DNV·GL

Certificate No:
TAF00000FG

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Equivalent Fixed Gas Fire Extinguishing System

with type designation(s)
Hygood, FM-200 Fixed fire suppresion system

Issued to
Macron Safety Systems (UK) Ltd
GREAT YARMOUTH NORFOLK, United Kingdom

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

Application :

Approved for use as "total flooding" fire extinguishing system in Machinery Spaces and Cargo Pump Rooms.
Minimum design gas concentration: 9.35 %.

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

This Certificate is valid until **2021-06-30**.

Issued at **Høvik** on **2016-11-21**

for **DNV GL**

DNV GL local station: **Great Yarmouth**

Approval Engineer: **Fryderyk Hoga**

Petter Langnes
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:
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Product description

"Hygood, FM-200 Fixed fire suppression system"
Fixed gas fire extinguishing system using fire extinguishing agent FM-200 stored in steel cylinders as a liquid super pressurized with Nitrogen.

The extinguishing concentration and the nozzles are covered by this type approval certificate. Other components submitted for this type approval are reviewed, but 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 extinguishing agent is produced by DuPont, USA.

FM-200 Physical properties:

Technical denomination	HFC-227ea
Chemical denomination	C_3HF_7
Agent specific vapour volume (S) at 20°C 1)	0.1372 m^3/kg
Design concentration (C)	9.35 %
Min agent required (W/V) 2)	0.752 kg/m^3
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 (oil fuel) shall be min 9.35 % (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 Hygood FM-200 Total Flood Fire Extinguishing Systems - Marine Design Manual (DNV version) No. 14A-21M/H Issue No. 01 dated 2012-04 from Tyco Fire Protection Products.

The following additional limitations will apply:

A. Hygood FM-200 Fixed fire suppression 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 and the design gas concentration shall be increased and the system is subjected to case by case approval.
B. When 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 are available with sizes of 4.5 ltr to 343 ltr. Cylinders being 81 ltr 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.
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 ⊓, UN or DOT.
E. Cylinders are topped up with nitrogen to 25 bar at 20°C. The fill density shall be maximum 1.0 kg/l.
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 6.7 %.

G. Components in the system will be regarded under 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.
H. The nozzles are to be located in accordance with the Hygood FM-200 Total Flood Fire Extinguishing Systems - Marine Design Manual (DNV version) No. 14A-21M/H Issue No. 01 dated 2012-04. A basic rule is that one nozzle can as a maximum cover an area of 5m x 10m. A 360° nozzle 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 4.87 m. The average pressure at the nozzles under discharge is 4.87 bar.
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 in each separate case:

1. Plans showing location of cylinders, piping, nozzles and release stations as well as the assembled system.
2. FM-200 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.
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, 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 minimum 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 2_{nd} 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 Class Programme DNVGL-CP-0338, October 2015.

Test report No. FMRC J.I. 3000347 dated January 1999 from Factory Matual Research Corporation, Massachusetts, USA.

Hygood FM-200 Total Flood Fire Extinguishing Systems - Marine Design Manual (DNV version) No. 14A-21M/H Issue No. 01 dated 2012-04.

Tests carried out

The system is tested according to IMO MSC/Circ.848 and IMO MSC.1/Circ.1267.

Marking of product

Main components in the system are 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.