DET NORSKE VERITAS

TYPE APPROVAL CERTIFICATE

CERTIFICATE NO. **F-20253**

This is to certify that the
Equivalent Fixed Gas Fire Extinguishing System

with type designation(s)
FM-200

Manufactured by
Kidde-Fenwal
ASHLAND MA, United States

is found to comply with
Det Norske Veritas' Interpretation of SOLAS 1974 Convention as Amended
Det Norske Veritas' Rules for Classification of Ships
Det Norske Veritas' Offshore Standards

Application
Approved for use as "total flooding" fire extinguishing system in machinery spaces and cargo pump rooms. Minimum design gas concentration: 8.7%

Høvik, 2012-09-29
for **Det Norske Veritas AS**

This Certificate is valid until
2016-12-31

Petter Langnes
Head of Section

DNV local office:
New York

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Surveyor

Product description

"FM-200"
is a fixed gas fire extinguishing system using fire extinguishing agent FM-200 stored in steel cylinders as liquid and pressurized with nitrogen 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.

The gas is produced by DuPont, Wilmington, DE, USA.

FM-200 physical properties

Other trade name:	HFC-227ea
Molecular formula:	CF_3CHFCF_3
Agent specific vapour volume (S) at 20°C [1]:	0,1373 m^3/kg
Design concentration (C):	8,7 %
Min. agent required (W/V) [2]:	0,6940 kg/m3
NOAEL [3]:	9,0 %
LOAEL [3]:	10,5 %

1) To be applied in conjunction with IMO MSC/Circ.848, 3.4.2.3.2
2) When calculated at 20°C. Ambient temperature to be determined case by case for each project
3) NFPA 2001 (2008 Edition)

Application/Limitation

The design gas concentration (diesel) shall be minimum 8,7% (applied on a net volume) and the maximum agent discharge time shall be 10 seconds. 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 Kidde manual.

The following additional limitations will apply:

A. FM-200 systems are not suitable for the ship's cargo holds. If FM-200 systems are installed inside cargo pump rooms, all components shall be certified for use in hazardous areas, the design gas concentration shall be increased and the system is subjected to case by case approval.
B. If FM-200 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 FM-200 be used in concentrations above its LOAEL.
C. Steel storage cylinders of size 10 lb to 900 lb. 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 fill density shall be maximum 1.12 kg/L. Cylinders are to be delivered with DNV product certificate or equivalent certificates acceptable to the flag administration and class.
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 min extinguishing concentration (after any single failure) shall be 6,7 %.
F. Components in the system shall be of pressure class II with a maximum design pressure of 35 bar (at 54 °C). Consideration will though be made for piping and couplings inside the protected space.
G. The nozzles are to be located in accordance with the Kidde manual. A basic rule is that one nozzle can as a maximum cover an area of 5 m x 10 m. A 360° nozzle shall be located centrally in this area, the 180° nozzles on the sides (as applicable). The maximum cover height is 5 m. The average nozzle pressure is 6,3 bar.
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 to the flag administration in each separate case:

1. Plans showing location of cylinders, piping, nozzles and release stations as well as the assembled system.
2. Capacity calculations, including hydraulic flow calculations.
3. Plans defining release lines and alarm system.
4. Material specification and dimensions for piping and specifications for all other components.
5. Ship specific release procedures and post discharge ventilation procedures.
6. 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, 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, except that DNV do not require monthly content check of cylinders. The test pressure is minimum 53 bar for any closed sections, whereas open section shall be tightness tested at minimum 7 bar.
- The system is subject to biennial (every 2nd year) inspections by a DNV approved service supplier. The attending surveyor will also apply the DNV Instructions to Surveyors on newbuilding and ship in operation surveys.

Type Approval documentation

Certification in accordance with Standard for Certification No. 1.2, Type Approval, April 2009.

Design, Installation, Operation and Maintenance Manual – FM-200, No. P/N 90-FM200M-021, issued June 2012 from Kidde.

Periodical audit (MED-D) dated 2012-05-10 from DNV New York.

Report No. CG-D-24-97 dated October 1997 from USCG Research and Development Centre, Connecticut, USA.

Report No. CG-D-02-99 dated December 1998 from USCG Research and Development Centre, Connecticut, USA.

Tests carried out

Tested in accordance with IMO MSC/Circ.776 (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 of manufacturer and type designation.

Certificate Retention Survey

Det Norske Veritas' surveyor is to be given permission to perform Certification Retention Surveys at any time during the validity period of this certificate and at least every second year. The arrangement is to be in accordance with procedure described in Standard for Certification No. 1.2 item 4.