

Economic Commission for Europe**Inland Transport Committee**

20 January 2017

Working Party on the Transport of Dangerous Goods**Joint Meeting of Experts on the Regulations annexed to the European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways (ADN)****Thirtieth session**

Geneva, 23-27 January 2017

Agenda item 5 (b)

**Proposals for amendments to the Regulations annexed to ADN:
other proposals**

Extinguishing agents – additional information**Transmitted by the Governments of Belgium and the Netherlands****Introduction**

1. In ECE/TRANS/WP.15/AC.2/2017/16, Belgium and the Netherlands propose to add Dry Aerosol to the list of extinguishing agents in 9.1.0.40.2.1 and 9.3.X.40.2.1 of the Regulations annexed to ADN.
2. In the annex of this document the following documents can be found related to the proposed extinguishing agent:
 - Type Examination Certificate
 - Product Quality Assurance Certificate
 - Information, Instruction and User Manual
 - Annex to the Manual
 - Attestation by a recommended classification society (Bureau Veritas)
 - Functioning of the system (in Dutch)

Additional amendments

3. Given the fact that for the other extinguishing agents, additional requirements are set in 9.1.0.40.2.10-13 and in 9.3.X.40.2.10-13, the Belgium and Dutch governments consider it desirable to add additional requirements to the extinguishing agent Dry Aerosol as well. The requirements for the other extinguishing agents are based on article 10.03b of the Rhine Vessel Inspection Regulations.
4. Regarding the Dry Aerosol, the CCNR issued in 2011 a recommendation for the use of this type of extinguishing agent. In confirmation with this recommendation, the Belgium and Dutch governments suggest to add a new article in the Regulations annexed to ADN, introduced after 9.1.0.40.2.13 and 9.3.X.40.2.13 as 9.1.0.40.2.14 (new) and 9.3.X.40.2.14 (new).

5. In German:

9.1.0.40.2.14 (new):

Feuerlöscheinrichtungen, die mit Trockenaerosol als Löschmittel betrieben werden, müssen über die Anforderungen der Absätze 9.1.0.40.2.1 bis 9.1.0.40.2.9 hinaus den folgenden Bestimmungen entsprechen:

- a. Jeder zu schützende Raum muss mit einer eigenen Löschanlage ausgestattet werden.
- b. Das Trockenaerosol bildende Löschmittel wird in speziell dafür vorgesehenen drucklosen Behältern im zu schützenden Raum aufbewahrt. Diese Behälter müssen so angebracht sein, dass das Löschmittel gleichmäßig verteilt wird. Insbesondere muss das Löschmittel auch unter den Flurplatten wirken.
- c. Die Aktivierung der Löschanlage muss durch eine elektrische Steuerung erfolgen, die 9.1.0.40.2.5.c entspricht. Jeder Behälter wird separat mit der Aktivierungseinrichtung verbunden.
- d. Die Menge an Trockenaerosol bildendem Löschmittel für den zu schützenden Raum muss mindestens 113 g/m^3 des Bruttovolumens des Raums betragen.
- e. Die Behälter mit Löschmittel müssen nach 15 Jahren ausgetauscht werden. Die Notstrombatterien müssen spätestens nach 6 Jahren ausgetauscht werden.

9.3.X.40.2.14 (new):

Feuerlöscheinrichtungen, die mit Trockenaerosol als Löschmittel betrieben werden, müssen über die Anforderungen der Absätze 9.3.X.40.2.1 bis 9.3.X.40.2.9 hinaus den folgenden Bestimmungen entsprechen:

- a. Jeder zu schützende Raum muss mit einer eigenen Löschanlage ausgestattet werden.
- b. Das Trockenaerosol bildende Löschmittel wird in speziell dafür vorgesehenen drucklosen Behältern im zu schützenden Raum aufbewahrt. Diese Behälter müssen so angebracht sein, dass das Löschmittel gleichmäßig verteilt wird. Insbesondere muss das Löschmittel auch unter den Flurplatten wirken.
- c. Die Aktivierung der Löschanlage muss durch eine elektrische Steuerung erfolgen, die 9.3.X.40.2.5.c entspricht. Jeder Behälter wird separat mit der Aktivierungseinrichtung verbunden.
- d. Die Menge an Trockenaerosol bildendem Löschmittel für den zu schützenden Raum muss mindestens 113 g/m^3 des Bruttovolumens des Raums betragen.
- e. Die Behälter mit Löschmittel müssen nach 15 Jahren ausgetauscht werden. Die Notstrombatterien müssen spätestens nach 6 Jahren ausgetauscht werden.

EC Type Examination Certificate

This is to certify that:

FirePro Systems Ltd
6 Koumandarias Street & Spyrou
Araouzou Tonia Court No.2
Limassol
3036
Cyprus

Holds Certificate Number:

BSI/A.1/3.46/560436

In respect of:

Directive reference: MED 96/98/EC, as amended, last amended by directive 2013/52/EU.

Annex A1 Item: A.1/3.46 - Equivalent fixed gas fire extinguishing systems for machinery spaces (aerosol systems).

Product Type: Aerosol Fire Extinguishing Units with dry condensed extinguishing agent, Fire Class A & B Product Description: FP20S, FP20SE, FP40S, FP80S, FP100S, FP200S, FP500S, FP1200, FP1200S, FP2000, FP2000S, FP3000, FP3000S, FP5700 & FP5700S.

Specified standard: IMO MSC/Circ.1007, MSC/Circ 1270.

This is to certify that BSI did undertake the relevant type approval procedures for the equipment identified above which was found to be in compliance with the Fire protection requirements of Module B of the Marine Equipment Directive (MED) 96/98/EC, as amended, last amended by Directive (2013/52/EU), subject to any conditions in the schedule attached hereto.

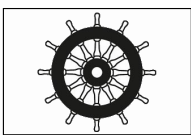
For and on behalf of BSI, a Notified Body for the above Directive (Notified Body Number 0086):

Pietro Foschi - Strategic Delivery Director

First Issued: 20/08/2010

Latest Issue: 21/02/2015

Expiry Date: 20/08/2020



0086/yy

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EC Type Examination Certificate

No. BSI/A.1/3.46/560436

Schedule of Approval

Product Specification

The products listed below are to be installed with an actuation system/panel where manual activation is achieved as defined in MSC1/Circ 1270 chapter 17 and as per the FirePro User/Installation manual. The actuation system/panel is excluded from this certification.

FP20S :	Aerosol generating fire extinguishing system unit with 20g dry condensed extinguishing agent, Fire Class A & B
FP20SE :	Aerosol generating fire extinguishing system unit with 20g dry condensed extinguishing agent, Fire Class A & B
FP40S :	Aerosol generating fire extinguishing system unit with 40g dry condensed extinguishing agent, Fire Class A & B
FP80S :	Aerosol generating fire extinguishing system unit with 80g dry condensed extinguishing agent, Fire Class A & B
FP100S :	Aerosol generating fire extinguishing system unit with 100g dry condensed extinguishing agent, Fire Class A & B
FP200S :	Aerosol generating fire extinguishing system unit with 200g dry condensed extinguishing agent, Fire Class A & B
FP500S :	Aerosol generating fire extinguishing system unit with 500g dry condensed extinguishing agent, Fire Class A & B
FP1200/FP1200S :	Aerosol generating fire extinguishing system unit with 1200g dry condensed extinguishing agent, Fire Class A & B
FP2000/FP2000S :	Aerosol generating fire extinguishing system unit with 2000g dry condensed extinguishing agent, Fire Class A & B
FP3000/FP3000S :	Aerosol generating fire extinguishing system unit with 3000g dry condensed extinguishing agent, Fire Class A & B
FP5700/FP5700S :	Aerosol generating fire extinguishing system unit with 5700g dry condensed extinguishing agent, Fire Class A & B

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EC Type Examination Certificate

No. BSI/A.1/3.46/560436

Schedule of Approval

Approval Documentation that forms part of this certification:

Drawing No.	Rev/Issue	Date	Title
C20ASS	1	27/05/2014	FP20S – General Assembly Drawing
C20EASS	1	27/05/2014	FP20SE – General Assembly Drawing
C40ASS	1	27/05/2014	FP40S – General Assembly Drawing
C80ASS	1	27/05/2014	FP80S – General Assembly Drawing
C1AS	3	27/05/2014	FP100S – General Assembly Drawings
C2AS	3	27/05/2014	FP200S – General Assembly Drawings
C5AS	3	27/05/2014	FP500S – General Assembly Drawings
B12AS	0	01/01/2008	FP1200 – General Assembly Drawing
B12EH	0	01/01/2008	FP1200 – External Housing Construction Drawing
B12IH	0	01/01/2008	FP1200 – Internal Housing Construction Drawing
B12IAS	1	27/05/2014	FP1200 – Internal Assembly Drawing
B20AS	0	01/01/2008	FP2000 – General Assembly Drawing
B20IAS	1	27/05/2014	FP2000 – Internal Assembly Drawing
B30AS	0	01/01/2008	FP3000 – General Assembly Drawing
B30IAS	1	27/05/2014	FP3000 – Internal Assembly Drawing
B2030EH	1	01/01/2008	FP2000 & FP3000 – External Housing Construction Drawing
B2030IH	0	01/01/2008	FP2000 & FP3000 – Internal Housing Construction Drawing
B122020BRKT	0	01/01/2008	FP1200 – Mounting Bracket
B2030BRKT	0	01/01/2008	FP2000 & FP3000 – Mounting Bracket
B57EH	1	01/10/2008	FP 5700 – External Housing Construction Drawing
B57IH	0	01/01/2008	FP5700 – Internal Housing Construction Drawing
B57IAS	1	27/05/2014	FP5700 – Internal Assembly Drawing
B57BRKT	0	01/01/2008	FP5700 – Mounting Bracket
AELACT	0	01/01/2008	Electrical Activators for all Models where fitted

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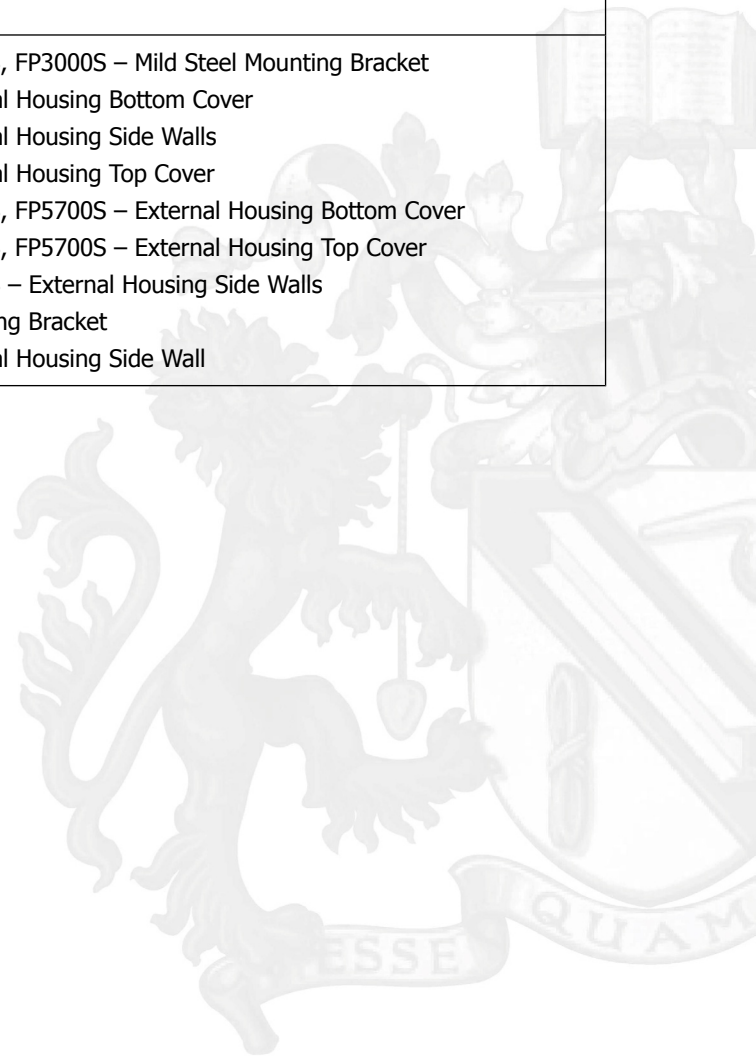
EC Type Examination Certificate

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Schedule of Approval

Approval Documentation that forms part of this certification (continued):

Drawing No.	Rev/Issue	Date	Title
B122030BRKT	1	01/08/2012	FP1200S, FP2000S, FP3000S – Mild Steel Mounting Bracket
B12EHBC	1	01/08/2012	FP1200S – External Housing Bottom Cover
B12EHSW	1	01/08/2012	FP1200S – External Housing Side Walls
B12EHTC	1	01/08/2012	FP1200S – External Housing Top Cover
B203057EHBC	1	01/08/2012	FP2000S, FP3000S, FP5700S – External Housing Bottom Cover
B203057EHTC	1	01/08/2012	FP2000S, FP3000S, FP5700S – External Housing Top Cover
B2030EHSW	2	01/08/2012	FP2000S, FP3000S – External Housing Side Walls
B57BRKT	1	01/08/2012	FP5700S – Mounting Bracket
B57EHSW	2	01/08/2012	FP5000S – External Housing Side Wall



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Schedule of Approval

Approval Documentation that forms part of this certification (continued):

Supporting Document	Rev/Issue	Date	Title
Technical Dossier	0	22/07/2010	SMO Ref 7498123– Electronic copy of the Technical file covering all models listed on page 1
Technical Dossier	1	Feb 2012	Updated to include minor changes to some drawings, Efectis Witness Test Report and Updated KIWA Certificate
Technical Dossier	2	Aug 2012	Updated to include Model FP20SE, Previous Technical Dossier included the information for this model, no change to the Technical Dossier.
Technical Dossier	3	Aug 2013	SMO Ref 8030440 - Updated to include variant Models FP1200S, FP2000S, FP3000S & FP5700S. The only difference being the external housing being made from Stainless Steel, no other change to the product.
Technical Dossier	5	Jan 2015	SMO Ref 8198682 – Drawing update to reflect name change of raw material from SBK Compound to FPC Compound. No other change, material identical just name change. Manuals updated.
Manuals	5	01/10/2011	Information, Instruction & User Manual
	5	Revised 26/08/2013	Information, Instruction & User Manual – Updated to include models FP1200S, FP2000S, FP3000S & FP5700S
	5	Revised 20/01/2015	Information, Instruction & User Manual – updated to replace the thermocord activation mode with bulb thermal activation, bi-metallic thermal activation, linear heat cable (Non MED).
	2	14/02/2012	Annex 1 Marine Manual to be read in conjunction with the above manual
	2	Revised 20/01/2015	Annex 1 Marine Manual – Update to revise some of the efficiency coefficient values

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Schedule of Approval

Approval Documentation that forms part of this certification (continued):

Supporting Document	Rev/Issue	Date	Title
Reports & Certificates	-	-	KIWA Certificate K21477/08 01/04/2010 UL Test Report, Project Ref 05CA05359, File EX6960 USCG Report CG-D-03-06 Russian Maritime Register of Shipping, Type approval Certificate Ref 10.80012.180 dated 11/06/2010 for MCS 1270 * Hughes Associates INC Analysis Report dated Nov 2004 & 15/01/2009 **
	-	06/08/2010	Technical Dossier Assessment Report 2411/7498123
	-	Aug 2011	K21477/08 01/08/2011
		26/01/2012	Cone Calorimeter Tests of IMO MSC Circ 1270 Class A Plastic Materials – Hughes Associates Inc
	-	Jan 2012	Efectis Test Report R1134, Fire test - Wood Cribs & Plastic Sheets
		12/09/2011	KIWA, EMC Test Report 126076-EMC
		11/01/2013	KIWA Certificate K21477/12 UK
		19/11/2014	KIWA Certificate K21774/14 UK – Using FPC Compound.

* The Russian Maritime Register of Shipping has made an independent evaluation of the test reports owned by FirePro and according to their opinion it satisfied the requirements of the MSC.1/Circ.1270. Since the Certification list is reporting all the approval documents received so far by FirePro, the Russian Registry Type Approval was included in the above list.

** The Hughes Report is that at the time MCA requested FirePro to run additional tests, the opinion of FirePro was that they had already run the additional tests as part of the listing with various accredited Institutes, such as UL. Therefore FirePro asked Hughes Associates, the largest in the world Fire Risk Assessment Company, to carry out an evaluation and provide their independent opinion on this issue. Mr.L.Borghetti (Hughes Europe) was the chairman of the CEN,ISO and IMO technical committees on the aerosol technology and therefore he is in position to give a competent opinion on the issue.

The conclusion of Hughes Analysis Report is: " FirePro was participating and contributing to the research and test campaign headed by USCG, having the scope to develop the information necessary for the revision of the existing IMO MSC/Circ.1007 (now IMO MSC/Circ.1270). The FirePro Aerosol Extinguishing Systems passed all the tests and requirements stated by the revised IMO MSC/Circ.1270 as reported by the USCG, the polymeric Sheet Test has been witnessed as passed by the listing issued by the Underwriters Laboratories.

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Schedule of Approval

Design Calculation.

Agent

The quantity (mass) of aerosol agent to be used should be determined as follows:

$$W = \frac{V \times q \text{ (g)}}{f}$$

where

W = Agent mass (g) (Total mass required to protect the specific volume)

V = Volume of enclosure (m³) (Protected volume)

q = Design application density (gr/m³) (net mass of agent per unit volume (g/m³) required by the system designer for the fire protection application)

f = Efficiency coefficient of generator's model (%) (net mass of agent delivered by a generator model (size))

q = 120 gr/m³

Efficiency coefficients (related to each generator model (size)):

FP-20S/SE= 60%

FP-500S = 66%

FP-40S= 61%

FP-1200 = 63%

FP-80S= 59%

FP-2000 = 60%

FP-100S = 61%

FP-3000 = 61%

FP-200S = 59%

FP-5700 = 59%

The total number of generators (N) to be used is derived by the following formula

$$N = \frac{W \text{ (total agent mass)}}{\text{nominal mass (initial mass of the solid compound) of each generator model (size)}}$$

Example: FP2000 = 2000 grams of nominal mass

FP5700 = 5700 grams of nominal mass

Note: If different generator models (size) should be selected, the total mass of extinguishant (solid compound) shall not be less than the quantity required (W).

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EC Type Examination Certificate

No. BSI/A.1/3.46/560436

Schedule of Approval

Technical Specification

Model

Type	FP-20S / FP20SE Cold
Activation mechanism FP20S ♦	thermal activation
Activation mechanism FP20SE ♦	electrical (6 - 36 V D/C 0.8 A in 3 - 4 sec)
Current intensity to be tested	maximum 5 mA
Weight gross	310 g
Weight net extinguishing agent	20 g
Operational discharge time	5 - 10 seconds
Discharge outlet	2
Discharge length	0.6 m
Size	165 mm x 32 mm (incl. connector housing)
Self activation temperature	300°C

Model

Type	FP-40S Cold
Activation mechanism ♦	thermal activation / electrical (6 - 36 V D/C 0.8 A in 3 - 4 sec)
Activator type	heating element with 2.3 ohm resistance
Current intensity to be tested	maximum 5 mA
Weight gross	610 g
Weight net extinguishing agent	40 g
Operational discharge time	5 - 10 seconds
Discharge outlets	2
Discharge length	1.2 m
Size	140 mm x 51 mm
Self activation temperature	300°C

♦ See Product Specification note on Page 2

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Schedule of Approval

Technical Specification

Model

Type	FP-80S Cold
Activation mechanism ♦	thermal activation / electrical (6 - 36 V D/C 0.8 A in 3 - 4 sec)
Activator type	heating element with 2.3 ohm resistance
Current intensity to be tested	maximum 5 mA
Weight gross	870 g
Weight net extinguishing agent	80 g
Operational discharge time	5 - 10 seconds
Discharge outlets	2
Discharge length	2 m
Size	185 mm x 51 mm (incl. connector housing)
Self activation temperature	300°C

Model

Type	FP-100S Cold
Activation mechanism ♦	thermal activation / electrical (6 – 36 V D/C 0.8 A in 3 – 4 sec)
Activator type	Heating element with 2.3 ohm resistance
Current intensity to be tested	Maximum 5 mA
Weight gross	1370 g
Weight net extinguishing agent	100 g
Operational discharge time	5 - 10 seconds
Nozzle	optional
Discharge outlet	1
Discharge length	1 m
Size	155 mm x 84 mm (incl. connector housing)
Self activation temperature	300°C

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Schedule of Approval

Technical Specification

Model

Type	FP-200S Cold
Activation mechanism ♦	thermal activation / electrical (6 - 36 V D/C 0.8 A in 3 - 4 sec)
Activator type	heating element with 2.3 ohm resistance
Current intensity to be tested	maximum 5 mA
Weight gross	1840 g
Weight net extinguishing agent	200 g
Operational discharge time	5 - 10 seconds
Nozzle	Optional
Discharge outlet	1
Discharge length	2 m
Size	185 mm x 84 mm (incl. connector housing)
Self activation temperature	300°C

Model

Type	FP-500S Cold
Activation mechanism ♦	thermal activation / electrical (6 - 36 V D/C 0.8 A in 3 - 4 sec)
Activator type	heating element with 2.3 ohm resistance
Current intensity to be tested	maximum 5 mA
Weight gross	3340 g
Weight net extinguishing agent	500 g
Operational discharge time	5 - 10 seconds
Discharge outlet	1
Discharge length	2.5 m
Size	295 mm x 84 mm (incl. connector housing)
Self activation temperature	300°C

♦ See Product Specification note on Page 2

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EC Type Examination Certificate

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Schedule of Approval

Technical Specification

Model

Type	FP-1200 / FP1200S Cold
Activation mechanism ♦	thermal activation / electrical (6 - 36 V D/C 0.8 A in 3 - 4 sec)
Activator type	heating element 2.3 ohm resistance
Current intensity to be tested	maximum 5 mA
Weight gross	10900 g (excl bracket)
Weight net extinguishing agent	1200 g
Operational discharge time	10 -15 seconds
Discharge outlet	1
Discharge length	3.5 m
Size	216 mm x 300 mm x 167 mm
Self activation temperature	300°C

Model

Type	FP-2000 / FP2000S Cold
Activation mechanism ♦	thermal activation / electrical (6 - 36 V D/C 0.8 A in 3-4 sec)
Activator type	heating element 2.3 ohm resistance
Current intensity to be tested	maximum 5 mA
Weight gross	15500 g
Weight net extinguishing agent	2000 g
Operational discharge time	10 - 15 seconds
Discharge outlet	1
Discharge length	3.5 m
Size	300 mm x 300 mm x 185 mm
Self activation temperature	300°C

♦ See Product Specification note on Page 2

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EC Type Examination Certificate

No. BSI/A.1/3.46/560436

Schedule of Approval

Technical Specification

Model

FP-3000 / FP3000S

Type	Cold
Activation mechanism ♦	thermal activation / electrical (6 - 36 V D/C 0.8 A in 3-4 sec)
Activator type	heating element 2.3 ohm resistance
Current intensity to be tested	maximum 5 mA
Weight gross	16300 g
Weight net extinguishing agent	3000 g
Operational discharge time	15 - 20 seconds
Discharge outlet	1
Discharge length	4 m
Size	300 mm x 300 mm x 185 mm
Self activation temperature	300°C

Model

FP-5700 / FP5700S

Type	Cold
Activation mechanism ♦	thermal activation / electrical (6 - 36 V D/C 0.8 A in 3-4 sec)
Activator type	heating element 2.3 ohm resistance
Current intensity to be tested	maximum 5 mA
Weight gross	26400 g
Weight net extinguishing agent	5700 g
Operational discharge time	15 - 20 seconds
Discharge outlet	1
Discharge length	8 m
Size	300 mm x 300 mm x 300 mm
Self activation temperature	300°C

♦ See Product Specification note on Page 2

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Schedule of Approval

Conditions of Certification

- i) This BSI/A.1/3.46/560436 issue 5 certificate remains valid unless cancelled or revoked, provided the conditions listed below are complied with and the equipment remains satisfactory in service
- ii) The certificate will not be valid if the manufacturer makes any changes or modifications to the approved equipment, which have not been notified to, and agreed with the notified body named on this certificate.
- iii) Should the specified regulations or standards be amended during the validity of this certificate, the product(s) is/are to be re-approved prior to it/they being placed on board vessels to which the amended regulations or standards apply
- iv) Detailed User instructions are to be provided with each product.
- v) The activation system supplied shall comply with all the requirements of MSC.1/Circ.1270, in particular clauses 12.1, 14 and 17"
- vi) "The mark of conformity may only be affixed to the above type approved equipment and a Manufacturers Declaration of Conformity issued when the production-control phase Module (D) of Annex B of the directive is fully complied with and controlled by a written inspection agreement with a notified body."

First Issued: 20/08/2010

Latest Issue: 21/02/2015

Expiry Date: 20/08/2020

Page: 13 of 13

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BSI Assurance UK Limited, registered in England under number 7805321 at 389 Chiswick High Road, London W4 4AL, UK.
A member of BSI Group of Companies.

EC Production Quality Assurance Certificate

This is to certify that:

FirePro Systems Ltd
6 Koumandarias Street & Spyrou
Araouzou Tonia Court No.2
Limassol
3036
Cyprus

Holds Certificate Number:

BSI/MED/PC/560437

In respect of:

Directive reference: MED 96/98/EC, as amended, last amended by directive 2013/52/EU

Annex A.1/3.46: Equivalent fixed gas fire extinguishing systems for machinery spaces (aerosol systems).

This is to certify that BSI did undertake the relevant type approval procedures for the equipment identified above which was found to be in compliance with the Fire protection requirements of Module D of the Marine Equipment Directive (MED) 96/98/EC, as amended, last amended by Directive (2013/52/EU), subject to any conditions in the schedule attached hereto.

For and on behalf of BSI, a Notified Body for the above Directive (Notified Body Number 0086):

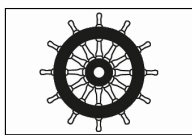


Pietro Foschi - Strategic Delivery Director

First Issued: 20/08/2010

Latest Issue: 21/02/2015

Expiry Date: 20/02/2018



0086/yy

Page: 1 of 3

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EC Production Quality Assurance Certificate

No. BSI/MED/PC/560437

Manufacturing Address: **FirePro Systems Limited**
Ayios Athansios
4 Falea Street
Limassol District
Cyprus

Product Description

Product Designation	Model	Certificate No.	Issue Date	Notified Body
A.1/3.46	FP20S, FP20SE, FP40S, FP80S, FP100S, FP200S, FP500S, FP1200, FP1200S, FP2000, FP2000S, FP3000, FP3000S, FP5700 & FP5700S aerosol generating fire extinguishing system unit with dry condensed extinguishing agent, Fire Rating Type A & B	BSI/A.1/3.46/560436	21/02/2015	0086
A.1/3.46	FNX-20S, FNX-40S, FNX-80S, FNX100S, FNX-200S, FNX-500S, FNX-1200, FNX-2000, FNX-3000 & FNX-5700 aerosol generating fire extinguishing system unit with dry condensed extinguishing agent, Fire Rating Type A & B	BSI/A.1/3.46/620133	21/02/2015	0086

First Issued: 20/08/2010

Latest Issue: 21/02/2015

Expiry Date: 20/02/2018

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A member of BSI Group of Companies.

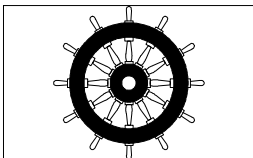
EC Production Quality Assurance Certificate

No. BSI/MED/PC/560437

Conditions of Certification

- i) This BSI/MED/PC/560437 issue 5 certificate remains valid unless cancelled or revoked, provided the conditions listed below are complied with and the equipment remains satisfactory in service
- ii) This certificate loses its validity if the manufacturer makes any changes or modifications to the approved quality system, which have not been notified to, and agreed with the notified body named on this certificate and/or after lapse of time, withdrawal or revocation of the EC Type Examination (Module B) Certificate.
- iii) The equipments detailed above are to be manufactured in accordance with Production Quality Assurance system (Module D) of the Marine Equipment Directive
- iv) If the specified standards are amended during the validity of this certificate, the product type are to be re-approved prior to it being supplied to vessels to which the amended standards apply.
- v) Production tests are to be conducted in accordance with the applicable requirements of the Directive and be recorded by the manufacturer in accordance with the approved Production Quality Assurance system (Module D) of the Marine Equipment Directive
- iii) This certificate authorises the manufacturer or his authorised representative established within the Community in conjunction with the EC TYPE EXAMINATION (MODULE B) CERTIFICATE of the equipment listed in the scope to affix the "Mark of Conformity" (wheelmark).
- v) Each equipment is to have the "Mark of Conformity" affixed and be issued with a "Declaration of Conformity".

Example for the Application of the "Mark of Conformity":



0086/YY

"Wheelmark" Format yy Last two digits of year mark affixed.
0086 Notified Body number undertaking surveillance module.

First Issued: 20/08/2010

Latest Issue: 21/02/2015

Expiry Date: 20/02/2018

Page: 3 of 3

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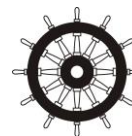
BSI Assurance UK Limited, registered in England under number 7805321 at 389 Chiswick High Road, London W4 4AL, UK.
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Information-, Instruction- and User manual
AMAC (Aerosol Marine Activation & Control) panel

Version : 08
Date : 01-08-2016

FirePro.

aerosol fire extinguishers & fire extinguishing systems



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Fire Safety 4 You B.V.® (FirePro Benelux®).
AMAC panel for activation of FirePro fire extinguishing systems in machinery spaces and pump rooms.



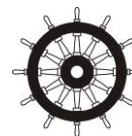
This AMAC panel is patented.

Before you start.

This instruction is a supplement to the FirePro Information-, Instruction- and User manual. This Information, Instruction and User manual is part of the ASP (**Aerosol Standard Procedure**). For proper installation of the AMAC (marine) panel, the user of this supplement needs to take note of the Information-, Instruction- and User manual. All instructions in this supplement as well as the Information-, Instruction- and User manual need to be followed accurately.

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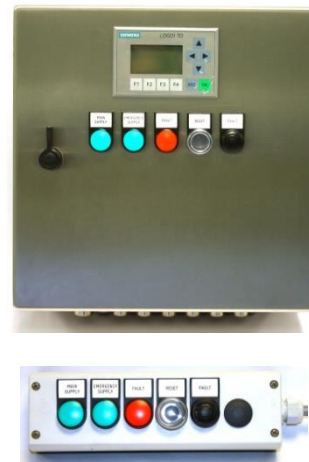
1. AMAC panel IMO – up to 84

The high quality AMAC panel is built to activate up to a maximum of 84 FirePro aerosol extinguishers units placed in machinery spaces and pump rooms.

The AMAC panel is built in a (light grey) powder coated ore stainless steel housing with certified components and is IMO certified.

The AMAC panel can be ordered in different types:

- AMAC panel IMO-2 (to activate up to 2 extinguishing units)
- AMAC panel IMO-4 (to activate up to 4 extinguishing units)
- AMAC panel IMO-6 (to activate up to 6 extinguishing units)
- AMAC panel IMO-8 (to activate up to 8 extinguishing units)
- AMAC panel IMO-12 (to activate up to 12 extinguishing units)
- AMAC panel IMO-16 (to activate up to 16 extinguishing units)
- AMAC panel IMO-20 (to activate up to 20 extinguishing units)
- AMAC panel IMO-24 (to activate up to 24 extinguishing units)
- AMAC panel IMO-28 (to activate up to 28 extinguishing units)
- AMAC panel IMO-32 (to activate up to 32 extinguishing units)
- AMAC panel IMO-36 (to activate up to 36 extinguishing units)
- in steps of 4 up to IMO-84 (to activate up to 84 extinguishing units)



This AMAC panel may only be installed by CATTAS (Certified Authorized Technical Technician Aërosol Systems) trained and certified persons.

2. Display AMAC Panels

On every AMAC panel there is a display which is connected to the LOGO inside the panel. With this display you can operate the AMAC panel and read several features. Further on in this manual these will be explained.

To show the software version of the control box, press F1 and F4 simultaneously for 1 second.



3. Connections of the AMAC Panel:

3.1. Remote control box

A remote control box (option) can be connected to the AMAC panel clamps (see drawing on page 10). The remote control box has the same functionality as the buttons on the AMAC panel.

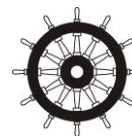


3.2. Potential free contacts

The AMAC panel has 2 potential free contacts that can be connected to the XS4 clamps. Both contacts are normally closed contacts. The first potential free contact is the error indication. If one of the following faults occurs, the contact will be open:

- main power supply missing;
- emergency power supply missing;
- short circuit in the wire of the connecting fire extinguisher;
- open circuit in the wire of the connecting fire extinguisher;
- door switch detects that the door of the AMAC panel is open.

The second potential free contact is to close the ventilation system, the contact will be open.



If a fault occurs:

- first fault / the red signal lamp "FAULT" and the buzzer "FAULT" will be activated (*the buzzer will sound and the red lamp will blink*).
You can press the rest button (*the buzzer will stop and the red signal lamp will burn continuously*)
- second fault / (*the buzzer will sound and the red lamp will blink*).
You can press the rest button (*the buzzer will stop and the red signal lamp will burn continuously*)
- If the fault is repaired, press on the reset button. (*the buzzer will stop and the red lamp goes out*).



Please Note

The potential free contact cannot be reset.
If the fault is repaired, the contact will close automatically.

3.3. Power supply

Two separate power supplies (24V) must be connected to the AMAC panel. A main power supply and emergency power supply are necessary for proper functioning. Wiring from the main power supply and emergency power supply to the AMAC panel must be flexible 2 x 2.5 mm² and fire resistant (E-30). If one of the power supplies is missing, the display will indicate this fault.

The two possible messages are:

- main power not available;
- emergency power not available.

3.4. Remote connection for the signal horn and flash light

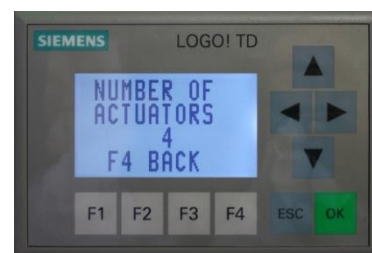
A signal horn and flash light can be connected to the XS3 clamps (see drawing page 6). These signal devices will activate when the door of the AMAC panel is opened. The signal devices reset automatically by closing the door.

4. A: SET UP NUMBER OF EXTINGUISHING UNITS LOGO ON THE DISPLAY!

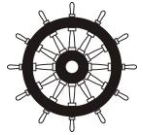
Programming the amount of extinguishers.

Press the buttons F2 and F3 on the display simultaneously for at least 5 seconds. The following screen will appear:

**NUMBER OF
ACTUATORS
4
F4 BACK**



Select the amount of actuators (units) by pressing F1. When the right number is selected press F4. The display will show the voltage measurement of the connected actuators. The measured current is approximately 4mA. So the resistance nor the length of the connected cable have any influence.



B: SET UP NUMBER OF EXTINGUISHING UNITS LOGO!

Programming the number of units connected to the LOGO! in the cupboard

Press the ESC button and hold it. Then press the (arrow left) button for 3 seconds. Release both buttons.

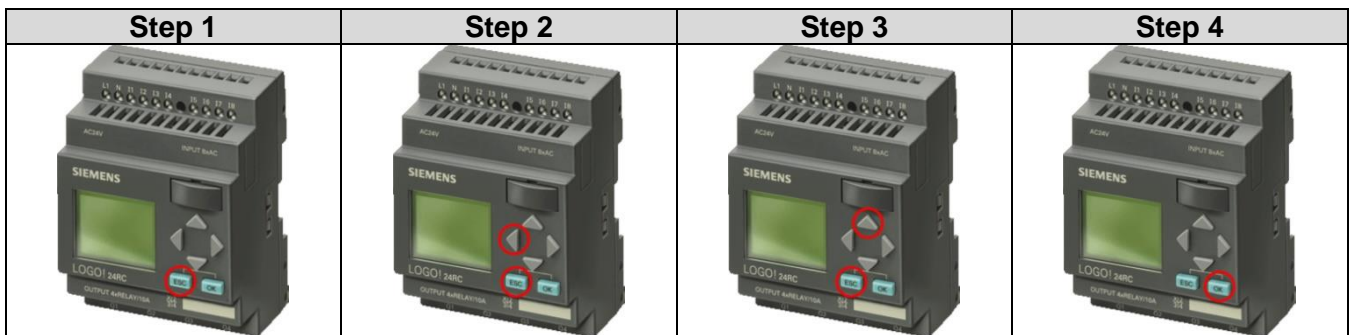
The screen will display the following:

**NUMBER OF
ACTUATORS**

4

F4 BACK

(the F4 back does not function now and is merely there for aesthetic reasons)



Now press the ESC button again and hold it. Press the (arrow up) button until you have reached the appropriate number of units. Finally press the OK button to finalize the installation.

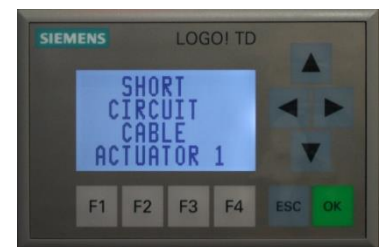
After a few moments, the display will automatically show the measuring mode.

5. ALARMS ON DISPLAY

5.1 Short circuit

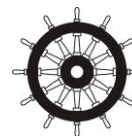
If there is a short circuit in the cabling of the connector the display will show the message:

**SHORT
CIRCUIT
CABLE
ACTUATOR [#]**



The display will also show the date and time when the problem emerged.

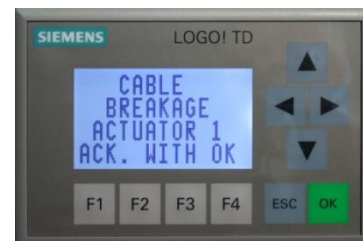
If this fault occurs, the signal lamp "FAULT" and the buzzer "FAULT" will activate. The buzzer can be reset by pressing the "RESET" button. If the problem is solved the message will stay on the screen until the fault is acknowledged by pressing the "OK / RESET" button. The date and time will disappear.



5.2 Open circuit

If there is an open circuit in the cabling of the connector the display will show the message:

**CABLE
BREAKAGE
ACTUATOR [#]
ACT. WITH OK**



The display will also show the date and time when the problem emerged. If this fault occurs, the signal lamp "FAULT" and the buzzer "FAULT" will activate. The buzzer can be reset by pressing the "RESET" button.

If the problem is solved the message will stay on the screen until the fault is acknowledged by pressing the "OK / RESET" button. The date and time will disappear.

5.3 Main supply

In case the main supply will be cut off, the display will show the message:

**MAIN SUPPLY
NOT
AVAILABLE**



5.4 Emergency supply

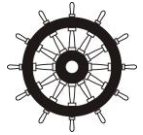
In case the emergency supply will be cut off, the display will show the message:

**EMERGENCY SUPPLY
NOT
AVAILABLE**



5.5 In case of fire

In case of fire, open the AMAC panel. The connected signal horn and flash light will be activated. After opening the AMAC panel door, the buzzer "FAULT" can be deactivated by pressing the "RESET" button. The signal devices deactivate by closing the door.



5.6 Main menu MF-20

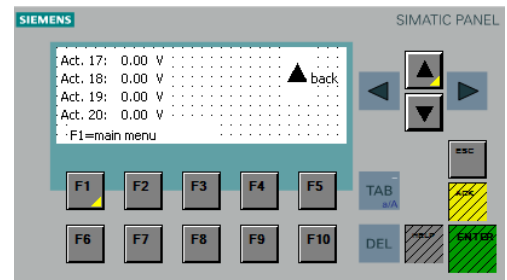
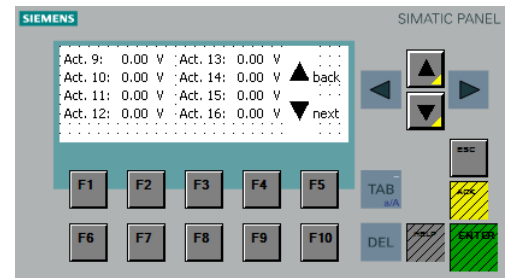
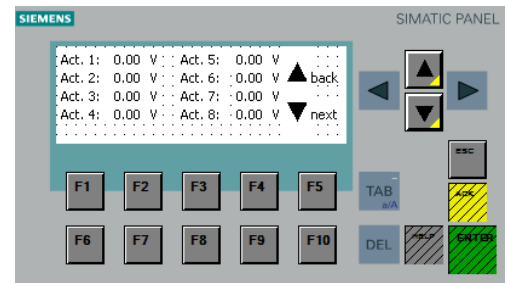
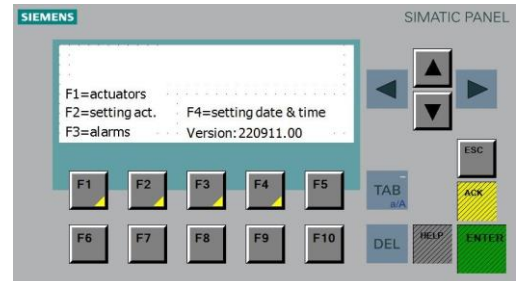
In the main menu you can select the following items:

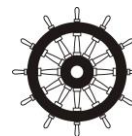
- F1=actuators, in this screen you can read the voltage input of the actuators.
- F2=setting act., in this screen you select the actual amount of connected actuators.
- F3=alarms, in this screen you can read out the alarm history.
- F4=setting date & time.

Screen “actuators”

There are three screens for reading out the voltage of the actuators. The first screen is for reading out the first eight actuators. Use the arrow buttons to scroll through the screens. In the last screen you can press the F1 button to go to the main menu.

A correctly connected actuator will give about 0.6 volt. A actuator with a short circuit will give about 0 volt. An actuator with a breakage will give more than 5 volt.

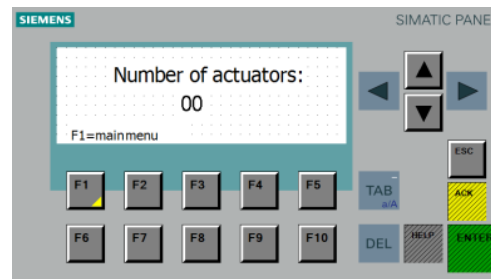




Screen “setting act.”

Select the amount of connected actuators and press the enter button.

Connect the actuators from left to right to the terminals in the switchboard.



Screen “alarms”

In the screen “alarms” you can scroll through the alarm history with the arrow buttons. The alarm message of the event is displayed with the date and time.

When an alarm occurs the message will appear in the actual screen. The message will disappear when the problem is solved and will be stored in the memory of the panel.



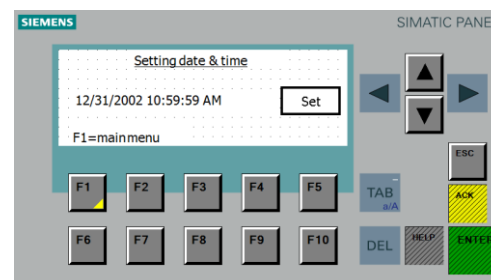
Screen “setting date & time”

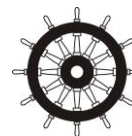
Use the arrow buttons (< and >) to go to the item you want to change. Press the enter button and a line of characters will appear. Press the enter button until the right character is reached. After a second the line of characters disappears. Use the arrow buttons to change the next item. If everything is OK, go to the “set” button with the arrow buttons and press enter. The date & time is stored in the plc and will be memorized for 20 days after a power failure. After 20 days without power you have to change the date & time.

Remark:

Date is displayed as: month/day/year

Time is displayed as: hour(0-12)/minutes/seconds AM or PM





6. ACTIVATING THE FIRE EXTINGUISHERS

Follow the next steps:

1. open the door of the AMAC panel by turning the handle on the door a quarter to the right (clockwise);



2. break the seal on the yellow/red rotary switch (see left lower part at the inside of the AMAC panel);



3. turn the yellow/red rotary switch inside the AMAC panel to the right (clockwise);



4. the fire extinguishers will be activated.



The message will stay on the screen until the fault is acknowledged by pressing the "OK/ENTER" button. The date and time will disappear.

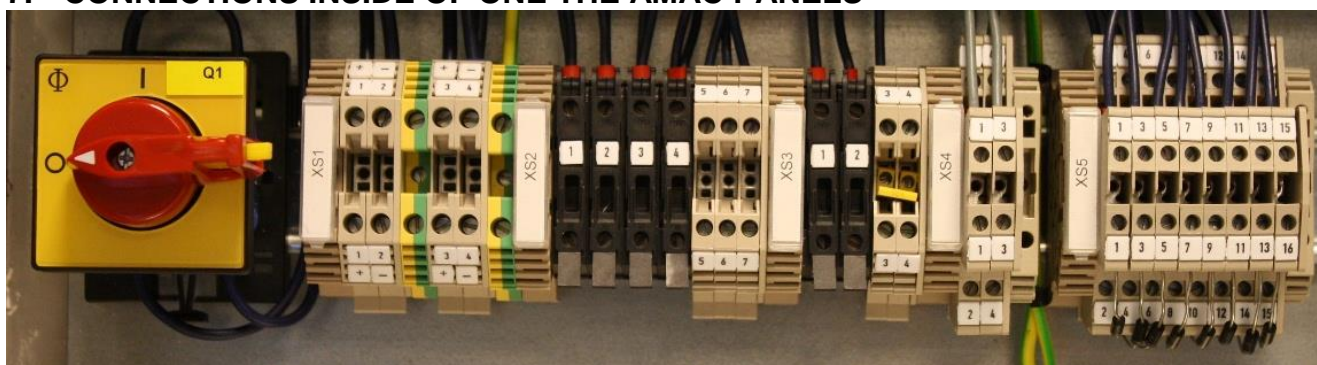


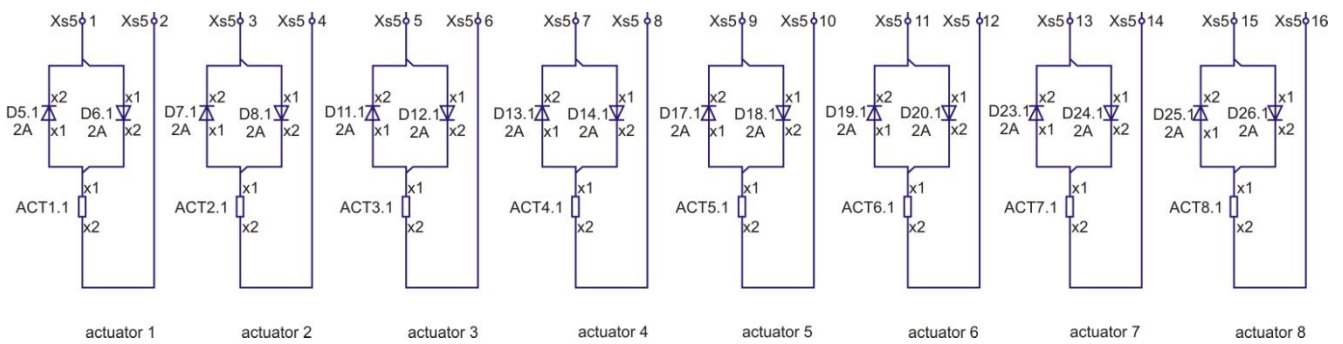
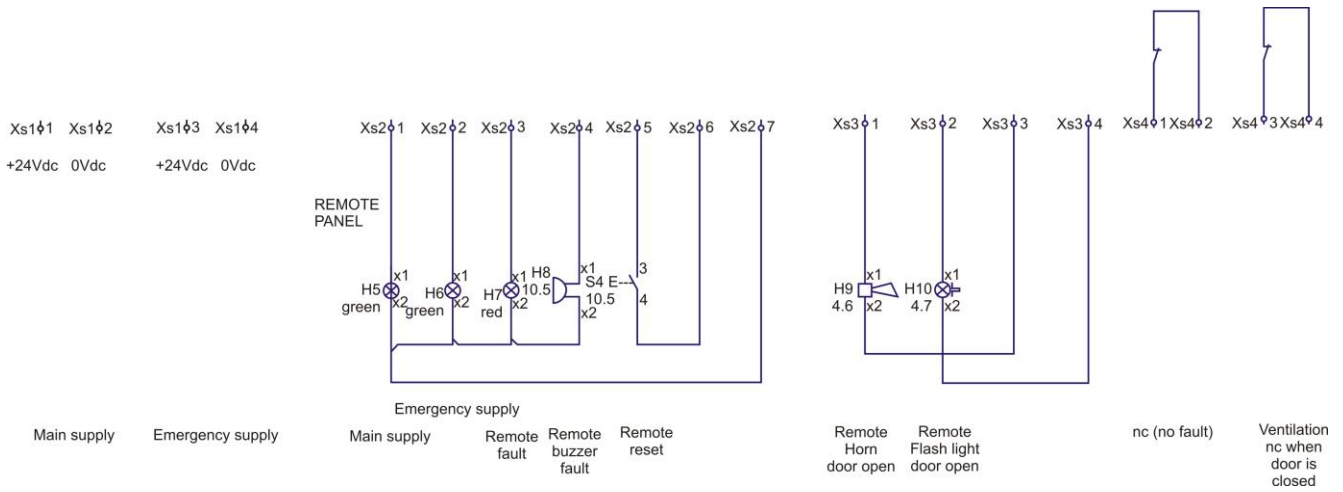
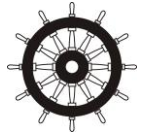
Warning

The fire extinguishers can work only once.

After activation of the fire extinguishing system you must immediately contact your dealer or the distributor via +31 (0)186-699600 or via info@firepro.nl

7. CONNECTIONS INSIDE OF ONE THE AMAC PANELS





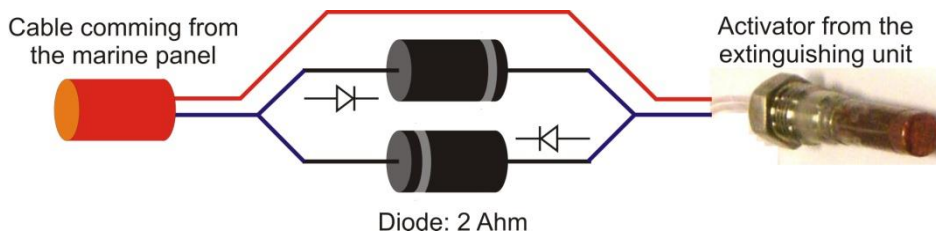
8. End of line diodes

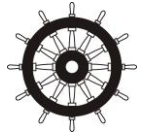
For the correct measurement of wire break and/or short-circuit, you have to place two diodes between the end of the wire and the activator from the extinguishing unit.



Please Note

Ask your supplier whether the diodes are already installed.
Diode type: 1N5062





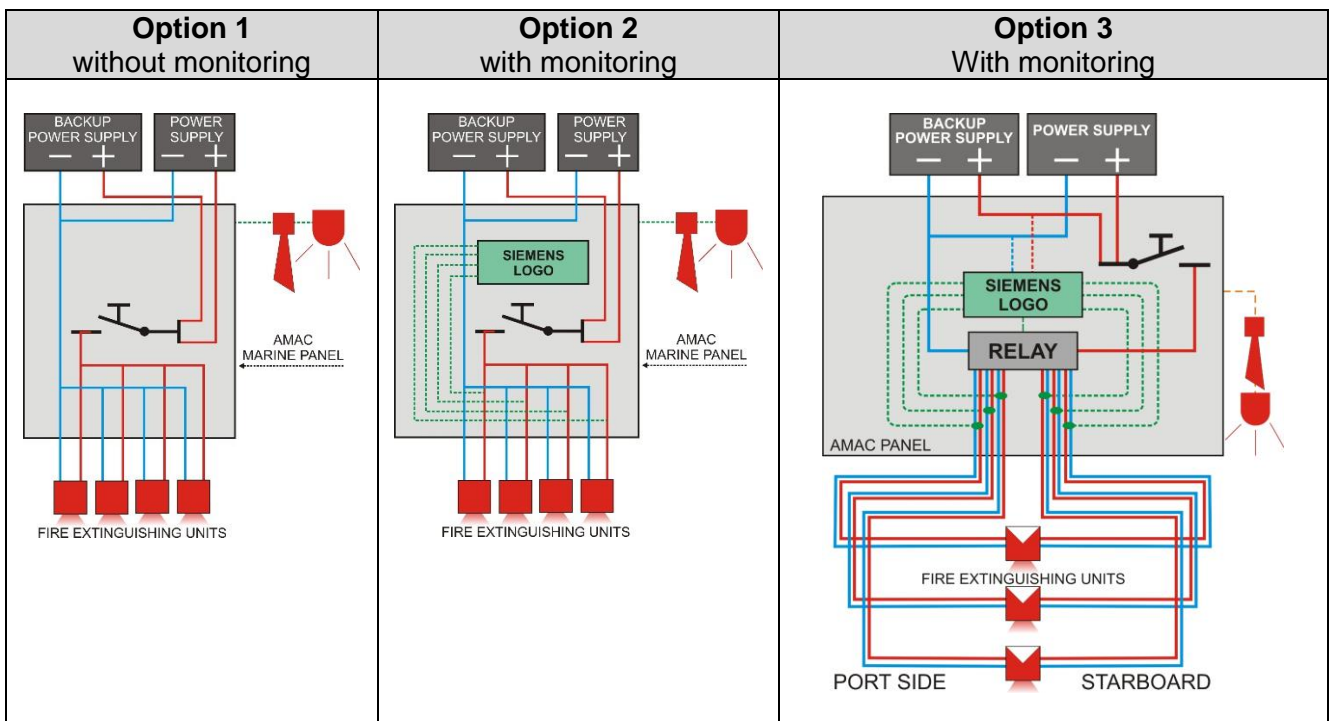
9. Double cable trace

There are several options for routing of the cables to activated the FirePro extinguishing units.

The experience teaches us that there is no consistency between classification-bureaus and different interpretations of wiring and monitoring. Therefore we develop several options so the classification-bureaus can make a choice before you start building the installation.

For monitoring there is a certified AMAC (marine) panel what constantly is monitoring the cables on short circuit and open circuit.

Below in a simple explanation the various options:

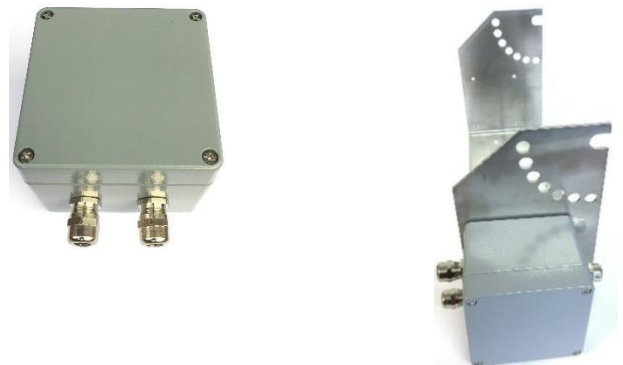


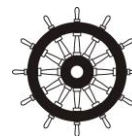
If you use the certified panel (option 2 ore 3) the cables are monitored constantly on short circuit and open circuit.

9.1 AMAC Couple Unit

If you want to install option 3, you have to use the AMAC Couple Unit.

This to bring the cables from Port-side and Starboard together to the FirePro unit.





TECHNICAL INFORMATION	
Purpose	to bring the cables, coming from the AMAC Panel over portside and starboard, together to the FirePro unit.
Protection	IP-66
Dimensions	without glands: length: 100 mm / wide: 100 mm / height: 82 mm
Mounting	on the extra strong SS bracket of the FirePro unit

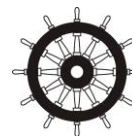
CONNECTIONS		
<p>1 = (+) cable coming over Portside 2 = (-) cable coming over Portside 3 = (+) cable coming over Starboard 4 = (-) cable coming over Starboard 5 = (+) cable going to the FirePro unit 6 = (-) cable going to the FirePro unit</p>		<p>TO FIREPRO UNIT</p> <p>PORTSIDE / STARBOARD</p>

9.2 Test lamp

To test the connections, you can use the test indicators develop for the AMAC Panel.

Simply connect them in place off the FirePro unit.





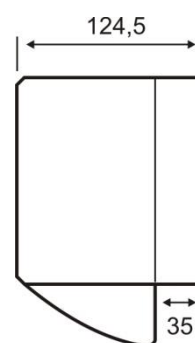
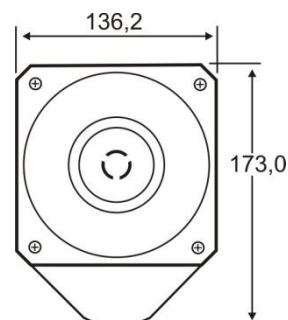
10. Sounder & Beacon

The Nexus-105 sounder & beacon is a high output, low current consumption sounder designed for industrial, fire and marine use. During the tests we did use the Nexus-105 and we recommend the Nexus-105 in combination with our AMAC panels. The Nexus-105 is IP66 i.e. you can install the Nexus at almost any location.



Nexus 105 dBA Industrial, Fire and Marine Sounder (Red)

- IP Rating IP66 / continuous
- Sound 105 dBA / 1m Version / 64 Tones / see tone table
- Operating Temp. -25°C to +70°C
- Weight 1.1Kg
- Quarter turn fasteners for ease of installation
- First fix, wire to base technology
- Cable Entries 5
- Volume control for greater flexibility
- Three alarm stages
- Operating Voltage 10-60V
- Compliancy EN54-3 TYPE B
- VDS Approved



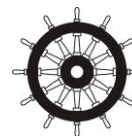
11. Seal



Please Note

Before you handover the installation, be sure that the seal is placed correct and the seal number is noted in the logbook.





12. Induction current

Induction or stray currents can occur aboard ships. This should be taken into account when installing a fire extinguishing system that is controlled by an AMAC panel so that these types of currents can be prevented from having undesired effects on the system's functioning.

As the mechanisms of induction, coils and magnetic fields are not always clear, the following paragraph contains a short theoretical introduction to the phenomena. Subsequently, there is an explanation as to why they sometimes occur aboard ships, followed by practical tips and pointers concerning the cabling to prevent interference with the system from happening.

Introduction

Induction is a natural phenomenon whereby the production of an electric current across a conductor moves through a magnetic field or when the conductor is located in a changing magnetic field. If there is a magnetic field in the vicinity of the coil, a physical entity Φ (Phi) flux (magnetic current) arises. Before the magnetic field, the coil had no Φ flux. Since coils do respond well to change, the coil produces an opposite flux that neutralises the first Φ flux. As a result, there is a (induction) current across the coil. At any place where there is a current, a voltage can be measured.

Electric current is impossible without a closed circuit. So if a magnet were to be moved back and forth through the coil, there may be (induction) tension between the coil's connection points, but there will be no electric current.

Technical explanation

Background information:

Magnetic induction

Magnetic induction B indicates the strength of the magnetic field, denoted T (tesla). The magnetic induction is strongest at a magnet's poles and weakest in its centre. Magnetic induction is a vector quantity, i.e. it has a direction. This direction goes from a magnet's north pole to its south pole.

In case of an induction coil, the strength of its magnetic field depends on:

- the intensity of the electric current through the coil;
- the number of loops of the coil;
- the coil's length;
- the presence of a core in the coil.

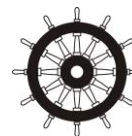
Magnetic flux

Magnetic flux Φ is a measure for the number of magnetic field lines that run perpendicularly through a surface. Its unit is the weber (Wb). Magnetic flux can be calculated with the formula $\Phi = B_n \cdot A$, where B_n is the component of B perpendicular to the surface and A the surface in m^2 through which the field lines run perpendicularly.

In other words, the more field lines run through a certain surface, the larger the flux.

Flux change arises when:

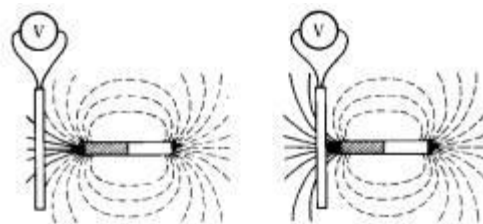
- the number of field lines increases, e.g. because a magnet is moved closer to the surface;
- the surface itself increases, e.g. by extending, increasing the number of field lines.



Electromotive force

The *electromotive force* V_{ind} is the electric current over the inductor's extremes that arises when the *magnetic flux* through that coil *changes*.

The adjoining illustrations show that there are few field lines running through the left coil and an increasing number through the right one. This means that if the magnet moves towards the induction coil, the flux through the coil will increase and electromotive force will be produced.



The amount of electromotive force produced can be calculated with the formula:

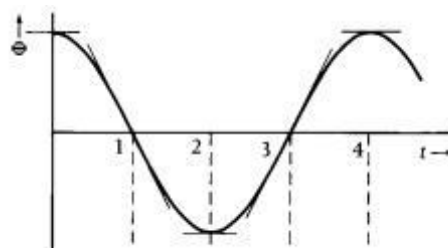
$$V_{ind} = N \cdot \frac{\Delta\Phi}{\Delta t}$$

where N is the coil's number of loops, $\Delta\Phi$ the change in flux and Δt the duration of the flux change.

The formula shows that there is a high electromotive force when in a coil with a large number of loops there is a large flux change in a short period of time.

Determining electromotive force with a flux/time graph.

In a graph where flux is plotted against time, the electromotive force can be found in the gradient of the line.



$$\frac{\Delta\Phi}{\Delta t}$$

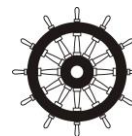
That gradient equals $\frac{\Delta\Phi}{\Delta t}$. When the line is a curve, as in the graph above, first draw a tangent line at the point in question. Then determine the gradient of the tangent. The product of the number of loops and the tangent is the electromotive force. In the illustration above, the flux change and therefore the electromotive force are largest at points in time 1 and 3. At the points in time 0, 2 and 4 the tangent lines are horizontal, i.e. the electromotive force is zero!

Induction current

If an electric component, e.g. a light or resistance, is connected to the induction coil where electromotive force is produced, this will lead to an induction current in the inductor.

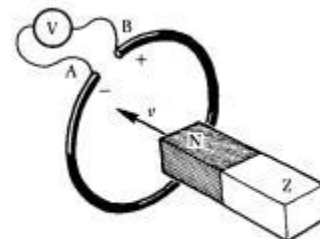
The direction of the induction current

The induction current's direction is such that it produces its own magnetic field that counteracts the change of the external flux.



The magnet nears the induction coil, the external flux increases.

In the adjoining illustration the north pole nears the coil. Therefore, the number of field lines directed towards the top left increases. The coil will oppose the change with a current that counteracts the increase of these external field lines.



In other words, the coil makes a field that is directed towards the bottom right. According to the right-hand rule, the induction current in the coil's loop goes from A to B.

The negatively charged electrons always move against the current, so an accumulation of negative charge arises at A, i.e. A becomes this voltage source's negative pole. B becomes the positive pole and therefore has the highest potential.

NB. The coil is a voltage source in this instance; *in a voltage source*, the current always goes from *negative to positive*, **outside the voltage source** the current always goes from **positive to negative!**

The magnet moves away from the induction coil, the external flux decreases.

If the magnet is now being pulled back, the external flux directed towards the top left diminishes and the coil opposes this change by producing field lines towards the top left. The induction current in the coil will then go in the opposite direction from the previous situation, when the magnet neared the coil. The positive and negative poles reverse.

Induction currents aboard ships.

Leakage and induction current occur more often aboard ships than on land, due to the fact that ships are usually made of steel and therefore mass can develop quite easily.

If an induction current develops in the electric circuit of the fire extinguishing system, this may lead to the undesired activation of that system. Provisions have been made in the design of the AMAC panel to prevent this from happening. The earth plate for instance, is isolated from the casing.

When installing the system, it is of the utmost importance to ensure that external induction currents cannot influence the fire extinguishing system's electric circuit. This can be realized by strictly following the cabling instructions below.

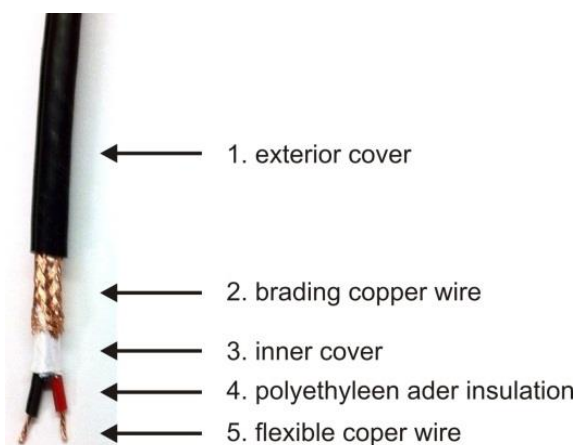
Important cabling instructions

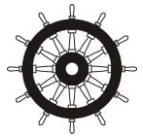
do not place cables in loops and/or coil them up;

cut cables properly;

lead cables through swivel correctly.

Illustration 1.





1. coiling up or looping a cable creates an induction coil. Placing the cable in straight lines prevents this.
2. when cutting the cable, it is important not to cut into the insulation in order to prevent (current) leakage.
3. When leading a cable through a swivel (illustrations 2 & 3), it is important that the braid, jacket and/or flexible copper wire (illustration 1) do not come in contact with the (metal) swivel. To ensure that, lead sufficient cable through the swivel and use a shrink sleeve for the coaxial cable.

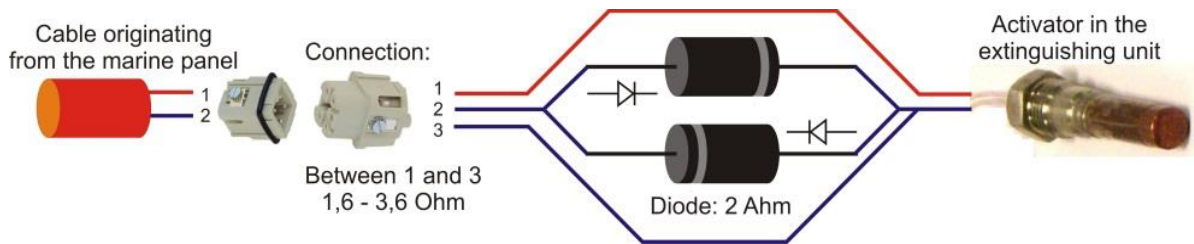


illustration 2



illustration 3

4. Make sure that the bare wire of the diodes are properly protected and cannot come in contact with the casing and/or other wiring.



13. Instructions on AMAC Panel

Place the instruction sticker on the door of the AMAC Panel. The text must be minimum in the English languish.

FirePro.

AEROSOL BRANDBLUSSYSTEEM
AEROSOL FIRE EXTINGUISHING SYSTEM

AMAC PANEL:
MSC.1/Circ.1270
Attest 2635RTD11

008810

Bij brand:

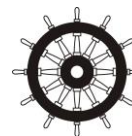
1. Open het paneel, alarm gaat af en ventilatie stopt (indien van toepassing).
2. Check of ventilatie is gestopt.
3. Zorg ervoor dat iedereen de beschermde ruimte heeft verlaten.
4. Sluit alle deuren, luiken en/of ramen.
5. Wacht 20 seconden, verbreek de verzegeling van de schakelaar en draai de schakelaar rechtersom in de actieve stand.

In case of fire:

1. Open the panel, pre-alarm will sound and forced ventilation (if applicable) will stop.
2. Check if ventilation has stopped.
3. Ensure everybody has evacuated the protected space.
4. Close all doors, vents and/or hatches.
5. Wait for 20 seconds, operate the red button (switch) inside the panel while breaking the seal to activate the extinguishing system.

Bij storing, beschadiging of activering van het systeem direct uw dealer waarschuwen.
In case of malfunction, damage ore activation of the system immediately inform your dealer.





14. Statement of conformity (II-A)

We, Fire Safety 4 You B.V., herewith declare that the product AMAC Panel types IMO- up to 84, where to this statement refers, is in conformity to the RS "Rules for the Classification and Construction of Sea-Going Ships" (2010) and EMC directives 89/336/EEG and BRL-23001/03 (by KIWA Nederland).

15. Warranty manufacturer

The manufacturer guarantees that the AMAC panel used in the installation performs consistent with the documentation, provided they are installed and maintained in accordance with these instructions.

Liability

Except in case of deliberate or conscious recklessness by the Supplier or its employees, the Supplier excludes all liability with respect to financial, consequential or other damage or loss on the User's side based on statements, guarantees (both explicit and implicit), conditions or other obligations by law. The same applies for unusual, indirect, incidental or consequential loss (including loss of profit or revenues, loss of documents or data, costs of substitute products, damage to reputation or goodwill, or any other matter that can reasonably be expected to be outside the Supplier's power).

Trademarks

Fire Safety 4 You®, FS4Y AMAC panel® and FirePro® are registered trademarks. All other company or product names are trademarks, registered trademarks or service brands of their respective owners.

Patents

AMAC Panel® and FirePro® are registered patents. Legal action will be taken against violations of these patents, by whichever name.

Information on guidelines / European guidelines

Products with the CE-mark mentioned in this manual and in the Information-, Instruction- and User manual comply with both the guideline for stationary extinguishing components on dry aerosol basis (EMC directives 89/336/EEG) and the BRL-K23001. The accredited institute KIWA NV has certified FirePro® in accordance with this BRL (Assessment guideline).

- Authors** : Fire Safety 4 You B.V. (Mr. R.G.C. Reijns)
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FirePro.

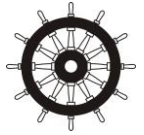
aerosol fire extinguishers & fire extinguishing systems

Annex Marine Manual
Marine Applications

Version: 07
Date : 01-02-2016

FirePro.

aerosol fire extinguishers & fire extinguishing systems



This Marine Manual must be read and used in conjunction with FS4Y / FirePro Benelux and FirePro Information, Instruction & User Manual Version 6, 01-04-2015

ANNEX NO 1

MARINE APPLICATIONS

DESIGN AND INSTALLATION GUIDELINES

This Marine Application Annex contains the specific engineering guidance for the installation of the FirePro extinguishing aerosol systems, in accordance to the MSC1/Circ.1270.

Marine Applications Codes of Reference:

- RS Rules for the Classification and Construction of Sea-Going Ships (2010)", "Rules for the Technical Supervision During Construction of Ships and Manufacture of materials and Products for Ships" (2009)", "Chapter II-2 SOLAS-74, International Code for Fire Safety System (IMO Resolution MSC.98 (73))" and "IMO MSC.1/Circ.1270: Revised Guide Lines for the Approval of Fixed Aerosol Fire- Extinguishing Systems equivalent to Fixed gas Fire- Extinguishing Systems, as referred to in SOLAS 74, for machinery spaces".

MSC 1/Circ. 1270, chapter 14.1.5

A MINIMUM SAFE DISTANCE IS REQUIRED BETWEEN GENERATORS AND ESCAPE ROUTES AND COMBUSTIBLE MATERIALS.

As per Information, Instruction and User Manual , version 6, 01-07-2015 , the aerosol temperatures are indicated in the tables at page 7, whereby the safe distances for escape routes are related to the L3 values (in meters) in the table and minimum clearance from persons (light orange colour).

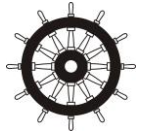
Safe distances for combustible materials are related to the L2 values (in meters) in the table and minimum clearance from combustible materials (dark orange colour).

MSC 1/Circ. 1270, chapter 14.7.3

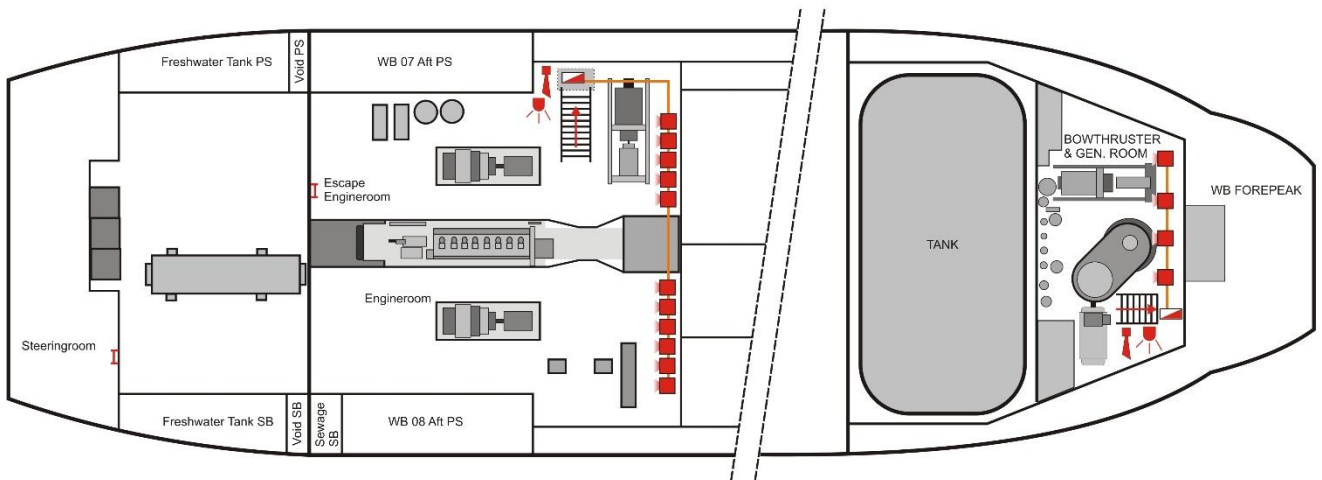
MOUNTING LOCATIONS REQUIREMENTS CONSIDERING SAFE DISTANCE TO ESCAPE ROUTES AND COMBUSTIBLE MATERIALS.

As per aerosol temperatures indicated in the table at page 7, safe distances for escape routes are related to the L3 values (in meters) in the table and minimum clearance from persons (light orange colour) in Figures A,B and C.

Safe distances for combustible materials are related to the L2 values (in meters) in the table and minimum clearance from combustible materials (dark orange colour).



Installation Guidelines



MSC 1/Circ. 1270, chapter 14.11.1

ELECTRICAL CIRCUITS FOR FIREPRO GENERATORS:

Requirements for mounting and protection of cables.

It is covered in the FirePro manual "AMAC (marine) Panel".

11.1 Cabling/Installation

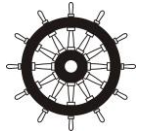
The cabling for the outgoing controls to the fire protection installation comes under the activities of the CATTAS certified installer.

Fixed cabling for main current (24 V) must have a minimum conductor cross section of 0,75 mm. The cabling must be of flame retardant construction (NEN-1010), provided that no function retention is required. All the cables that are part of the fire detection and fire alarm system and evacuation installation must be red or orange. Cables in a terminal box must be provided with a cable number.



Only lay cabling in a conduit or a compartmentalised cable duct:

- In cable ducts a division plate or 50 mm spacing is required between the fire detection and fire alarm system cabling and the power current cabling;
- In cable ducts control current cabling may be laid with fire detection and fire alarm cabling if no disruptive mutual interference is to be expected;
- Conduit must connect to the cable duct;
- Open bends, maximum 50 x 50 mm, are only permitted above suspended ceilings and beneath raised floors;



Where cabling is laid directly alongside power current cabling, for example next to motor cables of an air conditioning system, then use screened or twisted cabling, lay in separate compartments or keep a minimum of 50 mm spacing between power current cabling and fire detection and fire alarm cabling.

Where cabling is laid through fire-resistant partitions, suitable measures must be taken to ensure that the fire/smoke-resistance of the partition is not impaired.

The wiring, technology and tools used must be used according to the requirements of approved workmanship, with the aim of minimising the chance of failure. Do not include any conductors in the fire detection and fire alarm system cabling that are fed from other installations.

There may not be any joints in transmission paths, unless in consultation with the fire detection company and the local fire brigade. The joints must then be made in terminal boxes intended for the purpose. Any joints necessary must be housed in a completely sealed junction box. The conductors must be connected to the terminal strips with numbered screw terminals.

11.2 Function Retention Cabling

The installation and the route of the cabling must be chosen so that the chance of damage of the cabling by fire is prevented and/or is as small as possible.

This can be achieved by:

- Laying in a minimum of separate 30 minutes fire-resistant ducts.
- Between the fire alarm control unit (slow whoop and flashlight).

The cable support of cables for which function retention is required must also remain functional for 30 minutes in the event of fire.

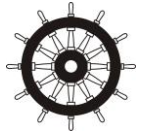
11.3 Cable Monitoring

There are several options for routing of the cables to activated the FirePro extinguishing units.

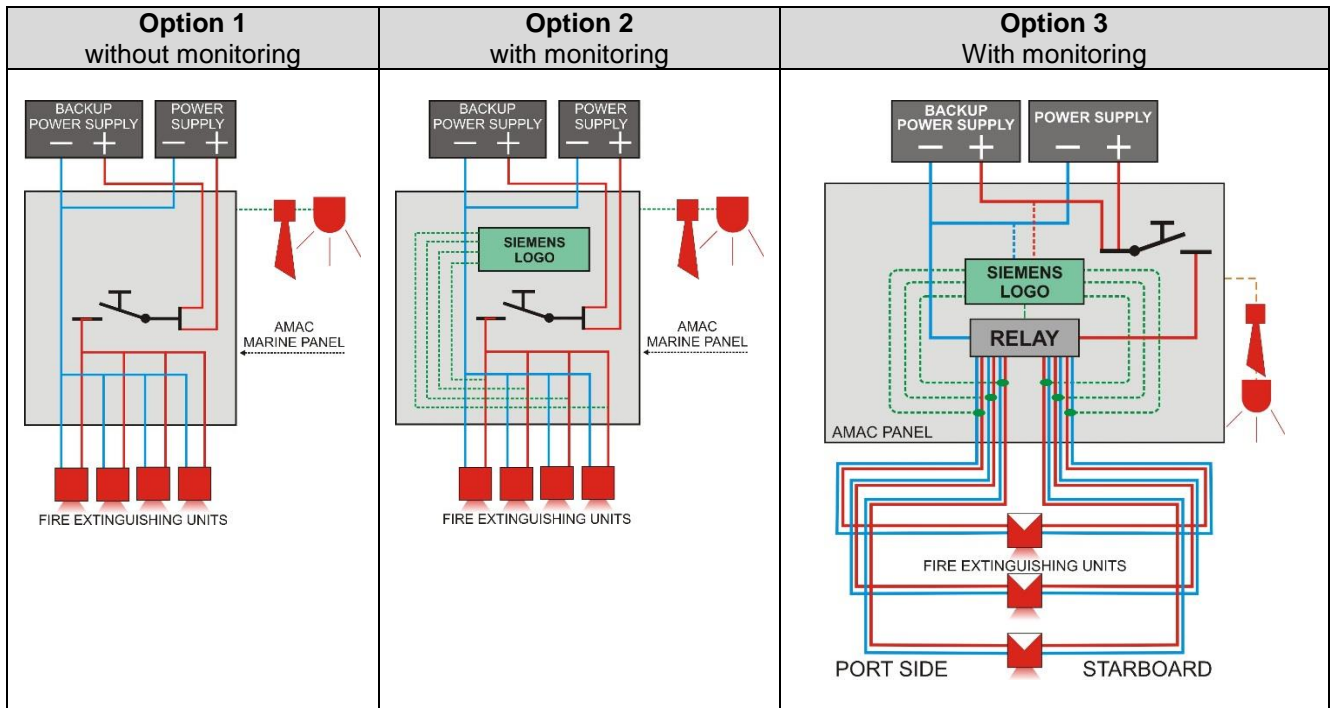
The experience teaches us that there is no consistency between classification-bureaus and different interpretations of wiring and monitoring. Therefore we develop several options so the classification-bureaus can make a choice before you start building the installation.

For monitoring there is a certified AMAC (marine) panel what constantly is monitoring the cables on short circuit and open circuit.

For a detailed explanation, please refer to the manual "FS4Y_AMAC_Panel-UK".



Below in a simple explanation the various options:



If you use the certified panel (option 2) there is no need for unnecessary extra cables over port side and starboard. This because the cables are monitored constantly.

MSC 1/Circ. 1270, chapter 14.14

INSPECTIONS, MAINTENANCE, SERVICE AND TESTING REQUIREMENTS

During the period that the FirePro fire extinguishing installation are in use the following inspections and maintenance procedures must be carried out every month:

- A periodic visual inspection of the aerosol fire extinguishers and fire extinguishing systems to check the following parts:
 - 1- electrical wiring
 - 2- alarm test on the AMAC (marine) Panel
 - 3- free outflow of the FirePro units
 - 4- fixing bolts of the FirePro units

At the time of the final inspection the following documents must be issued:

- Logbook of the fire extinguishing system;
- Calculation of used extinguishing aerosol per m³;
- Certificate of the CATTAS certified installer;
- Brief and concise operating instructions;
- Schematic drawings;
- A signed maintenance contract.

The authorised FirePro Benelux dealer must provide a separate quotation for inspection, management and maintenance of the FirePro fire extinguishing based installation. The installer of the fire detection company must alert the customer to its obligation to carry out limited functional installation tests and



maintenance, including a monthly functional test of the installation and transmission. The customer must ensure that this task is undertaken by a suitably trained officer.

The customer/user is obliged to conclude a maintenance contract with the authorised and certified dealer.

Inspection of the complete installation carried out by an authorised and certified dealer must take place every year or in a period in consultation with the classification-bureau

The suitably trained officer of the authorised FirePro Benelux dealer or the customer/user must keep a logbook, recording all the relevant events concerning the installation, such as false and nuisance alarms with any cause, maintenance, inspections and installation tests, adjustments, expansions and repairs.

Logbook

The logbook contains the items required that give a picture and provide for the recording of various things during the life of the installation. In the logbook you will find the following:

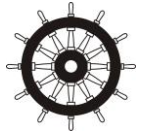
Content of logbook:

- Introduction
- Datasheets
- Manuals of used equipment
- Certificates
- Schematic installation drawings
- Schematic diagrams
- Inspection reports

MSC 1/Circ. 1270, chapter 17

WHERE THE AEROSOL GENERATORS ARE INSTALLED WITHIN THE PROTECTED SPACE, THE GENERATORS SHOULD BE EVENLY DISTRIBUTED THROUGHOUT THE SPACE AND MEET THE FOLLOWING PROVISIONS:

- A manually initiated power release, located outside the protected space, should be provided. Duplicate sources of power should be provided for this release and should be located outside the protected space and be immediately available.
- MSC 1/Circ. 1270, chapter 17.1
- Electric power circuits connecting the generators should be monitored for fault condition and loss of power. Visual and audible alarms should be provided to indicate this.
- MSC 1/Circ. 1270, chapter 17.2
- Electric power circuits connecting to the AMAC (marine) Panel should be in a main powers supply and a backup power supply.
- MSC 1/Circ. 1270, chapter 17.3
- Within the protected space, electrical circuits essential for the release of the system should be fire resistant according to standard IEC 60331 or equivalent standards.
- MSC 1/Circ. 1270, chapter 17.4
- The arrangement of generators and the electrical circuits essential for the release of any system should be such that in the event of damage to any one power release line or generator 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 test density can still be discharged having regard to the requirement for uniform distribution of medium throughout the space.
- MSC 1/Circ. 1270, chapter 17.6



The installer shall comply with all the requirements of chapter 17.







The actuation system supplied shall comply with all the requirements of chapter 17.

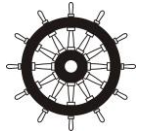
MSC 1/Circ. 1270, chapter 22

The casing temperature of condensed aerosol generators is indicated for each model.

Aerosol in length and time of stream					
Nr	Model unit	Discharge		Discharge Duration (sec)	
		opening	Length	Min.	Max.
1	FP-20 SE	2	0.5	3	6
2	FP-20 T & TH	1	0.5	3	6
3	FP-40 S	2	1.2	4	8
4	FP-40 T	1	1.2	4	8
5	FP-80 S	2	2.0	4	8
6	FP-80 T	1	2.0	4	8
7	FP-100	1	1.0	5	10
8	FP-200M	1	2.0	5	10
9	FP-200	1	2.0	5	10
10	FP-500	1	2.5	5	10
11	FP-1000M	2	3.0	20	25
12	FP-1200	1	3.5	15	20
13	FP-2000	1	3.5	15	20
14	FP-3000	1	4.0	15	20
15	FP-4200	1	7.0	15	20
16	FP-5700	1	8.0	15	20

Aerosol outflow temperature in length en wide (°C)									
Nr	Model unit	Discharge temperature length (°C)				Discharge temperature wide (°C)			
		L0-L1	L1-L2	L2-L3	L3-L4	B0-B1	B1-B2	B2-B3	B3-B4
		400	300	200	75	400	300	200	75
1	FP-20	0	0	0	0-0.1	0	0	0	0-0.005
2	FP-40	0	0	0	0-0.1	0	0	0	0-0.008
3	FP-80	0	0	0	0-0.1	0	0	0	0-0.008
4	FP-100	0	0	0	0-0.3	0	0	0	0-0.01
5	FP-200M	0	0	0-0.1	0.1-0.4	0	0	0-0.07	0.07-0.15
6	FP-200	0	0	0-0.1	0.1-0.4	0	0	0-0.07	0.07-0.15
7	FP-500	0	0	0-0.3	0.3-1.0	0	0	0-0.08	0.08-0.27
8	FP-1000M	0	0-1.0	1.0-1.5	1.5-2.5	0	0-0.35	0.35-0.55	0.55-0.95
9	FP-1200	0	0	0	0-1.5	0	0	0	0-0.22
10	FP-2000	0	0	0	0-1.5	0	0	0	0-0.24
11	FP-3000	0	0	0-0.6	0.6-2.0	0	0	0-0.16	0.16-0.53
12	FP-4200	0	0	0-99	0.6-2.3	0	0	0-0.22	0-0.64
13	FP-5700	0	0	0-0.6	0.6-2.0	0	0	0-0.22	0-0.64

L0 = Distance in metres between the outlet and the point where the temperature is > 400 °C is	 >400°C not applicable
L1 = Distance in metres between the outlet and the point where the temperature is > 300 °C is	 >300°C only FP-1000M
L2 = Distance in metres between the outlet and the point where the temperature is < 200 °C is	 <200°C
L3 = Distance in metres between the outlet and the point where the temperature is < 75 °C is	 <75°C
B0 = Distance in metres between the outlet and the point where the temperature is > 400 °C is	 <35°C
B1 = Distance in metres between the outlet and the point where the temperature is > 300 °C is	 ambient temperature
B2 = Distance in metres between the outlet and the point where the temperature is < 200 °C is	
B3 = Distance in metres between the outlet and the point where the temperature is < 75 °C is	



Important!

The distances shown under discharge length are those to be regarded as a maximum to obtain a rebound of discharge onto the surface (such as the floor) that then guarantees a good homogeneous spread of the aerosol in the protected compartment.

The temperatures shown under discharge temperature relate to the distances. In cases of storage of materials, cables, sensitive parts and/or the presence of persons, prevent them from coming into contact with discharges the heat of which is such that it can give rise to damage and/or injury.

Technische information table

Model unit	Activation	Weight in gr.		Size (mm)		Effectiveness		Type
		Unit tot.	SBC tot.	Height	diameter	%	grams	unit
FP-20 S	E / BA	290	20	165	32	60/70	12,0	Cold
FP-40 S	E / BA	610	40	140	51	61/62	24,4	Cold
FP-80 S	E / BA	870	80	185	51	59/60	47,2	Cold
FP-100 S	E / BA	1.370	100	155	84	61	61,0	Cold
FP-200M	M	1.800	200	180	84	59	118,0	Cold
FP-200 S	E / BA	1.840	200	185	84	59	118,0	Cold
FP-500 M	E / BA	2.670	500	260	84	66	330,0	Cold
FP-500 S	E / BA	2.670	500	260	84	66	330,0	Cold
FP-1000M	M	1.680	1000	200	84	95	950	Hot
FP-1200	E / BA	10.100	1200	216x300x167		63	756,0	Cold
FP-2000	E / BA	15.500	2000	300x300x185		60	1.200,0	Cold
FP-3000	E / BA	16.300	3000	300x300x185		61	1.830,0	Cold
FP-4200	E / BA	25.000	4200	300x300x300		60	3.363,0	Cold
FP-5700	E / BA	26.400	5700	300x300x300		59	3.363,0	Cold

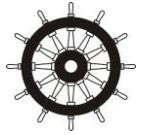
BA	Bulb activator	m/n	with nozzle
E	electrical activation	CSP	Carbon Steel Powder coated
M	manual (manual operation)	SS	Stainless steel









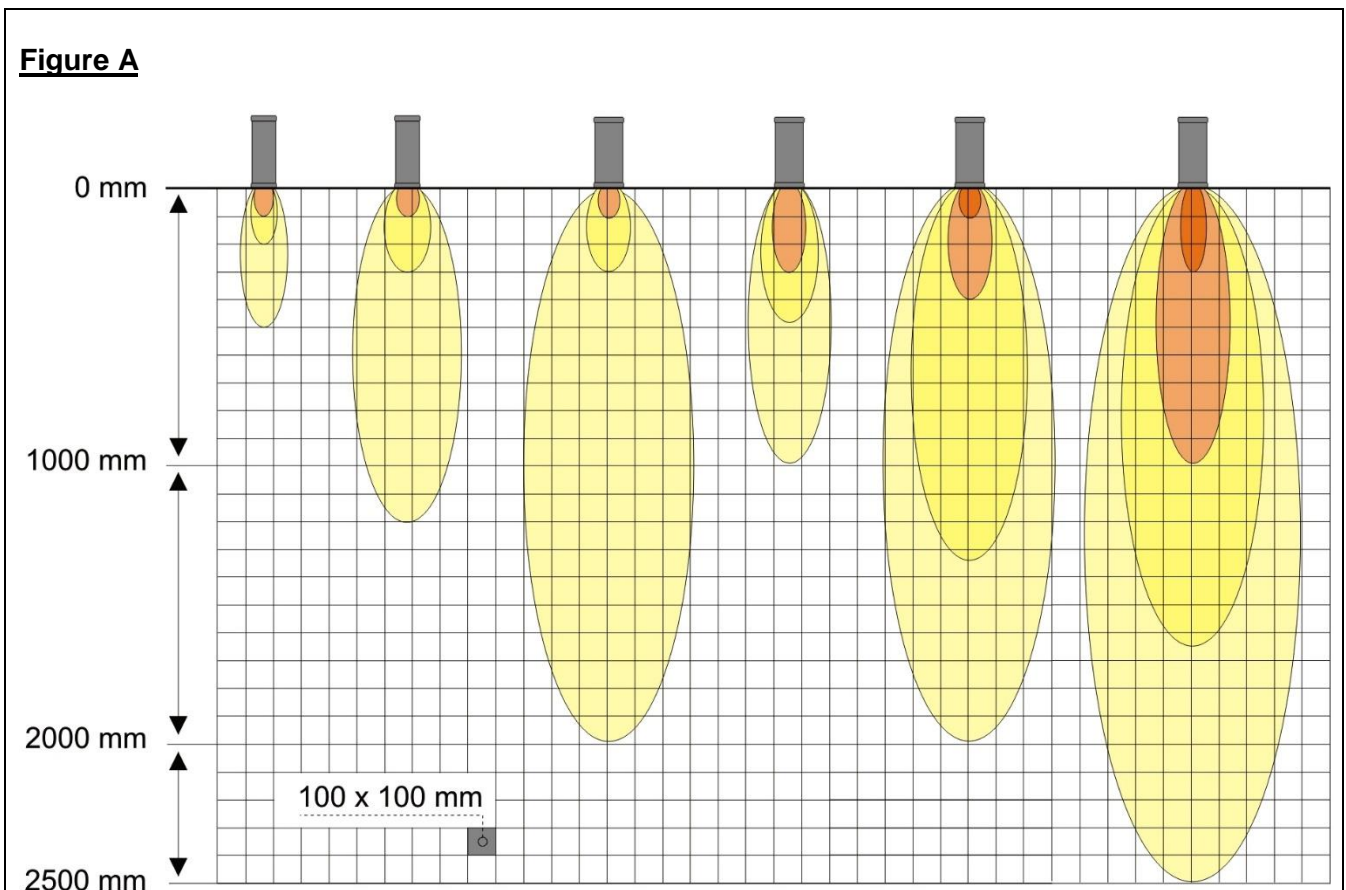
Important!

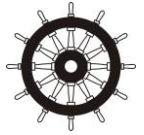
The overviews below give an indication of the heat emission. You must take these temperatures and minimal free discharge parabolas into account when siting and installing. Positioning of the unit at the right angle can be very important in this regard.

	>300°C
	<200°C
	<75°C
	<35°C
	surrounding temperature



Type	FP-20	FP-40	FP-80	FP-100	FP-200	FP-500
						










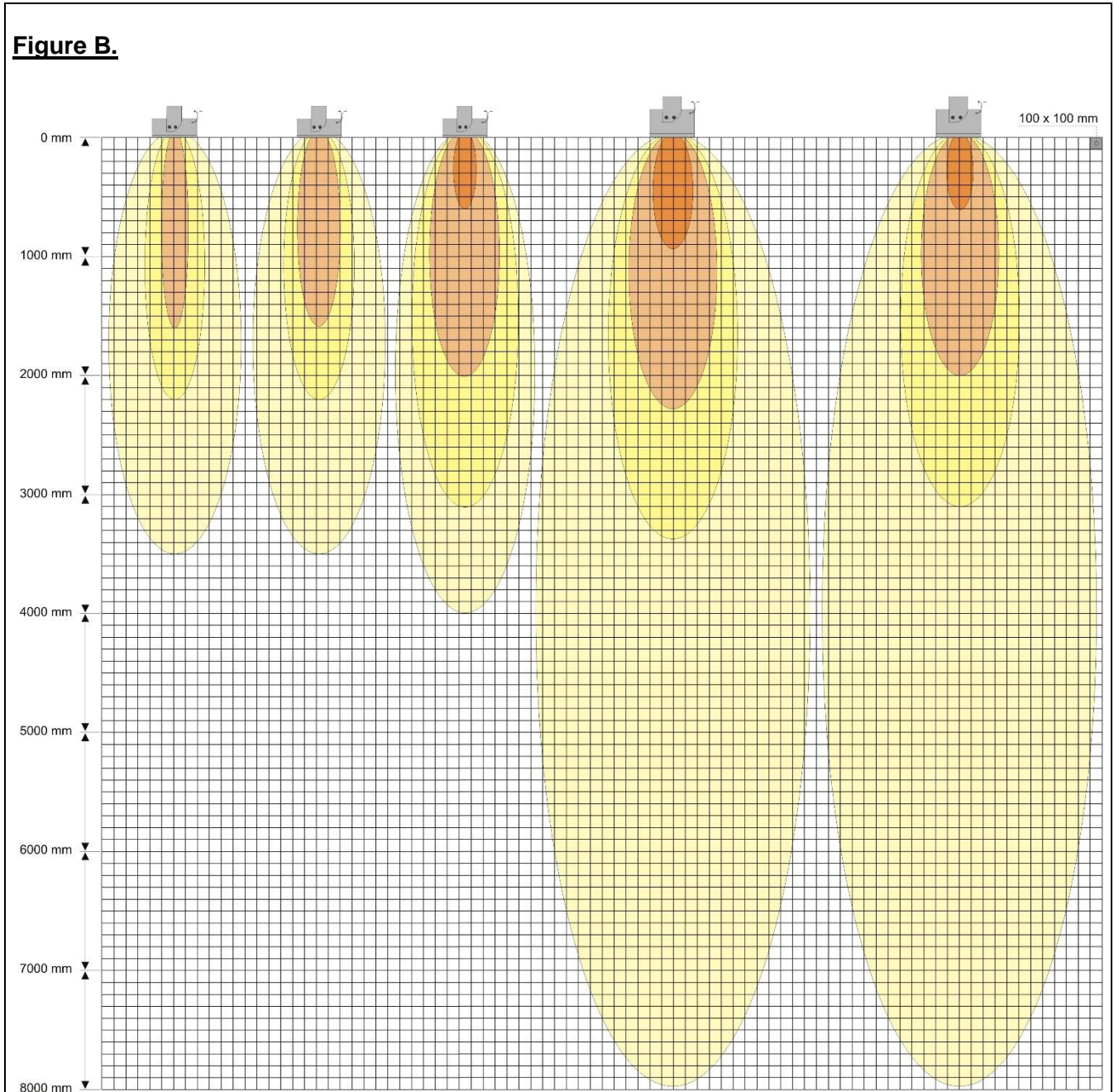
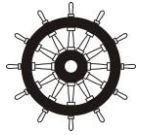
Type	FP-1200	FP-2000	FP-3000	FP-4200	FP-5700
					

Figure B.





MSC 1/Circ. 1270, chapter 11.

The quantity of extinguishing agent for the protected space should be calculated at the minimum expected ambient temperature using the design density based on the net volume of the protected space, including the casing.

MSC 1/Circ. 1270, chapter 11.2.

When calculating the net volume of a protected space, the net volume should include the volume of the bilge, the volume of the casing and the volume of free air contained in air receivers that in the event of a fire may be released into the protected space.

MSC 1/Circ. 1270, chapter 11.3.

The 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:

1. auxiliary machinery
2. boilers
3. condensers
4. evaporators
5. main engines
6. reduction gears
7. tanks
8. trunks

MSC 1/Circ. 1270, chapter 11.3.

Subsequent modifications to the protected space that alter the net volume of the space should require the quantity of extinguishing agent to be adjusted to meet the requirements of this paragraph and paragraphs 10.1, 10.2, 10.3, 10.4, 12.2, 12.3, 12.4 and 12.5.

FirePro.

aerosol fire extinguishers & fire extinguishing systems



Marine & Offshore
Division

Attestation number: 5186RTD14

The continuation sheet(s) form(s) part of the attestation.

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ATTESTATION FOR SWITCHBOARD AND COMPONENTS

Applicant : FIRE SAFETY 4 YOU B.V. (GOUDWAARD - NLD)
Requirements : MSC .1/Circ.1270

Product description : Control panel for aerosol fire extinguishing syst.
Quantity : 1 set

Particulars of products as declared by the applicant:

Manufacturer : FIRE SAFETY 4 YOU B.V. (GOUDWAARD - NLD)
Type of product : Aerosol control and monitoring system.
Drawing number & revision : Marine Panel FS4Y 23-10-2014
Declared as intended for : Monitoring and control of aerosol fire extinguishing system.
Piece / Serial number(s) : None, this report covers basic design review and testing of panel
: Control panel monitoring and release system for aerosol.
: The system automatically generates an alarm when the control
: panel is opened.
: The system is supervising the release circuits.
: No automatic time delays are part of controls, should be done by

Enclosures / Remarks : Control panel for aerosol fire extinguishing syst.

At the request of the applicant identified here above, this is to attest that the interventions as described in the subsequent page(s) were carried out with satisfactory results and within the scope of the General Conditions of Marine & Offshore Division of Bureau Veritas

Marking : None
Last attendance date : 05 Nov 2014
Surveyor : Erwin Poortvliet

Issuance date : 21 Nov 2014
Office : BV ROTTERDAM



This attestation is issued within the scope of the General Conditions of Bureau Veritas Marine & Offshore Division available on the internet site www.veristar.com. Any person not a party to the contract pursuant to which this document is delivered may not assert a claim against Bureau Veritas for any liability arising out of errors or omissions which may be contained in said document, or for errors of judgment, fault or negligence committed by personnel of the Society or of its Agents in establishment or issuance of this document, and in connection with any activities for which it may provide.

SCOPE OF INTERVENTION

- Check remarks compliance reviewed documents
 - General visual examination
 - Review of certificates for components
 - Functional test
-

Werking FirePro® blussers en blussystemen

Aan de FirePro® brandblusser- en brandblussystemen bevinden zich voedingsdraden voor de elektrische inwerkingstelling van de blustoestellen via een bluscentrale.

Voor bronbestrijding zijn er de mogelijkheid tot activering van de unit is door middel van Linear heat cable of bulb activators.

Aan de uitstroomzijde bevindt zich een raster voor de gelijkmatige verspreiding van de blus aerosol. De FirePro® brandblussers- en brandblussystemen kunnen elektrisch, thermisch of handmatig (of in een combinatie van twee van deze methoden) worden geactiveerd door middel van een element dat de noodzakelijke energie levert om de chemische transformatie van het vaste blusmateriaal in gang te zetten. Eenmaal geactiveerd wordt het vaste materiaal getransformeerd in een snel expanderende blus aerosol die, na een koelsectie te zijn gepasseerd (in bepaalde modellen) via de uitstroomopening van de brandblusser naar buiten treedt en in de beveiligde ruimte binnen luttele seconden de brand blust.

Blusprincipe

De FirePro® brandblusser- en brandblussystemen zetten - eenmaal geactiveerd - een reactie in gang waarbij de vrijgekomen aerosol de vrije radicalen van de verbranding bindt.

De aerosol die door de FirePro® Brandblussers en Brandblussystemen wordt gegenereerd bestrijdt en blust vuur niet door gebruik te maken van de methoden van verstikking (wegnemen van zuurstof) of koeling, maar door de verbrandingsreactie op moleculaire basis te stoppen (door het binden van vrije radicalen) zonder het zuurstofgehalte aan te tasten.

De aerosol is opgebouwd uit deeltjes van microformaat. Deze deeltjes zijn gesuspenderd in een edelgas, waarbij de verhouding tussen het blootgestelde oppervlak en de reactiemassa extreem hoog is (waardoor de voor het blussen benodigde hoeveelheid actief materiaal tot een minimum kan worden beperkt). Deeltjes van deze minieme afmetingen blijven gedurende een relatief lange tijd in suspensie, waardoor zij de bij ontbranding aanwezige natuurlijke convectiestromen kunnen binnenstromen. Dit leidt tot een toename van de doelmatigheid van de blusstof.

Blusactie

De FirePro® brandblussers- en brandblussystemen produceren een blus aerosol waarvan de deeltjes een bluskracht hebben die wordt bepaald door een chemische kettingreactie zonder het in de omgeving aanwezige zuurstofgehalte te beïnvloeden.

De bluswerking wordt teweeggebracht door twee acties (Fysisch & Chemisch):

Fysische actie

De fysische blusactie komt voort uit de chemisch-fysische kenmerken. Deze elementen hebben vergeleken met alle andere elementen de minste hoeveelheid energie nodig voor ionisatie (laagste ionisatiespanning). Daarom en omdat er slechts een zeer kleine hoeveelheid energie nodig is, is het mogelijk de elektronen van de atomen te scheiden. De vereiste hoeveelheid energie wordt geleverd door de overvloed aan energie die aanwezig is in het vuur.

De ionisatie van kalium blijkt tijdens het blussen uit een licht violette verkleuring van de vlam. De in de vlam aanwezige energie wordt daarom in overeenstemming met de ionisatiespanning van de aanwezige elementen gereduceerd.

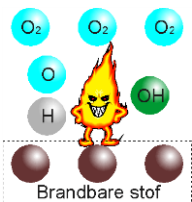
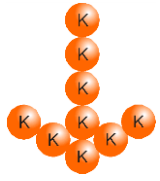
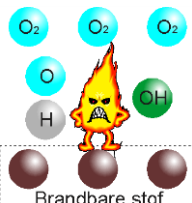
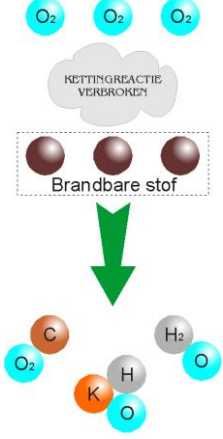
Chemische actie

Tijdens verbranding vinden er in de vlam in een snelle opeenvolging bepaalde reacties plaats tussen atomen en fragmenten van instabiele moleculen (radicalen). Zulke reacties vormen de zogenaamde kettingreacties van radicalen. Vanwege hun instabiele karakter neigen radicalen ertoe om via nog meer reacties een stabiele eindtoestand te bereiken.

De stabiele eindproducten zijn onder andere kooldioxide (CO₂) en water (H₂O). Het kalium, dat vrijkomt door het uiteenvallen van de kaliumverbindingen, reageert tijdens verbranding met de vrije radicalen van instabiele hydroxiden, waarbij kaliumhydroxide (KOH) wordt gevormd, wat een zeer stabiele verbinding is. In dit stadium wordt de kettingreactie van de vrije radicalen tot staan gebracht en wordt de vlam gedoofd.

In het kort

In het onderstaand overzicht een korte beschrijving van de blussende werking van FirePro[®] aerosol brandblussers en brandblussystemen.

	<p>Om een brand te krijgen zijn er minimaal drie factoren benodigd, deze zijn:</p> <ul style="list-style-type: none"> - Zuurstof - Een brandbare stof - Een ontbrandingstemperatuur <p>Vuur is niets anders dan een chemische reactie waarbij de stoffen O, H en OH de kettingreactie in stand houden.</p>
	<p>Door middel van elektrische activering of door de bulb activator zal de blusunit worden geactiveerd.</p> <p>De aerosol die vrij komt bevatten kaliumverbindingen die zowel (A) een fysische als (B) een chemische reactie met het vuur aangaan.</p>
	<p><u>Ad A. Fysische actie</u></p> <p>Voor het plaats vinden van de chemische reacties is een bepaalde hoeveelheid benodigde energie nodig. De vereiste hoeveelheid energie wordt geleverd door de in overvloed aanwezige energie in de vlam.</p>
	<p><u>Ad B. Chemische actie</u></p> <p>Er zijn zekere reacties tussen atomen en delen van onstabiele moleculen (radicalen), die in snelle opeenvolging plaats vinden in de vlam gedurende de verbranding.</p> <p>Onstabiele radicalen streven ernaar stabiel te worden en ondergaan meerdere reacties. Een hydroxide (OH) is een onstabiel radicaal wat tevens zorg draagt voor de kettingreactie van vuur. Het kalium, verkregen door de ontleding van de kaliumverbindingen, reageert gedurende de verbranding met de vrije radicalen van onstabiele hydroxides en vormen kaliumhydroxide (KOH), wat een erg stabiele verbinding is. In deze fase stopt de kettingreactie van de vrije radicalen en de vlam dooft.</p>