

## EC TYPE EXAMINATION (MODULE B) CERTIFICATE

This is to certify that :

LLOYD'S REGISTER VERIFICATION LIMITED (LRV), specified as a "notified body" under the terms of The Merchant Shipping (Marine Equipment) Regulations S.I. 1999 No. 1957, did undertake the relevant type approval procedures for the equipment identified below which was found to be in compliance with the essential Fire protection requirements of Marine Equipment Directive (MED) 96/98/EC as modified by Commission Directives 98/85/EC, 2001/53/EC, 2002/75/EC, 2002/84/EC, 2008/67/EC, 2009/26/EC and 2010/68/EU subject to any conditions in the Design Appraisal Document attached hereto.

**Manufacturer** Tyco Safety Products

**Address** Burlington House  
Hewett Road  
Gapton Hall Industrial Estate  
Great Yarmouth  
Norfolk, NR31 0NN  
United Kingdom (UK)

**Annex A1 Item** A.1/3.45 EQUIVALENT FIXED GAS FIRE EXTINGUISHING SYSTEMS COMPONENTS FOR MACHINERY SPACES & CARGO PUMP ROOMS

**Type** FIXED GAS FIRE EXTINGUISHING SYSTEM

**Description** Fixed Gas Fire Extinguishing System – Type: "Sapphire total flood fire suppression system" for Machinery Spaces of Category A and Cargo Pump Rooms equivalent to fire-extinguishing systems required by SOLAS 1974 as amended, Chapter II-2/10.5 and 10.9. In addition the system may be used in the cargo compressor and pump rooms of LNG and LPG carriers."

**Specified Standard** IMO MSC/Circ. 848 as amended by MSC.1/Circ.1267

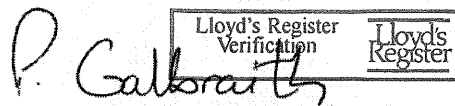
**The attached Design Appraisal Document (schedule) forms part of this certificate.**

**This certificate remains valid unless cancelled or revoked, provided the conditions in the attached schedule are complied with and the equipment remains satisfactory in service.**

Date of issue 2 June 2011 Expiry date 1 June 2016

Certificate No. MED 1150157

Signed



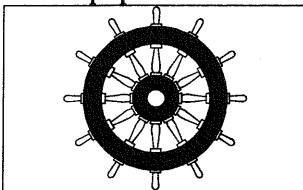
Sheet No 1 of 4

Name

P. Galbraith  
For and on behalf of Lloyd's Register Verification  
LRV EC Distinguishing No. 0038

Note:

**This certificate is not valid for equipment; the design or manufacture of which has been varied or modified from the specimen tested. The manufacturer should notify the notified body named on this certificate of any modification or changes to the equipment in order to obtain a valid Certificate.**



Subject to compliance with the conditions in the attached Design Appraisal Document (schedule), which forms part of this certificate, and those of Articles 10.1(i) and 11 of the Directive, the Manufacturer is allowed to affix the "Mark of Conformity" to the Product described herein.  
yy Last two digits of year mark affixed.

**This certificate is issued under the authority of the MCA.**

"Lloyd's Register Verification is the business name of Lloyd's Register Verification Limited, a member of the Lloyd's Register Group.

Registration number 4929226.

Registered office 71 Fenchurch Street, London EC3M 4BS, England

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**DESIGN APPRAISAL DOCUMENT**

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**ATTACHMENT TO EC TYPE EXAMINATION (MODULE B) CERTIFICATE No.MED 1150157**

The undernoted documents have been appraised for compliance with the relevant requirements of International Conventions and European Union legislation for the EC Type Examination of Marine Equipment for use on Merchant Ships Registered in the European Economic Area.

This Design Appraisal Document (schedule) forms part of the Certificate.

**APPROVAL DOCUMENTATION**

Hughes Associates, Inc. Report HAI Project #5087, "An evaluation of 3M total flooding NOVEC 1230 systems with the IMO gaseous agents test protocol for machinery space applications", dated July 3, 2002. Additional testing has been carried out to satisfy Lloyd's Register as to the spacing of the nozzles.

FM Approvals Report PI3026502 dated 24 March 2006.

**CONDITIONS OF CERTIFICATION**

1. The National Authorities of the vessel concerned are to accept the use of Novec 1230 as being acceptable for compliance with The International Code for Fire Safety Systems (Fire Safety Systems Code), Chapter 1, paragraph 4 and Chapter 5, paragraph 2.5 at the design stage. The manufacturers of the system are to advise, whoever they are contracted to, of this requirement at the earliest opportunity.
2. If the system is to be of the modular type, i.e., with the cylinders distributed within the machinery space, the National Authorities are to accept the arrangements with due reference to the Fire Safety Systems Code, Chapter 5, paragraph 2.1.1.4. and MSC/Circular 848, paragraph 11 of the Annex, as amended by MSC.1/Circ 1267.
3. The computation of the discharge time for each application is to be produced by the TEPG Novec1230 FlowCalc TSP3.60b Flow Calculation Program and is to be independently verified at the design stage. The system should be designed so that 95% of the extinguishing agent can be discharged in 10 seconds.
4. The quantity of Novec 1230 for the protected space is to be calculated at the minimum expected ambient temperature (which is to be no greater than zero degrees Celsius) with a minimum design concentration of 5.85%. The maximum concentration is not to exceed 10% (LOAEL Limit) at the maximum expected ambient temperature, (not less than 50 degrees Celsius). Other temperature ranges may be considered on a project by project basis, subject to agreement by the National Administration.
5. Where the system is installed in the cargo compressor and/or pump rooms of a Liquefied Natural Gas carrier, the minimum design concentration of the extinguishing agent is to be 7.2% at an operating temperature of 20 degrees Celsius.
6. Where the system is installed in the cargo compressor and/or pump rooms of a Liquefied Petroleum Gas carrier, the minimum design concentration of the extinguishing agent is to be 6.5% at an operating temperature of 20 degrees Celsius.
7. The design concentration is to be based on the net volume of the protected space, including the casing, the bilge and the volume of free air contained in air receivers that in the event of a fire, is released into the protected space. All objects that occupy volume in the protected space should be subtracted from the gross volume of the space. They include, but are not necessarily limited to: auxiliary machinery, boilers, condensers, evaporators, main engines, reduction gears, tanks and trunks.
8. The discharge of Novec 1230 is to be evenly distributed over the protected space and the nozzle spacing is not to exceed 8 metres for a 360 degree nozzle or 11 metres for a 180 degree nozzle or equivalent nozzle coverage arrangement. The maximum nozzle vertical spacing is not to be greater than 5 metres.
9. The average minimum pressure at each nozzle is to be not less than 5.5 bar, at a maximum cylinder fill density of 1121 kg/m<sup>3</sup>, for nozzle types: 360° and 180°. The drill sizes of each nozzle orifice, nozzle part numbers and the quantity of agent to be discharged from each nozzle is to be determined by the flow calculation program. Nozzles to be manufactured from ASTM B16 Brass or stainless steel.

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10. The arrangements and parts used in the system are to be in accordance with the Sapphire Total Flood Firte Suppression Systems- Marine Design Manual - Rev.04 ref. 14A-06M/T, issue date 06/2011. This manual also contains recommended procedures for the control of products of agent decomposition, including HF vapour generated from fluorocarbon extinguishing agents which could impair escape.
11. Arrangement drawings and calculations are to be submitted for acceptance in each case where it is proposed to install this system. Control panel schematics are also to be submitted. All principle components of the system are to be identified and their location indicated.
12. The means of control of the fixed gas fire-extinguishing system shall be readily accessible, simple to operate, and shall be grouped together in as few locations as possible at positions not likely to be cut off by a fire in a protected space. At each location there shall be clear instructions relating to the operation of the system having regard to the safety of personnel.
13. Where agent containers are stored within a protected space, the containers should be evenly distributed throughout the space and the arrangement of containers and the electrical circuits and piping essential for the release of any system should be such that in the event of damage to any one power release line or container valve through mechanical damage, fire or explosion in a protected space, i.e. a single fault concept, at least the amount of agent needed to achieve the minimum extinguishing concentration can still be discharged having regard to the requirement for uniform distribution of medium throughout the space; and the containers should be monitored for decrease in pressure due to leakage and discharge. Visual and audible alarms in the protected area and on the navigation bridge or in the space where the fire control equipment is centralised should be provided to indicate this condition.

**GENERAL NOTES**

1. The system is to be designed in accordance with the Annex of IMO MSC/Circ. 848 as amended by MSC.1/Circ 1267. In particular, revised requirements apply where agent containers are stored within a protected space.
2. All systems should be designed to allow evacuation of the protected spaces prior to discharge. Means should also be provided for automatically giving audible and visual warning of the release of the fire-extinguishing medium into any space in which personnel normally work or to which they have access. The alarm should operate for the period of time necessary to evacuate the space, but not less than 20 seconds before the medium is released. Unnecessary exposure, even at concentrations below an adverse effect level, should be avoided.
3. Even at concentrations below an adverse effect level, exposure to gaseous fire extinguishing agents should not exceed 5 minutes. If a halocarbon agent is to be used above its NOAEL, means should be provided to limit exposure to no longer than the time specified according to a scientifically accepted physiologically based pharmacokinetic (PBPK) model or its equivalent which clearly establishes safe exposure limits both in terms of extinguishing media concentration and human exposure time.
4. The mechanical ventilation of the protected space(s) must be stopped before the activation of the fixed gas system and compartment closure arrangements should be designed to provide an agent hold time of at least 15 minutes. The release of an extinguishing agent may produce significant over and under pressurisation in the protected space. Measures to limit the induced pressures to acceptable limits should be provided.
5. The system should be supplied by both main and emergency sources of power, with the emergency power supply being provided from outside the protected machinery space.
6. The system pipe work including; pipes, valves and fittings are to be in accordance with the requirements of the approval authority.
7. 10% of the distribution piping is to be tested to 1.25 times the maximum pressure likely to be experienced in service. For the Sapphire system, this equates to 1.25 x 28.6 bar (at 50 deg. C) = 42.9 bar. The manifold pipework is to be tested to at least 1.5 times the setting of the manifold relief valve. The manifold relief valve is to be set at a minimum pressure of 43 bar and the minimum manifold test pressure is to be 64 bar. All pipework and fittings should be of suitable galvanised steel or stainless steel construction. Threaded joints in fixed gas systems shall be allowed only inside protected spaces and in cylinder storage spaces.

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8. The system storage containers and associated pressure components are to be designed and tested to codes of practice recognised by the approval authority, indicating that they can withstand the pressure expected in service, having regard to their installed location and that they are suitable for the agent identified.
9. Recommended procedures for the control of products of agent decomposition are to be provided. In particular, on passenger ships, the decomposition products should not be discharged in the vicinity of muster (assembly) stations.
10. Provisions should also be made to ensure that escape routes which may be exposed to leakage from the protected space are not rendered hazardous during or after discharge of the agent. Control Stations and other locations that require manning during a fire situation should have provisions to keep HF and HCl below 5 ppm at that location. The concentrations of other products should be kept below concentrations considered hazardous for the required duration of exposure.
11. As longer exposure of the agent to high temperatures would produce greater concentrations of HF and HCl gases, the type and sensitivity of detection, coupled with the rate of discharge, should be selected to minimise the exposure time of the agent to the elevated temperature. The performance of fire-extinguishing arrangements on passenger ships should not present health hazards from decomposed extinguishing agents, for example on passenger ships, the decomposition products should not be discharged in the vicinity of muster (assembly) stations. Other mitigating steps include evacuation and donning masks.
12. Warning signs and audible and visual alarms should be located outside each entry to the protected space(s).
13. Suitable means of checking storage cylinder pressure and weight to be provided.
14. **Installation onboard:** The on board arrangements and installation of this system are not part of this design Appraisal or certificate. All such arrangements are to be to the satisfaction of the Surveyors attending on board. On completion of the installation final acceptance of the system is dependent on satisfactory survey.
15. Production items of the subject equipment are to be manufactured in accordance with either an approved Production Quality Assurance system (Module D), a Product-Quality assurance system (Module E) or a Product Verification Process (Module F). The wheelmark cannot be affixed to the product until a conformity assessment module is in place.
16. Each item, batch or lot of the equipment is to be issued with a "Declaration of Conformity" and have the "Mark of Conformity" affixed after a conformity assessment module is in place.

**PLACE OF PRODUCTION**

Tyco Fire Protection Products  
 Burlington House  
 Hewett Road  
 Capton Hall Industrial Estate  
 Great Yarmouth  
 Norfolk, NR31 0NN  
 United Kingdom (UK)

Paul Galbraith  
 Lead Specialist  
 For and on behalf of Lloyd's Register Verification  
 LRV EC Distinguishing No. 0038