DNV·GL

Certificate No:
TAF00000VA

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Equivalent Fixed Gas Fire Extinguishing System

with type designation(s)
N2 Fire Extinguishing System

Issued to
NK Co., Ltd.
Busan, Korea

is found to comply with
DNV GL rules for classification – Ships
DNV GL offshore standards
DNV GL statutory interpretations DNVGL-SI-0364 – SOLAS interpretations

Application :

Approved for use as a fixed total flooding fire extinguishing system in machinery spaces and cargo pump rooms. Minimum design gas concentration is 46.9%.

Product(s) approved by this certificate is/are accepted for installation on all vessels classed by DNV GL.

Issued at **Høvik** on **2017-12-18**
This Certificate is valid until **2022-12-17**.
DNV GL local station: **Busan**

Approval Engineer: **Marius Mørner**

for **DNV GL**

Mårten Schei-Nilsson
Head of Section

This Certificate is subject to terms and conditions overleaf. Any significant change in design or construction may render this Certificate invalid.
The validity date relates to the Type Approval Certificate and not to the approval of equipment/systems installed.

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Job Id: **262.1-007708-8**
Certificate No: **TAF00000VA**

Product description

"N2 Fire Extinguishing System"
Is a fixed gas fire extinguishing system using the fire extinguishing agent NK Nitrogen stored in cylinders and distributed through pipes and nozzles.

The extinguishing concentration and nozzles are covered by this type approval certificate.
Documentation for the other system components shall be submitted and approved for each project.

The system is to be designed in accordance with IMO MSC/Circ.848 as amended by IMO MSC.1/Circ.1267 and the gas is to be produced by a maker endorsed by NK. The nozzles are made by NK, Korea.

N2 physical properties:

Type designation	N_2 (IG-100)
Composition	N_2 – 99.9%
Agent specific vapour volume (s) at 20°C [1)]	1.16 kg/m^3
Design concentration (C) [2)]	46.9%
Design concentration, specific mass (W/V) [3)]	0.575 kg/m^3
Physiological Effects, No Effect Level[4)]	43%
Physiological Effects, Low Effect Level [4)]	52%

1) s [specific volume (m^3/kg)] = specific volume of superheated IG-100 vapor can be approximated by the formula:
$s = 0.7997 + 0.00293t$ (NFPA 2001 (2012 Edition))
2) To be applied in conjunction with IMO MSC/Circ.848, 3.4.2.3.2.
3) When calculated at 20°C. Ambient temperature to be determined case by case for each project
4) NOAEL/LOAEL equivalent

Application/Limitation

The design concentration (based on oil fuel) shall be minimum 46.9% (applied on a net volume) and the maximum agent discharge time shall be 120 seconds for 85% of design concentration. The extinguishing system shall be designed and installed according to SOLAS Ch. II-2, IMO MSC/Circ.848 as amended by IMO MSC.1/Circ.1267 and the NK's manual.

<u>The following additional limitations will apply:</u>

A. N2 Fire Extinguishing System is approved for use in engine rooms, cargo pump rooms (hydrocarbon only) and similar spaces. This certificate does not address use of the system for protection of cargo holds and cargo handling spaces for other cargoes than oil (alcohol, LPG, LNG). This will have to be considered by the applicable Administration on a case by case basis.
B. Evacuation time and warning procedures as per IMO MSC.1/Circ.1267, 6.2 should be considered for each project. In no case should the design concentration exceed 52% (net volume, maximum expected ambient temperature).
C. Steel storage cylinders are available with sizes of 68 l to 83 l. Cylinders being 81 l or larger is only accepted when arrangements are provided on board to ensure that cylinders can be easily moved (even to shore) for service and recharging. All cylinders shall be of the same size.
D. Gas cylinders shall be delivered on board with a product certificate of the Society or with a certificate issued by a recognized certification authority according to national regulations based on the requirements of the design standard and marked accordingly π, UN or DOT.
E. Cylinders to be located in a separate room in accordance with SOLAS Ch. II-2 Reg. 10.4.3, or distributed throughout the protected space in accordance with the requirements in IMO MSC/Circ.848 item 11 as amended by IMO MSC.1/Circ.1267. When distributed within the protected space, the minimum extinguishing concentration (after any single failure) shall be 32.2% (NFPA 2001 (2012 Edition)).
F. Components in the system will be regarded as pressure class I with a maximum design pressure as per the hydraulic calculations for each project. To be certified according to DNVGL-RU-SHIP Pt.4 Ch.6. Sec.2. Consideration will though be made for piping and couplings inside the protected space.

G. Nozzles type "N3", "N5" or "N14" shall be used. These nozzles are made of brass and the nozzle design pressure is 25 bar. Maximum coverage area for each nozzle is 12.5 m^2 for "N14" and 25m^2 for "N3" and "N5".
H. Bilges (except open bilges in small volume engine rooms) are to be protected with a dedicated nozzle network.

The following documentation is to be submitted in each separate case:

1. Plans showing location of cylinders, piping, nozzles and release stations as well as the assembled system.
2. N2 Fire Extinguishing System capacity calculations, including hydraulic flow calculations.
3. Plans defining release lines and alarm system.
4. Specification for piping, valves and other components in the system.
5. Ship specific release procedures and post discharge ventilation procedures.
6. The manual containing design, inspection, operation and maintenance procedures.
7. Control arrangements for closure of openings and stop of fans and any pressure relief devices as per IMO MSC/Circ.848 as amended by IMO MSC.1/Circ.1267, item 13. These plans can also be supplied by yard.

Testing at installations and periodical surveys

- The system shall be tested as per maker's manual both at installations and at periodical surveys. The minimum test pressure is 1.5 times the design pressure.
- The system is subject to inspections every 2nd year by a DNVGL approved service supplier. The attending surveyor will also apply the DNV GL Instructions to Surveyors on newbuildings and ships in operation surveys.

Type Approval documentation

Certification in accordance with Class Programme DNVGL-CP-0338, October 2015.

Test report no. 2008317340 dated 2009-03-13 issued by KIMM, Daejeon, Korea.

Test report no. KIMM-14-1196 dated 2015-01-15 issued by KIMM, Daejeon, Korea.

Manual from Corporation NK:

- Installation & commissioning, 2009
- Operation and Maintenance, 2009

Tests carried out

The system is tested according to IMO MSC/Circ.848 as amended by IMO MSC.1/Circ.1267.

Marking of product

Main components in the system is to be marked with name of manufacturer and type designation.

Periodical assessment

DNV GL's surveyor is to be given permission to perform Periodical Assessments at any time during the validity of this certificate and at least every second year. The arrangement is to be in accordance with procedure described in Class Programme DNVGL-CP-0338, Section 4.