TYPE APPROVAL CERTIFICATE

Certificate No:
TAF000018N
Revision No:
2

This is to certify:

That the Equivalent Fixed Gas Fire Extinguishing System

with type designation(s)
Novec 1230 / Fluoro-K ADS

Issued to
Kidde-Fenwal, Inc.
Ashland, MA, USA

is found to comply with
DNV rules for classification – Ships
DNV offshore standards
DNV statutory interpretations DNV-SI-0364 – SOLAS interpretations, Edition July 2021

Application :

Approved for use as "total flooding" fire extinguishing system in machinery spaces and cargo pump rooms.

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

Issued at **Høvik** on **2023-09-25**

This Certificate is valid until **2026-02-01**.
DNV local unit: **Certification & Inspection Services**

Approval Engineer: **Tessa Biever**

for **DNV**
Digitally Signed By: Permoda, Jowita
Location: DNV Gdynia, Poland

Jowita Permoda
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.

Product description

"Novec 1230 / Fluoro-K ADS",
is a fixed gas fire extinguishing system using fire extinguishing agent Novec 1230 or Fluoro-K stored in steel cylinders connected to pressurized nitrogen cylinders. The fluid is distributed through steel pipes and stainless-steel 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 the "Principal Requirements" in IMO MSC/Circ.848 as amended by IMO MSC.1/Circ.1267.

The extinguishing agent Novec 1230 is produced by 3M, Cordova, Illinois, USA.
The extinguishing agent Fluoro-K is produced by Sinochem, Hangzhou, China.

Physical properties of extinguishing agent

Trade name	Novec 1230 or Fluoro-K
Other trade name	FK-5-1-12
Molecular formula	$CF_3CF_2C(O)CF(CF_3)_2$
Agent specific vapour volume (S) [1)]	0.07188 m^3/kg
Design concentration (C)	5.85%
Min. agent required (W/V) [2)]	0,8644 kg/m^3
NOAEL [3)]	10.0%
LOAEL [3)]	>10.0%

1) To be applied in conjunction with IMO MSC/Circ.848, 3.4.2.3.1
2) When calculated at 20 °C. Ambient temperature to be determined case by case for each project
3) NFPA 2001 (2008 Edition)

The following associated companies are authorised by Kidde-Fenwal to apply this certificate:
- Kidde-Fenwal Inc., Ashland, USA
- Kidde Products Limited T/A Kidde Fire Production, Buckinghamshire, UK

Application/Limitation

Approved for use as "total flooding" fire extinguishing system in machinery spaces and cargo pump rooms. The design gas concentration (oil fuel) shall be minimum 5.85% (applied on a net volume) and the maximum agent discharge time shall be 10 seconds for 95% of the extinguishing 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 maker's manual.

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

A. Novec 1230 / Fluoro-K ADS systems are not suitable for the ship's cargo holds. If Novec 1230 / Fluoro-K ADS systems are installed inside cargo pump rooms, all components shall be certified for use in hazardous areas, the design gas concentration shall be adjusted, and the system is subjected to case-by-case approval.
B. If Novec 1230 / Fluoro-K is used above its NOAEL (calculated on net volume at max expected ambient temperature), means should be provided to limit exposure (IMO MSC.1/Circ.1267, 6). In no case should Novec 1230 / Fluoro-K be used in concentrations above its LOAEL.
C. Steel storage cylinders of sizes up to 900 lb (408 kg). 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. The Novec 1230 / Fluoro-K cylinder is stored at 25 bar pressure at 0-21°C room temperature, maximum density 1.12 kg/L.
E. Cylinders are to be delivered with product certificate or equivalent certificates acceptable to the flag administration and class.
F. 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 min. extinguishing concentration (after any single failure) shall be 4.5%.
G. Components in the system will be regarded under pressure class II with a maximum design pressure of 39 bar (at 55 °C). Consideration will though be made for piping and couplings inside the protected space.
H. The nozzles approved in this certificate is of type ADS, size 1.5". The nozzles are to be located in accordance with the Design, Installation, Operation and Maintenance Manual. A basic rule is that one 1.5" nozzle can as a maximum cover an area of 5 x 10 m. A 360° nozzles shall be located centrally in this area, the 180° nozzles on the sides (as applicable). The maximum coverage height for a row of nozzles is 5 m. The average pressure at the nozzle during

discharge is 4.3 - 5 bar for a maximum coverage area of 100 m^2. The sides of the coverage area described above shall not exceed 10 m.

I. 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 to the flag administration in each separate case:

a. Plans showing location of cylinders, piping, nozzles and release stations as well as the assembled system.
b. Calculations, including hydraulic flow calculations.
c. Plans defining release lines and alarm system.
d. Material specification and dimensions for piping and specifications for all other components.
e. Ship specific release procedures and post discharge ventilation procedures.
f. Manual containing design, inspection, operation and maintenance procedures.
g. Control arrangements for closure of openings and stop of fans and any pressure relief devices as per IMO MSC/Circ.848, 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, flag administration and class requirements.
- The system is subject to biennial (every 2nd year) inspection by an approved service supplier. The attending surveyor will also apply requirement relevant for flag administration and/or class on newbuilding and ship in operation surveys.

Type Approval documentation

Certification in accordance with Class Program DNV-CP-0338, September 2018.

Design, Installation, Operation and Maintenance Manual No. 06-237257-001 Rev. AC dated December 2022 from Kidde Fire Systems.

Report No. HAI Project #5087 dated 28 June 2002 from Hughes Associates, Baltimore, USA.
(tested on U.S. Coast Guard's Fire & Safety Test Detachment in Mobile, AL).
Report No. 04-CRADA-RDC-001, dated 16 November 2004, from Kidde-Fenwal Inc., Massachusetts, USA.
(tested on U.S. Coast Guard's Fire & Safety Test Detachment in Mobile, AL, witnessed by UL).
Report No. 3026502 dated 24 March 2006 from FM Approvals, Norwood, USA.
Report File EX4674, Project 4786098741 dated 27 November 2013 from UL, Northbrook, USA.
Report File EX4674, Subscriber 359696001, Project 4789259964 dated 25 February 2020 from UL, Northbrook, USA.
Report File EX4674_20141101 revised 24 November 2020 (2 pages) from UL, Northbrook, USA

Drawing No. 85-X94413-2XX, Rev. AE (180° nozzle) dated 9 September 2019 from Kidde Fire Systems.
Drawing No. 85-X94423-2XX, Rev. AE (360° nozzle) dated 9 September 2019 from Kidde Fire Systems.

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 are to be marked with name and address of manufacturer and type designation.

Periodical assessment

DNV'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 Program DNV-CP-0338, Section 4.