

TYPE APPROVAL CERTIFICATE

This is to certify:**That the Fire Damper**

with type designation(s)

FDSO (FGSO)-P/E/M, FGSM-A60-1/1D, PFGD-A6MS-1, PFGD-A6SS-1, EFGD-A6SS-1

Issued to

HI AIR KOREA Co., Ltd.**Gimhae-si Korea, Republic of Korea**

is found to comply with

Det Norske Veritas' Offshore Standards**Det Norske Veritas' Rules for Classification of Ships****Det Norske Veritas' Interpretation of SOLAS 1974 Convention as Amended****Application :****The damper is approved for use in ducts penetrating bulkhead or deck Class A-60.****Application/Limitations see overleaf.****This certificate is recognized by Transport Canada.****Product(s) approved by this certificate is/are accepted for installation on all vessels classed by DNV GL.**This Certificate is valid until **2019-09-01**.Issued at **Høvik** on **2015-09-02**for **DNV GL**DNV GL local station: **Changwon**Approval Engineer: **Synnøve Bolstad Eri**

Petter Langnes
Head of Section

This Certificate is subject to terms and conditions overleaf. Any significant change in design or construction may render this Certificate invalid. The validity date relates to the Type Approval Certificate and not to the approval of equipment/systems installed.

Product description

"FDSO (FGSO)-P/E/M, FGSM-A60-1/1D, PFGD-A6MS-1, PFGD-A6SS-1, EFGD-A6SS-1"
are fire dampers with the following specifications:

"FDSO (FGSO)-P/E/M"

Actuator operated fire dampers with 2 mm thick stainless steel blades (double skin, internally insulated with Byucksan mineral wool of nominal density 200 kg/m³) and 300 mm deep casing made from 3 mm stainless steel. The fire dampers are fixed to 5 mm thick steel coamings which are welded into the structural core. Coamings and fire dampers are insulated on both exposed and unexposed sides with 50 mm thick Byucksan mineral wool of nominal density 120 kg/m³. The actuator is fitted in a 1.5 mm thick stainless steel control box on exposed side.

The fire damper casing can be bolted or welded to the coaming.

Length of coaming: 675 mm

"FGSM-A60-1/1D"

Pneumatic operated rectangular fire dampers with 2 mm thick stainless steel blades (double skin, internally insulated with Byucksan mineral wool of nominal density 200 kg/m³) and 300 mm deep casing made from 3 mm stainless steel. Maximum breadth of blades is 295 mm. The fire dampers are fitted with a frangible bulb trigger of type F3 from JOB, Germany. Fire dampers and coamings/duct are insulated with 50 mm thick Byucksan mineral wool of nominal density 120 kg/m³, 900 mm on the unexposed side and 525 mm on the exposed side. The dampers are fitted with one transvers and one longitudinal mullion.

The fire damper is to be bolted to the 5 mm thick steel coaming with bolts at a maximum spacing of 150 mm apart, or fully welded. The coaming is welded to the steel bulkhead/deck.

Length of coaming: 1 175 mm

"PFGD-A6MS-1"

Pneumatic operated rectangular fire damper with 1.5 mm thick stainless steel blades (double skin) and 300 mm deep casing made from 3 mm stainless steel. Maximum breadth of blades is 295 mm. The fire damper is fitted with a frangible bulb trigger of type F3 from JOB, Germany. The damper is fitted with one transvers and one longitudinal mullion.

The fire damper is to be bolted to the 5 mm thick steel coaming with bolts at a maximum spacing of 150 mm apart and sealed with non-combustible gasket, or fully welded. The coaming is welded to the steel bulkhead/deck, and bolted to the steel duct with bolts at a maximum spacing of 150 mm apart and sealed with non-combustible gasket.

Length of coaming: 600 mm

For installation in Deck:

Fire damper and coaming/duct are insulated with 50 mm thick Byucksan mineral wool of nominal density 120 kg/m³, 1050 mm on the unexposed side and 450 mm on the exposed side.

For installation in Bulkhead:

Fire damper and coaming/duct are insulated with 50 mm thick Byucksan mineral wool of nominal density 120 kg/m³, 1350 mm on the unexposed side and 450 mm on the exposed side.

"PFGD-A6SS-1"

Pneumatic operated rectangular fire damper with 1.5 mm thick stainless steel blades (double skin) and 300 mm deep casing made from 3 mm stainless steel. Maximum breadth of blades is 295 mm. The fire damper is fitted with a frangible bulb of type F3 from JOB, Germany. Fire damper and coaming/duct are insulated with 50 mm thick Byucksan mineral wool of nominal density 120 kg/m³, 1050 mm on the unexposed side and 450 mm on the exposed side.

The fire damper is to be bolted to the 5 mm thick steel coaming with bolts at a maximum spacing of 150 mm apart and sealed with non-combustible gasket, or fully welded. The coaming is welded to the steel bulkhead/deck, and bolted to the steel duct with bolts at a maximum spacing of 150 mm apart and sealed with non-combustible gasket.

Length of coaming: 600 mm

"EFGD-A6SS-1"

Electrical operated rectangular fire dampers with 1.5 mm thick stainless steel blades (double skin) and 300 mm deep casing made from 3 mm stainless steel. Maximum breadth of blades is 295 mm. The fire damper is fitted with a frangible bulb of type F3 from JOB, Germany. Fire damper and coaming/duct are insulated with 50 mm thick Byucksan mineral wool of nominal density 120 kg/m³, 1050 mm on the unexposed side and 450 mm on the exposed side.

The fire damper is to be bolted to the 5 mm thick steel coaming with bolts at a maximum spacing of 150 mm apart and sealed with non-combustible gasket, or fully welded. The coaming is welded to the steel bulkhead/deck, and bolted to the steel duct with bolts at a maximum spacing of 150 mm apart and sealed with non-combustible gasket.

Length of coaming: 600 mm

For further details, see the documents listed under Type Approval documentation.

Application/Limitation

The fire dampers are to be operated automatically and/or manually according to SOLAS II-2, Reg. 9.7.

Approved sizes:

Type of damper	Min. size (W x H x L mm)	Max. Size (W x H x L mm)	Installation in Bulkhead or Deck
FDSO (FGSO)-P/E/M Multi-blade (7)	150 x 150 x 300	1200 x 1400 x 300	A60 Deck and A60 Bulkhead
FGSM-A60-1/1D Multi-blade (10)		2500 x 2100 x 300	A60 Deck and A60 Bulkhead
PFGD-A6MS-1 Multi-blade (10)		2500 x 2100 x 300	A60 Deck and A60 Bulkhead
PFGD-A6SS-1 Multi-blade (7)		1200 x 1400 x 300	A60 Deck and A60 Bulkhead
EFGD-A6SS-1 Multi-blade (7)		1200 x 1400 x 300	A60 Deck and A60 Bulkhead

The fire dampers are operated with fusible link by actuators of following types:

Electrical:

FDSO (FGSO)-P/E/M:

- BF230-T from Belimo, Switzerland (*)
- SFU-S2 from Belimo, Switzerland (*)
- RedMax-5.10SF - 50SF from Schischek, Germany (*)
- ExMax-5.10SF - 50SF from Schischek, Germany (*)
- InMax-5.10SF - 50SF from Schischek, Germany (*)

EFGD-A6SS-1:

- RedMax-5.10SF - 50SF from Schischek, Germany (*)
- ExMax-5.10SF - 50SF from Schischek, Germany (*)
- InMax-5.10SF - 50SF from Schischek, Germany (*)

Pneumatic:

FDSO (FGSO)-P/E/M:

- 125A from Valbia, Italy (*)
- SR160 from Valbia, Italy (*)

FGSM-A60-1/1D:

- SR160 from Valbia, Italy (*)

PFGD-A6MS-1:

- RS50-RS210 from Emico, Korea (*)

PFGD-A6SS-1

- RS50-RS210 from Emico, Korea (*)

(*) Actuators of same make but with different size as mentioned above may also be used, provided that they have similar installation arrangement and equivalent fire technical and functional properties compared to the tested actuator/fire damper arrangement.

The fire dampers may also be spring loaded with fusible link or manually operated by handle without fusible link.

Steel thickness of damper casing shall be equal to or greater than the thickness of the duct required by the rules if the damper casing is part of the duct.

The insulation used is to be regarded as minimum insulation for all fire ratings, and is not to be removed if the fire damper is used in divisions with lower fire rating.

The damper shall be capable of being closed from both sides of the bulkhead or deck.

Each product is to be supplied with its manual for installation and use.

Type Approval documentation

Certification in accordance with Standard for Certification No. 1.2, Type Approval, January 2013.

Test reports Nos. from Fire Insurers Laboratories of Korea (FILK), Gyeonggi-Do, Korea:

- 2008-1133 dated 7 November 2008 (FDSO (FGSO)-P/E/M)
- 2008-0424 dated 25 July 2008 (FDSO (FGSO)-P/E/M)
- AK2011-0425 dated 2 May 2012 (FDSO (FGSO)-P/E/M)
- AK2011-0426 dated 2 May 2012 (FDSO (FGSO)-P/E/M)
- AK2014-0063 dated 25 March 2014 (FGSM-A60-1D, Deck)
- A2012-1332 dated 29 April 2013 (FGSM-A60-1, Bulkhead)
- AK2014-0581 dated 17 December 2014 (PFGD-A6MS-1, Deck)
- AK2015-0059 dated 19 March 2015 (PFGD-A6MS-1, Bulkhead)
- AK2014-0582 dated 17 December 2014 (EFGD-A6SS-1, Deck)
- AK2014-0580 dated 17 December 2014 (PFGD-A6SS-1, Deck)
- AK2014-0584 dated 17 December 2014 (PFGD-A6SS-1, Bulkhead)

Test reports No. from Korea Marine Equipment Research Institute (KOMERI), Korea:

- KOMERI-0402-15T0404 dated 13 April 2015 (EFGD-A6SS-1, Bulkhead)

Letter from FILK dated 23 March 2009 (confirmation about bolting).

Drawing Nos. from Hi Air:

- FDSO(A60)-P-REC-1 / FDSO(A60)-E-REC-1 (one page) dated 17 June 2008
- FDSO(A60)-REC-DK-1, FDSO(A60)-REC-DK-2 & FDSO(A60)-REC-DK-3 (3 pages) dated 17 June 2008
- FDSO(A60)-REC-BK-1, FDSO(A60)-REC-BK-2 & FDSO(A60)-REC-BK-3 (3 pages) dated 17 June 2008

Job Id: **262.1-016080-2**
Certificate No: **TAF0000026**

- FGS-A60-1 dated 5 January 2012
- FGSM-A60-1D (7 pages) dated 18 November 2013
- FGSM-A60-1 (6 pages) dated 28 January 2013
- PFGD-A6MS-1 Rev. 1 (8 pages) dated 5 September 2014
- EFGD-A6SS-1 (8 pages) dated 5 September 2014
- PFGD-A6SS-1 (8 pages) dated 5 September 2014

Tests carried out

Tested according to IMO 2010 FTP Code part 3, and according to IMO FTPC Part 3 and in compliance with IMO 2010 FTP Code Ch. 8.

Marking of product

The product is to be marked with name of manufacturer, type designation and fire-technical rating.

Transport Canada Approval

Based on the procedures laid down in the Transport Canada Publication entitled "*Approval Procedures for, Life Saving Equipment and Structural Fire Protection Products (TP 14612)*", Det Norske Veritas confirms that the product/s listed in this certificate is/are in accordance with Transport Canada's requirements.

Periodical assessment

DNV GL's surveyor is to be given permission to perform Periodical Assessments at any time during the validity of this certificate and at least every second year. The arrangement is to be in accordance with procedure described in Standard for Certification No. 1.2 Item 4.