EC-TYPE EXAMINATION CERTIFICATE (MODULE B)

Certificate No:
MEDB00001D6

Application of: Council Directive 96/98/EC of 20 December 1996 on Marine Equipment as amended by directive (EU) 2015/559, 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 the Kingdom of Norway.

This is to certify:

That the Inside air high expansion foam systems for the protection of machinery spaces and cargo pump rooms
with type designation(s)
Unitor HiFoam
Issued to

Wilhelmsen Technical Solutions China Co., Ltd.

Shanghai, China
is found to comply with the requirements in the following Regulations/Standards:
Annex A.1, item No. A.1/3.61 and Annex B, Module B in the Directive; SOLAS 74 as amended Regulation II-2/10 and FSS Code 6
Further details of the equipment and conditions for certification are given overleaf.
This Certificate is valid until **2021-05-03**.

Issued at **Høvik** on **2016-08-08**

Notified Body
No.: **0575**

DNV GL local station:
Shanghai CMC
Approval Engineer:
Fryderyk Hoga

for **DNV GL AS**

Vidar Dolonen
Head of Notified Body

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Product description

"Unitor HiFoam"
consists of HiFoam foam generators, foam concentrate as specified below and other system components like water and foam pump(s), foam proportioner, steel distribution piping, strainer, valves, test and blow through lines, power and control system.
The system is accepted for use in machinery spaces, cargo pumps rooms (oil products only) and similar spaces. The system can also be accepted for use in ro-ro spaces (see the DNV GL rules for this application).
Only the foam generators are type approved by this certificate. All other systems components are subject to case-by-case approval.

Application/Limitation

The system shall be installed according to the below specifications:

Volume of protected space	**Minimum required filling rate**
Up to 500 m^3	2.0 m per minute
Between 500 m^3 and 3348 m^3	1.8 + 0.0000702 x (3348 – V) m per minute
Above 3348 m^3	1.8 m per minute

The HiFoam system is approved for use with the below specifications for the foam generators:

UFG-90 [Drawing 53-09-056 (May 2010)]	
Foam production (cold condition)	20.8 m^3/min at 3.0 bar 67.2 m^3/min at 6.0 bar, 38.0 m^3/min at 8.0 bar 25.9 m^3/min at 9.0 bar
k-factor ($Q = k \times p^{1/2}$)	38.1 lpm/$bar^{1/2}$ at 6.0 bar
Premix consumption (Premix = solution of foam concentrate and water)	69.2 l/min at 3.0 bar 92.9 l/min at 6.0 bar, 105.4 l/min at 8.0 bar 111.5 l/min at 9.0 bar
Expansion ratio	1:301 at 3.0 bar 1:723 at 6.0 bar, 1:361 at 8.0 bar 1:232 at 9.0 bar
UFG-60 [Drawing 53-09-057 (May 2010)]	
Foam production (cold condition)	14.2 m^3/min at 3.0 bar 41.8 m^3/min at 6.0 bar, 30.6 m^3/min at 7.0 bar 22.1 m^3/min at 9.0 bar
k-factor ($Q = k \times p^{1/2}$)	25.6 lpm/$bar^{1/2}$ at 6.0 bar
Premix consumption (Premix = solution of foam concentrate and water)	46.7 l/min at 3.0 bar 62.2 l/min at 6.0 bar, 66.8 l/min at 7.0 bar 74.7 l/min at 9.0 bar
Expansion ratio	1:305 at 3.0 bar 1:672 at 6.0 bar, 1:458 at 7.0 bar 1:296 at 9.0 bar

UFG-30 [Drawing 53-09-058 (May 2010)]	
Foam production (cold condition)	5.2 m^3/min at 3.0 bar 15.6 m^3/min at 6.0 bar, 9.3 m^3/min at 8.0 bar 8.1 m^3/min at 9.0 bar
k-factor ($Q = k \times p^{1/2}$)	12.8 lpm/$bar^{1/2}$ at 6.0 bar
Premix consumption (Premix = solution of foam concentrate and water)	23.5 l/min at 3.0 bar 31.1 l/min at 6.0 bar, 35.6 l/min at 8.0 bar 37.7 l/min at 9.0 bar
Expansion ratio	1:222 at 3.0 bar 1:502 at 6.0 bar, 1:262 at 8.0 bar 1:214 at 9.0 bar

The following additional applications / limitations apply:

A. Nominal pressure is 6.0 bar. Approved pressure range is 3-9 bar. Application of generators at a pressure above or below the approved pressure range is subject to case by case approval

B. Only DNV GL approved foam concentrate "Unitor High Expansion Foam Concentrate 2%" manufactured by Dr. Sthamer, Germany shall be used

C. The foam generators shall be equally spaced in a horizontal plan at a level above the main and auxiliary engines. Generators shall also be arranged to cover other high-risk objects at all levels in the machinery spaces. Extra foam generators may be required in locations where the normally required generators have problem to reach due to obstructions like gratings, (semi-)tight bulkhead / decks, structures, etc.

D. The generators shall have at least 1 m free space in front of the foam outlet. Positions exposed to overpressure in case of boiler and crankshaft explosions shall be avoided as far as practicable (positions above and somewhat to the side of the object is in general accepted)

E. At least two foam generators shall be fitted in each protected area. However, small workshops and similar spaces may be covered with only one foam generator. The system shall be activated with as little delay as possible and it is recommended for spaces above 500 m3 that natural ventilation openings in upper part of the space are kept in an open position

F. Sufficient amount of foam is to be provided to produce a volume of foam equal to five times the largest space to be protected, applying the expansion ratio above, or 30 minutes operation, whatever value is larger

G. With respect to cargo pump rooms, the system is approved for pump rooms which handle oil cargos only, the system can not be applied for pump rooms which are also intended for alcohol cargos (polar solvents)

H. A strainer with maximum mesh openings of maximum 1.5 mm shall be fitted on the sea water pressure line before the foam proportioner (this to avoid clogging). Ambient room temperature for foam pump / foam container should be between 4 °C and 45 °C. The water pump(s) are to be delivered with a DNV GL product certificate

I. The system shall in addition to the above comply with relevant parts of SOLAS Ch. II-2, the FSS Code and DNV GL rules for classification: Ships Pt.4 Ch.11

The following items are to be submitted for approval for each project:

- System arrangement plans including location of generators, section valves, release stations, pumps, foam tank and foam proportioner
- Documentation of power supply and control system
- Specification of pipes, section valves, electrical motors, pumps, foam concentrate, foam tank, foam proportioner and associated components
- Foam capacity calculations and pressure drop calculations, including actual pressure characteristic (pump curve) of water supply pump
- Design, installation, operation (including emergency operation) and maintenance manual

Installation testing:

- Pipes, valves and fittings and assembled systems shall be tested to the satisfaction of the Society
- All distribution piping shall be blown through with air to ensure that the piping is free from obstructions
- Function testing of the foam proportioner shall be performed as per it's type approval certificate (see also Pt. 4 Ch.10 App.C for details). A mixing range of 2.0 – 2.6% will normally be accepted. The mixing ratio shall be measured
- Function testing of the power and control systems, water pump(s), foam pumps(s), valves, remote and local releases stations and alarms shall be carried out

- Other tests as required by DNV Rules and according to maker's manual

Periodical testing:

- Every 3rd month: function test of water and foam pumps
- Annually (minimum): foam mixer to be function tested, with water and foam pumps running (or an equivalent test procedure)
- Annually: Distribution pipes shall be blow through with air annually and nozzles inspected for debris
- After 3 years and then annually: condition test for the foam concentrate
- Renewal survey: Distribution pipes should be flushed properly with fresh water and inspected to ensure that they are free from debris and not clogged

Test log and condition test report for foam concentrate shall be presented to the surveyor. Other tests may be required on a case by case basis.

Type Examination documentation

Fire test reports:
NBL F09125 dated 18 December 2009 from SINTEF, Trondheim, Norway.
Component test reports:
P905741 dated 21 October 2010 from SP, Borås, Sweden.
P905741-1 dated 18 October 2010 (rev.date) from SP, Borås, Sweden.
P907018 dated 17 September 2010 from SP, Borås, Sweden.
Foam concentrate test reports (separate approval):
P402374-A & P402374-B, both dated 22 September 2004 from SP, Borås, Sweden.
P904918 dated 06 October 2009 from SP, Borås, Sweden.
Drawings, foam generators:
53-09-056, rev. 06, dated 14 May 2010 (Unitor Foam Generator UFG-90).
53-09-057, rev. 06, dated 14 May 2010 (Unitor Foam Generator UFG-60).
53-09-058, rev. 06, dated 13 May 2010 (Unitor Foam Generator UFG-30).

Tests carried out

The foam generators have been tested according to IMO MSC.1/Circ. 1271, including selected items of IMO MSC/Circ. 1165 and EN 13565-1.
The foam concentrate has been tested according to IMO MSC/Circ.670, ISO 7203-2:1995 and IMO MSC.1/Circ. 1271 (see separate approval).

Marking of product

The foam generators and other main components in the system are to be marked with name of manufacturer, type designation and MED Mark of Conformity (see first page).