STATEMENT

No. 2013WT01-64

Client: KARMIN INTERNATIONAL CO., LTD.

Subject: Witness the test of specimen for K87 Working Boat

We here declare that at request of KARMIN INTERNATIONAL CO., LTD. RINA surveyor has witneseed the following tests:

- Verified & dimensional check the test specimen sampled by RINA surveyor

- Witnessed Fire-retardant test

- Witnessed Flame-resistant test

Test details see Report No.2013-10-M19 & 2013-10-M20 issued by Shanghai R&D Center of Polymer Material

Issued at: SHANGHAI on 17/12/2013

RINA

Y.R. Zhao

RINA

Shanghai R&D Center of Polymer Material

Test Report of Fire-retardant test

SCPM

Report No.: 2013-10-M019

Test Date: 2013.11.18

RINA

Y.R. Zhao

Shanghai R&D Center for Polymer Materials

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REPORT NO.: 2013-10-M019

REPORT DATE: 2013.11.21

TEST REPORT

TEST METHOD:

IMO MSC/Circ.1006<GUIDELINES ON FIRE TEST PROCEDURES FOR ACCEPTANCE OF FIRE-RETARDANT MATERIALS FOR THE CONSTRUCTION OF LIFEBOATS>

PRODUCT NAME: K87 Working Boat (Hull no. H6837)

CLIENT(S): KARMIN INTERNATIONAL CO., LTD.

ADRESS: NO.3, S.1ST RD., PINGTUNG CITY, PINGTUNG COUNTY 900, TAIWAN (R.O.C.)

TEST BY:

CHECK BY:	APPROVED BY:
TEST DATE: 2013.11.18	TOTAL NO. OF PAGES: 5

ABSTRACT:

The product Lifeboat GRP laminate was tested according to IMO MSC/Circ.1006 "Guidelines on fire test procedures for acceptance of fire-retardant materials for the construction of lifeboats" of 18 June 2001.

The fire test reported in this report was based on item 3 "Fire-retardant test". The "Fire-retardant test" is performed by using the cone calorimeter as described in ISO 5660-1 with an irradiance of 50kW/m^2.

Test results are given in Appendix Ⅱ, and can be summarized as the following:

"Fire-retardant test"

- Average time to ignition at 50kW/m^2 exposure:**over 40s**

Thus,the specimen is passed the test of IMO MSC/Circ.1006 on item 3 "Fire-retardant test".

RINA Y.R Zhao

PRODUCT SAMPLE DESCRIPTION :

Product name: K87 Working Boat (Hull no. H6837)

Manufacturer: KARMIN INTERNATIONAL CO., LTD.

Adress: NO.3, S.1ST RD., PINGTUNG CITY, PINGTUNG COUNTY 900, TAIWAN (R.O.C.)

Sampling: The specimen was provided by applicant, which was received at 2013.10.22. For entrusted test, we are only responsible for the samples provided.

Test specimens: The specimen with size of 100mm × 100mm ("Fire-retardant test"), respectively.

According to the client, the product was constructed by:

Polyester resin :	ETERNAL CHEMICAL CO.,LTD	Type: 2960PI-K
Fiberglass chopped strand :	Taiwan Glass Ind. CorP.,Taiwan	Type: M300
Fiberglass woven roving:	Chrong Yi Composite Co.,Ltd.,Taiwan	Type: LT800/225
Matting description :	M300*1+(LT800/225)*5	

Measured thickness: 6.24 mm

Color: Grey Gel coat + Grey Laminate

Condition of the test: relative humidity of 50% and temperature of 22℃.

Conditioning of the specimen: be conditioned in natural sunlight to 300 MJ/m^2 of UV radiation exposure of outdoor weathering for 21 days, which included temperatures of 30℃ and 20 % wet time and then stored for 30 days at ambient temperature as stated.

Number of single specimens: 3 pieces of 100mm×100mm (Unaged)

The details are in the appendix

Appendix Ⅰ : Summarize

Appendix Ⅱ: Test results

Appendix Ⅲ: Test Photos

RINA Y.R. Zhao

Appendix Ⅰ: Summarize

Shanghai R&D Center of Ploymer material

Summarize

This test and report are based on IMO MSC/Circ.1006.The standard is determined in the No. 74 conference of International Maritime Organization in June 2001.Full name is "GUIDELINES ON FIRE TEST PROCEDURES FOR ACCEPTANCE OF FIRE-RETARDANT MATERIALS FOR THE CONSTRUCTION OF LIFEBOATS", the guide pointed out the document in detail, process of lifeboat testing , the fire-resistant standard data. The guide has been adopted by International Maritime Organization member countries as the standard of lifeboat fire resistance testing standards.

In accordance with the provisions of IMO MSC/Circ.1006, fire-resistant testing, the parameters are as follow:

"The fire-retardant test"

Test specimens: Three test specimen laminates should be with size of 100mm×100mm.

Test condition: The test should be performed in the horizontal position using a specimen edge frame, and the irradiance to the specimen during the testing should be kept constant. The test specimens should be tested to an irradiance of 50 kW/m²

RINA Y.R. Zhao

Appendix Ⅱ： Test results

According to IMO MSC/Circ.1006, item 3 the "Fire-retardant test" results should be reported as:

1. the average ignition time from three tests-calculated as the arithmetic mean of the ignition time of the three specimens
2. observations during the test

Test no.	Time to ignition（seconds）
1	Over 600s
2	Over 600s
3	Over 600s
Average	Over 40s

Table 2 Time to ignition during "Fire-retardant test"

According to IMO MSC/Circ.1006

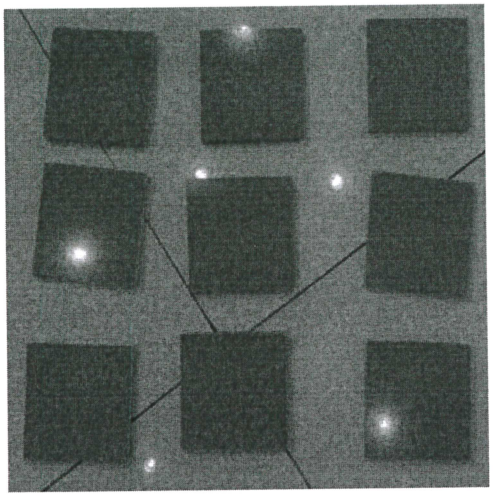
The average ignition time from three tests should be greater than 40 seconds;

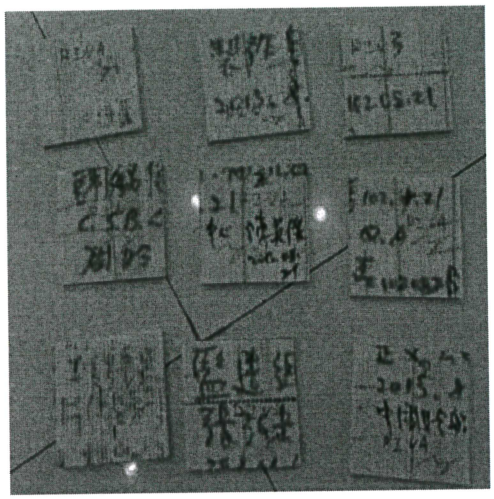
Thus, the specimen of this report passed the criteria of IMO MSC/Circ.1006 on item 3 "Fire-retardant test".

RINA Y.R. Zhao

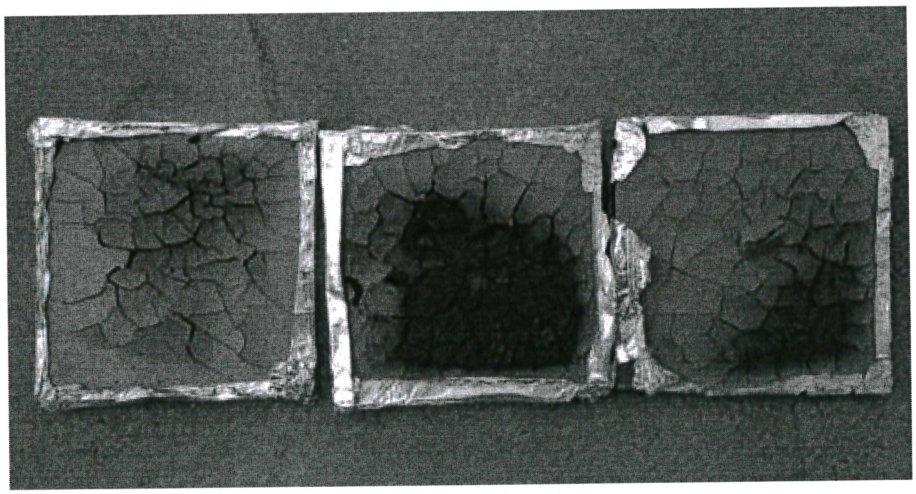
Appendix Ⅲ: Test Photos

Sample pictures:





Picture after test:



RINA Y.R. Zhao

Shanghai R&D Center of Polymer Material

Test Report of Flame-resistant & Fire-retardant Tests

SCPM

Report No.: 2013-10-M020

Test Date: 2013.11.18

RINA

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REPORT NO.: 2013-10-M020

REPORT DATE: 2013.11.21

TEST REPORT

TEST METHOD:

IMO MSC/Circ.1006<GUIDELINES ON FIRE TEST PROCEDURES FOR ACCEPTANCE OF FIRE-RETARDANT MATERIALS FOR THE CONSTRUCTION OF LIFEBOATS>

PRODUCT NAME: K87 Working Boat (Hull no. H6837)

CLIENT(S): KARMIN INTERNATIONAL CO., LTD.

ADRESS: NO.3, S.1ST RD., PINGTUNG CITY, PINGTUNG COUNTY 900, TAIWAN (R.O.C.)

TEST BY:

CHECK BY:	APPROVED BY:
TEST DATE	**TOTAL NO. OF PAGES**
2013.11.18	7

ABSTRACT:

The product Lifeboat GRP laminate was tested according to IMO MSC/Circ.1006 "Guidelines on fire test procedures for acceptance of fire-retardant materials for the construction of lifeboats" of 18 June 2001.

The fire test reported in this report was based on item 3 "Fire-retardant test" and item 4 "Flame-resistant test". The "Fire-retardant test" is performed by using the cone calorimeter as described in ISO 5660-1 with an irradiance of 50kW/m^2.

Test results are given in Appendix Ⅱ, and can be summarized as the following:

"Fire-retardant test"

- Average time to ignition at 50kW/m^2 exposure:**over 40 seconds**

"Flame-resistant test"

- Time for flame extinguishment after 60 seconds exposure: **3 seconds**.

- Burn-through time: **370 seconds**.

Thus,the specimen of this report meets the criteria of IMO MSC/Circ.1006.

RINA Y.R. Zhao

PRODUCT SAMPLE DESCRIPTION:

Type of boat: K87 Working Boat (Hull no. H6837)

Manufacturer: KARMIN INTERNATIONAL CO., LTD.

Adress: NO.3, S.1ST RD., PINGTUNG CITY, PINGTUNG COUNTY 900, TAIWAN (R.O.C.)

Sampling: The specimen was provided by applicant, which was received at October, 22, 2013. For entrusted test, we are only responsible for the samples provided.

Test specimens: Received 3 pieces with size of 100mm×100mm specimens for "Fire-retardant test",

Received 1 piece with size of 1m×1m specimen. Cut it into size of 450mm×450mm for "Flame-resistant test".

According to the client, the product was constructed by:

Polyester resin :	ETERNAL CHEMICAL CO.,LTD	Type: 2960PI-K
Fiberglass chopped strand :	Taiwan Glass Ind. CorP.,Taiwan	Type: M300
Fiberglass woven roving:	Chrong Yi Composite Co.,Ltd.,Taiwan	Type: LT800/225
Matting description :	M300*1+(LT800/225)*5	

Thickness: 6.44mm

Colour: Grey Gel coat + Grey Laminate

Condition of the test: relative humidity of 50% and temperature of 22℃

Conditioning of the specimen: be conditioned in natural sunlight to 300 MJ/m^2 of UV radiation exposure of outdoor weathering for 21 days, which included temperatures of 30℃ and 20 % wet time and then stored for 30 days at ambient temperature as stated.

QUV Conditioning of the specimen: finished the above conditioning, be conditioned in QUV light to 261.8 W/m^2 of UV radiation exposure of specified weathering for 318 hours, which included temperatures of 60℃ and 20 % wet time. UV wavelengths is 340nm.

Number of single specimens: 1 piece of 450mm×450mm, 3 pieces of 100mm×100mm (Aged)

The details are in the appendix

Appendix I : Summarize

Appendix II: Test results

Appendix III: Test photos

RINA Y.R. Zhao

Appendix I: Summarize

Shanghai R&D Center of Ploymer Material

Summarize

This test and report are based on IMO MSC/Circ.1006.The standard is determined in the No. 74 conference of International Maritime Organization in June 2001.Full name is "GUIDELINES ON FIRE TEST PROCEDURES FOR ACCEPTANCE OF FIRE-RETARDANT MATERIALS FOR THE CONSTRUCTION OF LIFEBOATS", the guide pointed out the document in detail, process of lifeboat testing , the flame-retardant and fire-resistant standard data. The guide has been adopted by International Maritime Organization member countries as the standard of lifeboat flame retardant and fire resistance testing standards.

In accordance with the provisions of IMO MSC/Circ.1006, fire-resistant and flame retardant testing, the parameters are as follow:

"Flame-resistant test"

Test specimens: The test specimen should be cut from a one metre square panel of the above minimum thickness, which has been allowed to cure for not less than 21 days and then stored for 30 days at ambient temperature as stated.

Test condition:With a maximum flame temperature of approximately 1600℃, and burning propane at the rate of 4,110 grams per hour with a pressure of 0.2MPa, the length of blue flame being approximately 200mm to the point of the greatest heat.

"The fire-retardant test"

Test specimens: Three test specimen laminates should be with a size of 100mm×100mm.

Test condition: The test should be performed in the horizontal position using a specimen edge frame, and the irradiance to the specimen during the testing should be kept constant. The test specimens should be tested to an irradiance of 50 kW/㎡

In addition, before a specimen passing the "fire-retardant" test,it should undergo the "Flame-resistant" test.

RINA Y.R.Zhao

Appendix II： Test results

According to IMO MSC/Circ.1006, item 4 the "Flame-resistant test" results should be reported as:

1. time for flame extinguishment after one minute exposure
2. burn-through time
3. observations during the test

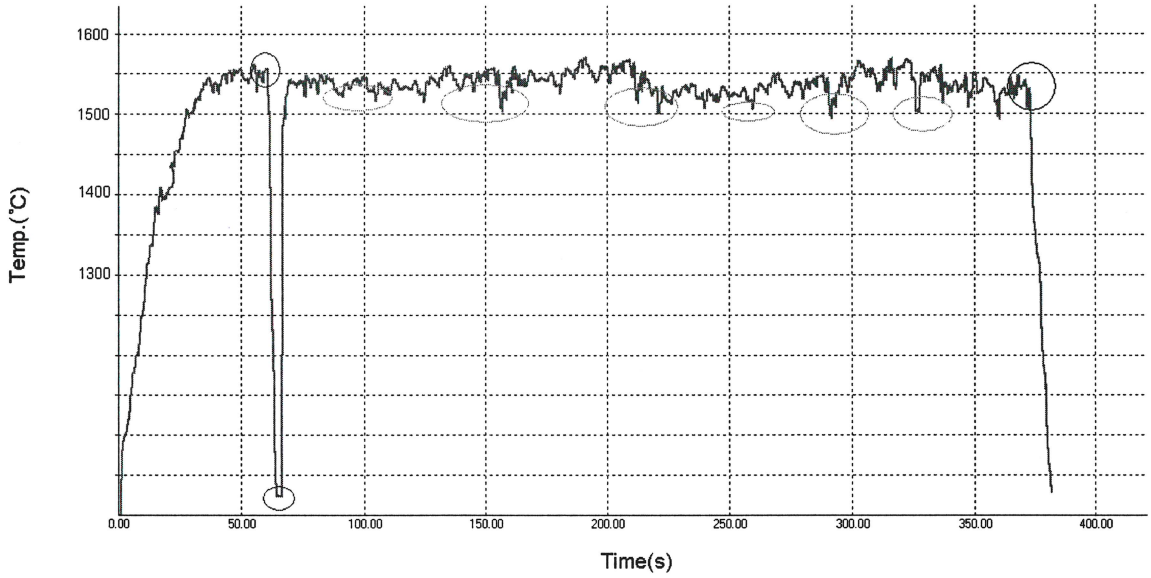


Figure 1. the reflextion of the contact center flame temperature-time curve

Time from start of test[s]	Observations
0	The flame is positioned to expose the test specimen as described in Circ.1006, item 4.1.1
30	Part of the surface seems to be burning-this is however difficult to observe as the flames from the burner are also spreading along the surface
60	The burner is removed from the test specimen-the complete surface is burning
63	The flames on the surface extinguish-time for flame extinguishment is **3** seconds. The burner is re-positioned to expose the test specimen as described in Circ.1006, item 4.3
64～373	Part of the glass fiber melting and dripping, temperature changed obviously
374	During the exposure time, no flames were observed on the sides of the specimen. This means that the IMO MSC/Circ.1006 term "burn-through" occurred. Test over.

Table 1

RINA Y.R. Zhao

Appendix II： Test results

In the Fig.1, the first **blue point** is temperature for flame removed after 1 minute. The second **blue point** is temperature for flame re-positioned to expose the test specimen after the flames on the surface extinguish.

The green point is the point of temperature dropped, it may be caused by the glass fibres decalescence to reach its melting point, and there is the glass melt drop.

The **blackpoint** is the point of "burn-through", the temperature rapidly declined after burn-through as fig.1.

According to IMO MSC/Circ.1006,item 3 the "Fire-retardant test" results should be reported as:

1. the average ignition time from three tests-calculated as the arithmetic mean of the ignition time of the three specimens
2. observations during the test

Test no.	Time to ignition（sec）
1	Over 600s
2	Over 600s
3	Over 600s
Average	Over 40s

Table 2 Time to ignition during "Fire-retardant test"

According to IMO MSC/Circ.1006

1.The average ignition time from three tests should be greater than **40** seconds;

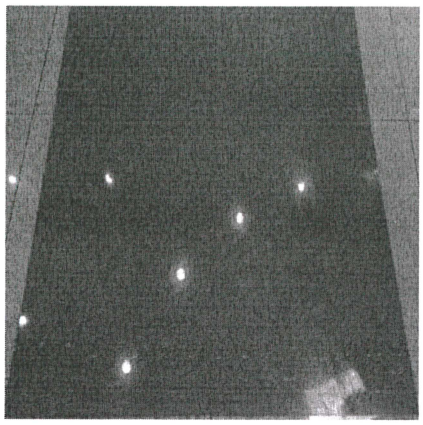
2.At the end of the one minute period, the burner should be removed and the area of flame impingement should not support combustion more than **30s** after being removed from the burner, and the extinguish-time for the specimen is **3** seconds.

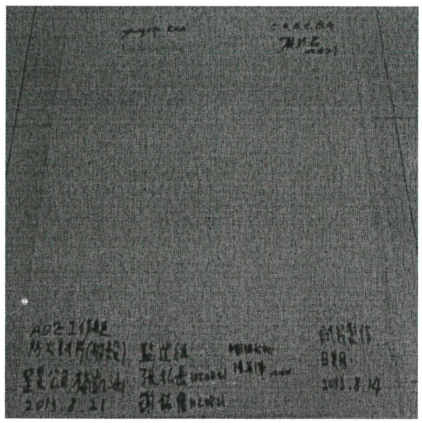
Thus, the specimen of this report meets the criteria of IMO MSC/Circ.1006.

RINA Y.R. Zhao

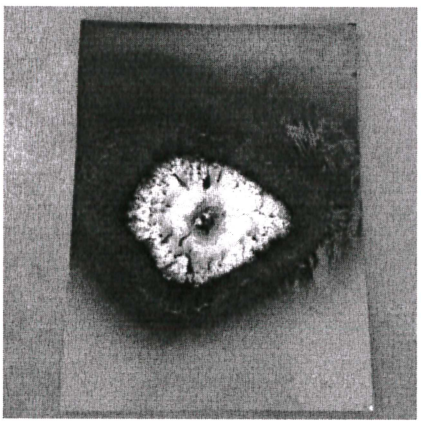
Appendix III: Test Photos

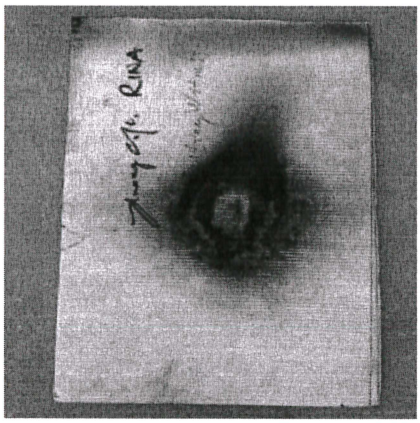
Sample pictures of Flame-resistant test:





Picture after Flame-resistant test:

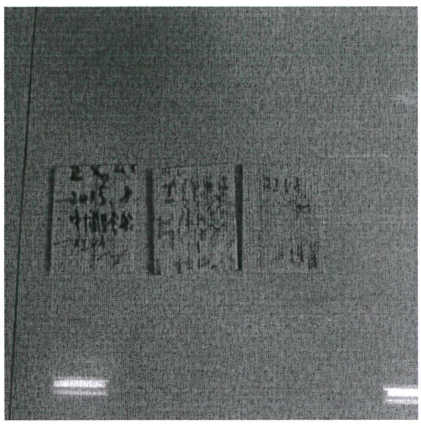


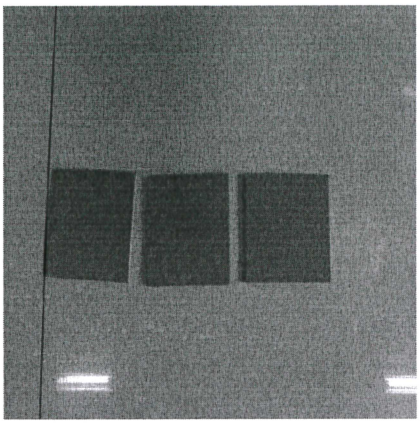


RINA
Y.R. Zhao

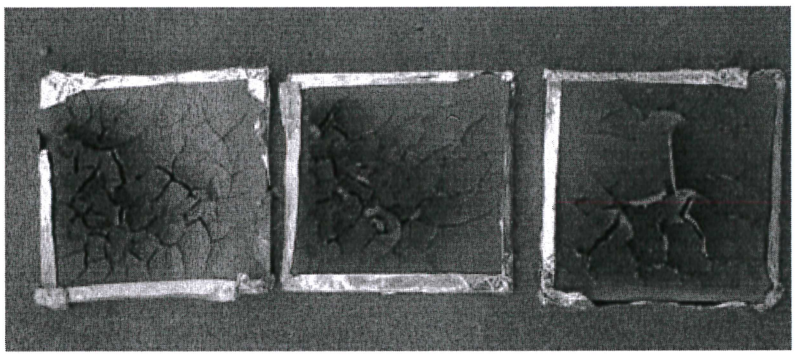
Appendix III: Test Photos

Sample pictures of Fire-retardant test:





Picture after Fire-retardant test:



RINA Y.R. Zhao

DET NORSKE VERITAS

TYPE APPROVAL CERTIFICATE

CERTIFICATE NO. **K-5813**

This is to certify that the
Glass Fibre Products

with type designation(s)
Chopped Strand Mats; TGFM-300P, TGFM-450P, TGFM-600P, TGFM-300E, TGFM-450E and TGFM-600E

Issued to
Taiwan Glass Ind. Corp., Taoyuan Factory
TAIPEI, Taiwan

is found to comply with
Det Norske Veritas' Rules for Classification of High Speed, Light Craft and Naval Surface Craft
Det Norske Veritas Standards' for Certification No. 2.21, Craft, 2010
Det Norske Veritas' Standards for Certification No. 2.20, Lifeboats and Rescue Boats, 2007

Application
For use in marine vessels according to stated Rules/Standards.

This Certificate is valid until **2017-12-31**.

Issued at **Høvik** on **2014-01-22**

DNV local station: **Kaohsiung**

Approval Engineer: **Gisle Hersvik**

for Det Norske Veritas AS
Digitally Signed By: Strande, Martin
Location: DNV Høvik, Norway
Signing Date: 2014-01-28

Martin Strande
Head of Section