

Technical Details and Material Specifications

1.0 Company Introduction:

Factory located in Qingdao, Shandong province, established in 1992, Qingdao Florescence Marine Supply Co., Ltd specializes in manufacturing various ship dock rubber fenders, foam fenders, pneumatic rubber fenders, and ship launching & salvage rubber airbags.

Florescence's products are designed, manufactured, and tested by per ISO 9001:2015 requirements. And every unit is robustly built to the stringent requirements of ship surveyors such as CCS, BV, RS, ABS, LR, etc. The company can produce over 20 series of rubber fender types in its own workshop. Its main fender types, including arch fenders, cell fenders, cone fenders, and element fenders, have obtained the Type Approval Certificate in accordance with PIANC2002. We are the supplier of many Navies, such as Bangladesh Navy, France Navy, Greece Navy, Thailand Navy, Italy Navy, Philippines Navy, etc.



1.1 Certificates



Industry & Facilities Division Third Party Inspection Report

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INSPECTION REPORT Nr: INS/NR/SHOP-23/353		Revision Nr: 0	
☐ Initial ☒ Interim ☐ Final ☐ Resident Inspection requested by: Qingdao Floresearch Co., Ltd. Inspection performed as Recognised Authority: ☐ Yes, ☒ No BV Job Nr: INS/NR/SHOP-23/353			
Project: Third party inspection for Rubber Fender		I/O Ref (if applicable): / (BV internal P/O)	
BV Client: Qingdao Floresearch Co., Ltd		P/O nr: INS/NR/SHOP-23/353 (client to BV)	
Manufacturer/Vendor: Qingdao Floresearch Co., Ltd		P/O nr: / (client to Manufacturer)	
Sub-Vendor (if applicable): /		Previous Inspection (if applicable): (Date) /	
Inspection Location: Qingdao City, Shandong P.R. CHINA		Next Inspection (if applicable): (Date) /	
Inspection performed on: July 28 th , 2023 (Date(s))			
MATERIAL / SUBJECT OF INSPECTION	ITEM / TAG Nr	QTY As per P/O	QTY Offered for inspection
Arch fender	1000H*2500L	2 sets	2 sets
[Refer to attachment section J instead (Indicate if separate material list is provided in attachment)]			
A - INSPECTION RESULT			

RUSSIAN MARITIME REGISTER OF SHIPPING
THE VOLUNTARY CERTIFICATION SYSTEM OF PRODUCTS AND FABRICATIONS OF INDUSTRIAL PURPOSES
 POCC RU.B1719.04A003
CERTIFICATE OF COMPLIANCE

Manufacturer, address
 Qingdao Floresearch Co., Ltd. Room 1608 Dingshi International Mansion, No.54 Moscow Road, Free Port Trade Zone, Qingdao City, China 266555

Applicant, address
 Qingdao Floresearch Co., Ltd. Room 1608 Dingshi International Mansion, No.54 Moscow Road, Free Port Trade Zone, Qingdao City, China 266555

This is to certify that the products listed below are in compliance with the requirements of Items 9.2, 9.3 and 9.4 ISO 17557-1:2014.

Quantity	Name, type and technical data of products, manufacturer's (serial) number	Products Code
10 pcs.	Pneumatic rubber fenders Drawing No.: FL-DL1350XL2500 (Reviewed by RS letter No 266-327-01-20943 of 29.01.2021). Serial Nos.: 2021-01 - 2021-10. Dimensions, mm: 01350 x 12500. Material: Natural Rubber NR with Nylon Reinforcement Layers. Working pressure, MPa: 50.	40169400

This Certificate corresponds to the category 3.2 EN 10204:2004 and 3.2 ISO 10474:2013 and is issued on the basis of:

L.S.  Expert: Xia Qi
 Authorized person: I. Starovoltov
 Certificate No.: 21.10041.206 Date of issue: 29.01.2021

RS
 10/2020

1.2 Patents



2.0 Fender Required

2.1 Fender System-1

SD fender system, one rubber fender

Fender Type: 350H*350W mm

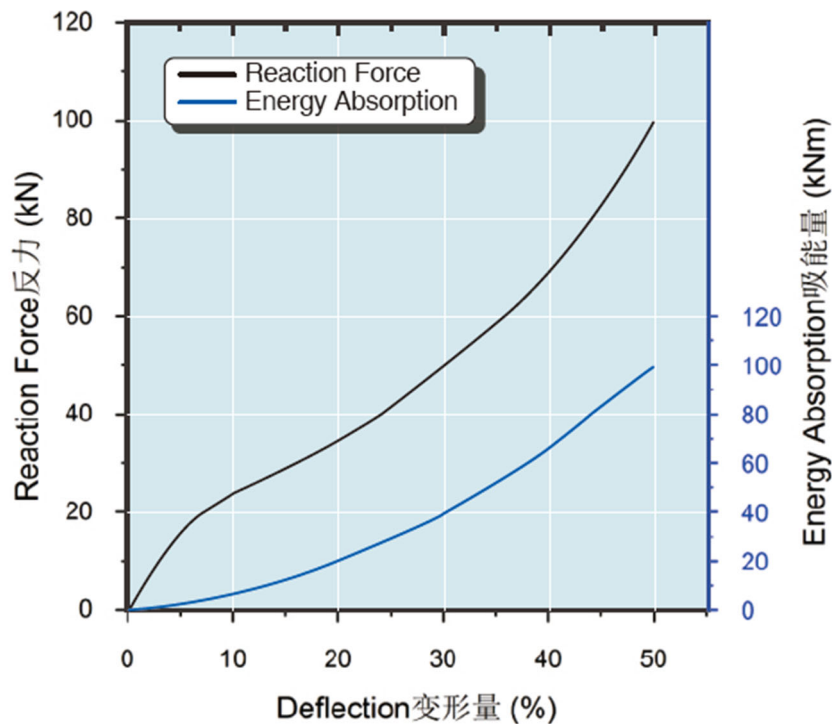


Fender Performance

Rated Deflection: **50%** of the original fender height

Energy Absorption: not less than **34** kN-m -10%

Reaction Force: not above **476** kN +10%



2.2 Fender System-2

Cylindrical fender system, one rubber fender

Fender Type: 500OD*250ID mm

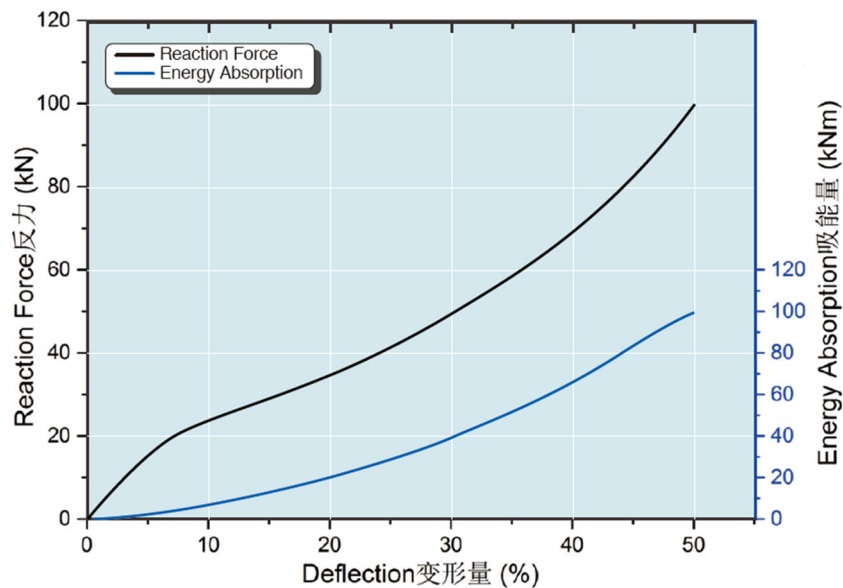


Rated Deflection: **50%** of the original fender height

Energy Absorption: not less than **26** kN-m -10%

Reaction Force: not above **239** kN +10%

Performance Curve



2.2 Fender System-3

Cylindrical fender system, one rubber fender

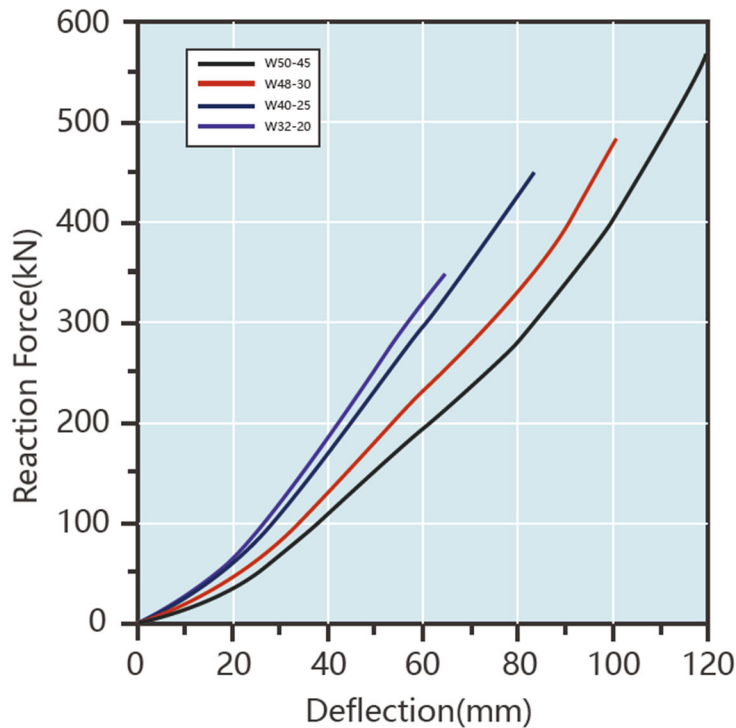
Fender Type: 500OD*250ID mm



Rated Deflection: **50%** of the original fender height

Energy Absorption: not less than **26** kN-m -10%

Reaction Force: not above **239** kN +10%



3.0 Fender Specification

3.1 Material

The production of rubber fenders shall strictly comply with HG/T 2866 - 2003 and relevant GB/T standards.

Raw Material Selection:

Vulcanized mixtures of natural and synthetic rubber are employed in the manufacturing of rubber fenders. To enhance the fenders' resistance to seawater corrosion, aging, ozone exposure, and other adverse factors, additives such as carbon black and anti - ozone agents are incorporated into the rubber compound. The rubber material must be of uniform quality, free from any impurities like foreign substances, bubbles, damages, cracks, or other detrimental defects.

Bonding of Steel Components and Rubber:

During the vulcanization process, the embedded steel plates and nuts should be fully and firmly bonded to the rubber fender body. All steel parts must be completely embedded within the fender body to ensure the structural integrity and stability of the rubber fender.

3.2 Properties

The rubber compound used for fender production shall comply with the requirements of table below.

Physical Properties of Rubber Compound (The data is sourced from the inspection report previously conducted by **SGS**):

Test point	Testing standard	Condition	Requirement	Result
Tensile strength (MPa)	ASTM D412-98a Die C	Original	16 (min)	22.2
Tensile strength (MPa)	ASTM D412-98a Die C	Aged 96 hours @ 70°C	12.8(min.)	19.1
Elongation at break (%)	ASTM D412-98a Die C	Original	350%(min)	5.4
Elongation at break (%)	ASTM D412-98a Die C	Aged 96 hours @ 70°C	280%(min)	4.63
Hardness (Shore A)	ASTM D2240-03	Original	75 (Max.)	66
	ASTM D2240-03	Aged 96 hours @ 70°C	Original +8 (max)	Original+4
Compression set (%)	ASTM D395-18 Method B	Aged 22 hours @ 70°C	30% (max)	0.173
Tear resistance strength (kN/m)	ASTM D624-00 Die B	Original	70 (min)	102.47
Ozone resistance	ASTM D1149-18	50pphm at 20% stain, 40°C,96hours	100% no crack	No crack
Bonding strength (N/mm)	ASTM D429-14 Method B	Original	7 (min)	11.95

3.3 Fender Test

The fender performance test shall be carried out in accordance to PIANC 2002 Constant Velocity (CV) Method. Minimum 10% of the total quantity shall be tested.



The performance of the Fender is expressed by the value of the energy absorbed during the compression of Fender up to the designed deflection and the maximum value of reaction load thus obtained.

During the performance test, the fender will be subjected to a vertical force acting directly on the top surface of the fender:

Compression stroke speed at 2-8cm per minute up to the designed deflection is to be repeatedly conducted for three consecutive testing. The load and the deflection in each test shall be recorded with the precision of 1.0 KN (0.1Ton) and 1mm respectively unless otherwise specified.

The value of energy absorption is expressed in KN-m (Ton-m) and is obtained by the reaction load/deflection curve up to the designed deflection.

Performance of fender is obtained from the average of the second and third test data. The average value shall be more than the designed performance value for the energy absorption and less than the designed performance value for the maximum reaction load taking into consideration of the plus minus ten percent tolerance.

3.4 Fixings Specification

Material of Cast-in Anchors

Bolt	SUS316
Nut	SUS316
L Washer	SUS316



3.5 Test of Fender Fixings

Inspection

Five (5) percent of each size

Appearance: Visual Inspection

Dimension: Convex Rule / Vernier Caliper

Material: Refer to steel manufacturer's mill sheets Galvanization exposed parts: Weight measuring method.

Chains capacity test: Adjust the due data (ton) and chains are not broken

Test criteria

Appearance: There shall be no sign of flaw or defect inimical to usage Dimension: To conform to the dimensions shown on the attached drawing Material: Mill Certificate to be identified to the requirement.

3.6 Dimensions Tolerance

The tolerance for the fender dimensions shall comply as follows:

Items	Outer	Inner	Length
Tolerance	+ 4%	+1%	+4%
	- 2%	- 2%	- 2%

If bolts are used for fixing Fender, tolerance for bolt holes on Fender shall be in Table-2

Items	Diameter of Hole Bolt	Pitch of Holes
Tolerance	±5 mm	±4 mm