusted pro rata to provide equivalent protection.	

Spray head information

Sprinkler type	k-factor [lpm/$bar^{1/2}$]	Flow [lpm]	Initial pressure [bar]	Data Sheet
4S 1MC 8MC 1000	3.9 1)	12.5 2)	75 ± 10 3)	TC0170
Spray heads are made of stainless steel and the maximum operating pressure is 140 bar.				

Notes:
1) k-factor assuming only water are being used at 75 bar
2) Initial water flow rate (approximately 55% of the flow is water, 45% is gas)
3) Initial pressure at spray head

For all applications

A. The pumps and gas cylinders shall be delivered with DNV GL product certificate, whereas other system components are to be inspected in accordance with DNV GL Rules (or equivalent standard as specified by the Flag Administration).
B. Redundant pump arrangement is to be approved on a case by case basis.
C. Stainless steel piping and couplings or equivalent shall be applied.
D. Pipes, couplings and other components are regarded as "Class I" piping.
E. The pump unit and section valves shall be installed in a room having ambient temperature between +4 °C and +45 °C.
F. Due care should be taken to ensure correct dimensioning piping (some back-pressure is required to ensure correct mix of water and nitrogen). See the see the design manual from maker for examples.

The following items are to be approved and filed by the flag administration for each project:

i. System arrangement plans including routing of pipes, location of spray heads, sections valves, release stations and gas and water supply
ii. Documentation of power supply and control system
iii. Specification of cylinders, pipes, section valves, pumps and associated components
iv. Pressure drop calculations and water mist capacity calculations
v. Design, installation, operation and maintenance manual

Other documents:

- Gas cylinders, gas pumps, any pipes above DN 50 mm, valves and couplings above DN 100 mm are to be delivered with DNV GL product certificates (or standards considered by the Flag Administration to be equivalent)
- Documentation for other components (according to EN 3.1B and EN 2.2, as applicable) shall be submitted to the site representative of the Flag Administration

Installation testing:

- The system is to be cleaned in accordance with routines outlined in maker's system description manual
- All sections should be tested with full flow through the spray heads
- Manual release of all section valves and start of pumps shall be carried out
- Alarms inside protected space and at a manned control stations shall be tested
- Other tests as required by Class Rules (pressure testing of piping, etc.) and according to maker's manual shall be carried out

Periodical testing:

- The periodical testing shall comply with instructions from flag administration, statutory interpretations and maker's maintenance manual.
- At least one section should each year be tested with full flow through the spray heads

Type Examination documentation

Type Approval Documentation Hi-Fog GPU System dated April 2008.

Performance:

- VTT Report No. VTT-S-6097-06 dated 27 June 2006

Component:

- VTT Report No. RTE11340/95 dated 22 November 1995
- DNV Report No. 98-1147 dated 25 August 1998
- UL Report No. EX4553 dated 30 November 1995

Tests carried out

Tested according to IMO MSC/Circ.1165 (fire tests and component tests).

Marking of product

The spray heads and other main component in the system are to be marked with type designation and Mark of Conformity.