A DETAILED GUIDE TO

PNEUMATIC RUBBER FENDERS

Pneumatic fenders manufactured to exceed ISO 17357-1:2014 standards.

The RUBBER company®

Manufacturers · Designers · Distributors

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The Rubber company

Manufacturers · Designers · Distributors

INTRODUCTION

The Rubber Company has over 100 years of experience in meeting customers' rubber product needs in a vast range of industries. We manufacture, convert and distribute: extruded and moulded fenders manufactured from natural and synthetic rubbers (elastomers). Our competence includes design support, material selection and specification, prototyping and full production.

The combination of our comprehensive product range and in depth 'know how' means we are well placed to provide effective solutions for engineers and buyers with the challenge of keeping industry moving.

As a company, we are committed to understanding and responding to our customers' needs with speed, efficiency and competitive pricing. We take great pride in our ability to meet demanding delivery requirements on a global scale. Your satisfaction is our top priority, and we are here to ensure that you receive the service you deserve, no matter where you are located.

All our pneumatic rubber fenders are manufactured to a high quality and fully compliant to ISO 17357-1:2014 standards. This ensures longevity and low maintenance, no matter how demanding the environment.

KEY FEATURES OF

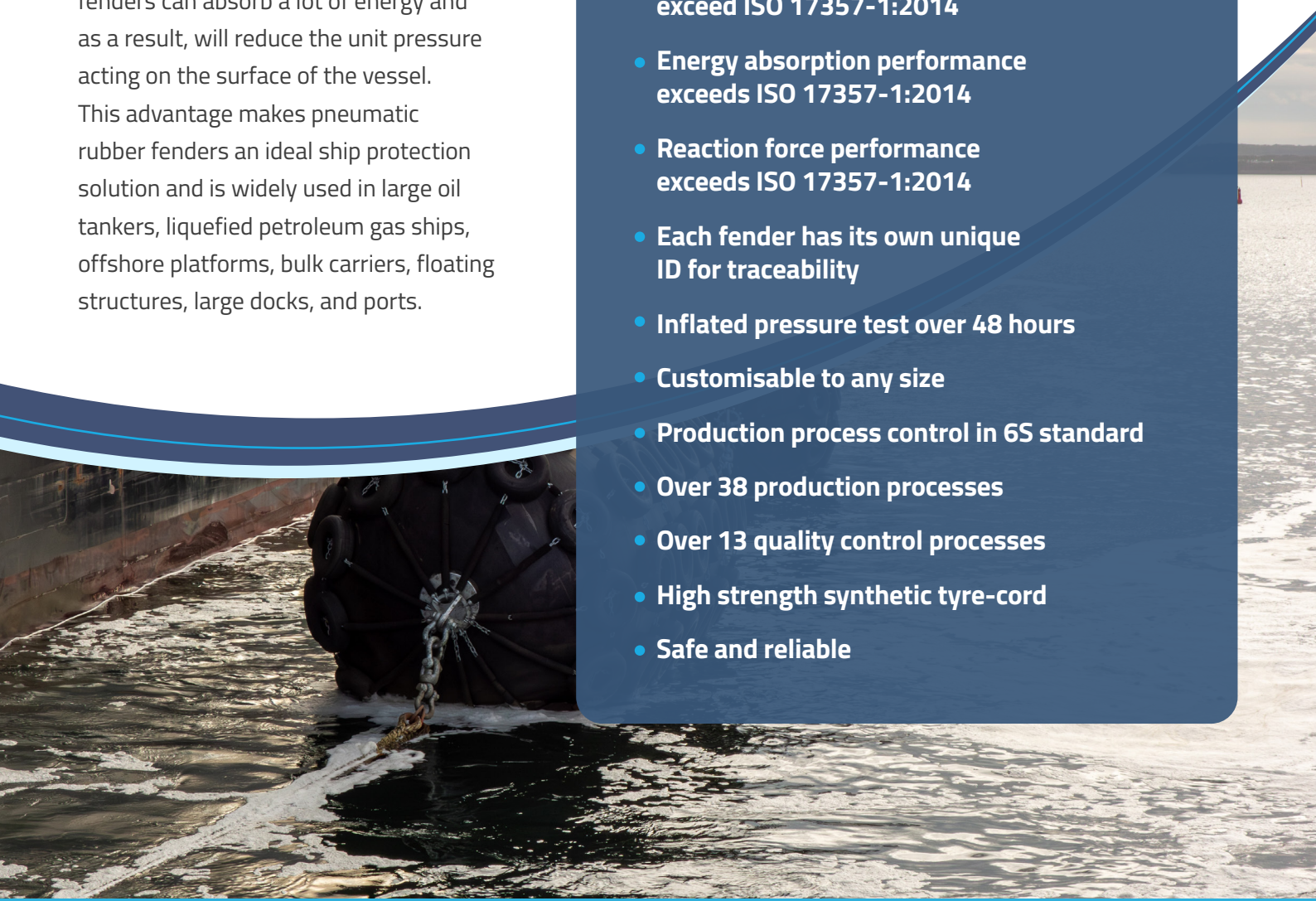
FLOATING FENDERS

Pneumatic rubber fenders are a world-leading marine anti-collision solution. They are manufactured using a synthetic cord reinforced rubber sheet, with compressed air inside which can float on water as a protective medium.

During transferring and mooring operations, pneumatic rubber fenders are used as an important protective medium to prevent collisions. Floating fenders can absorb a lot of energy and as a result, will reduce the unit pressure acting on the surface of the vessel. This advantage makes pneumatic rubber fenders an ideal ship protection solution and is widely used in large oil tankers, liquefied petroleum gas ships, offshore platforms, bulk carriers, floating structures, large docks, and ports.

KEY FEATURES

- No deterioration or variation in performance
- Advantages at inclined berthing
- Most cost competitive system
- Soft reaction force for ship and jetty structure
- Low reaction force and hull pressure
- Lower mooring forces under rough weather conditions
- Stronger resistance against shearing force
- Adaptable to the tide
- Simple and low-cost installation
- Low maintenance cost
- Deflatable for reduced shipping cost
- Minimum design requirements exceed ISO 17357-1:2014
- Energy absorption performance exceeds ISO 17357-1:2014
- Reaction force performance exceeds ISO 17357-1:2014
- Each fender has its own unique ID for traceability
- Inflated pressure test over 48 hours
- Customisable to any size
- Production process control in 6S standard
- Over 38 production processes
- Over 13 quality control processes
- High strength synthetic tyre-cord
- Safe and reliable



TYPES OF FENDERS

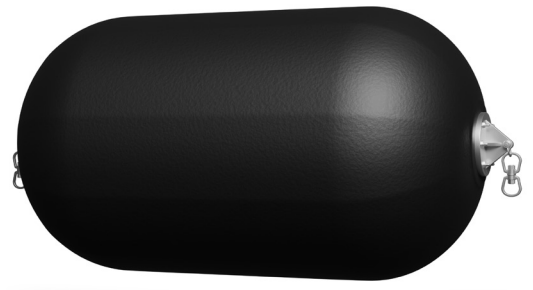
We can supply the most common types of pneumatic rubber fenders, compliant with ISO 17357-1:2014 standards.

Standard sizes range from 500mm to 4500mm diameters with lengths ranging from 1000mm to 12000mm. They are supplied in black rubber with two pressure options available, 50kPa and 80kPa. Each fender type is designed with a robust flange attachment, which includes a shackle and swivel. This configuration allows for easy and secure mounting of a chain or cable.

Two internal pressure options available

50kPa & 80kPa

CTN TYPE (CHAIN TYRE NET)



SLING TYPE

STANDARD SIZES

Diameter	Length
500mm	1000mm
600mm	1000mm
700mm	1500mm
1000mm	1500mm
1000mm	2000mm
1200mm	2000mm
1350mm	2500mm
1500mm	3000mm
1700mm	3000mm
2000mm	3500mm
2500mm	4000mm
2500mm	55000mm
3000mm	5000mm
3000mm	6000mm
3300mm	4500mm
3300mm	5000mm
3300mm	6000mm
3300mm	6500mm
3300mm	10600mm
3700mm	6000mm
4500mm	9000mm
4500mm	12000mm

Bespoke fenders can be made in any size with two other colour options available of grey or cream to meet the customers' specific requirements.

CHAIN TYRE NET PNEUMATIC

Chain Tyre Net (CTN) fenders are the most common out of the types of pneumatic fenders, and easy and fast to deploy, ensuring a safe clearance between the vessel and structure.

They are covered with a chain, wire or fibre net (for smaller fenders), and covered with used truck or aircraft tyres secured to the net, adding further protection to the fender body. These chains are then covered with a rubber sleeve in order to reduce damage to any vessels. Chain nets last longer against corrosion, while wire nets are lighter and more easily repaired.

SLING PNEUMATIC

The sling type fender is essentially the same as the Chain Tyre Net fender, but without the chain netting. It does however, feature a specially processed outer rubber double-layer cover, which can better protect the fender and reduce damage.

HYDRO PNEUMATIC

Hydro-Pneumatic Fenders are designed for berthing submarines and other sub-surface vessels. The fender is partially filled with water before being pressurised with air and equipped with a counterweight in order to keep them in a vertical position. They are highly absorbent with a low reaction force.

RIBBED PNEUMATIC

Ribbed type pneumatic rubber fenders feature a heavy-duty rib shell. The weight of these fenders is the same as a traditional sling type fender, but it is considered as durable as the Chain Tyre Net type. It is typically viewed as a middle ground between Chain Tyre Net and Sling types. These are particularly useful in applications where weight, price and flexibility are important.

WE CAN ALSO SUPPLY

FOAM FILLED FENDERS

In addition to the standard pneumatic rubber fenders, we also supply foam filled fenders as an alternative. These foam fenders feature a high quality, closed-cell foam core with nylon filament reinforced polyurethane skin.

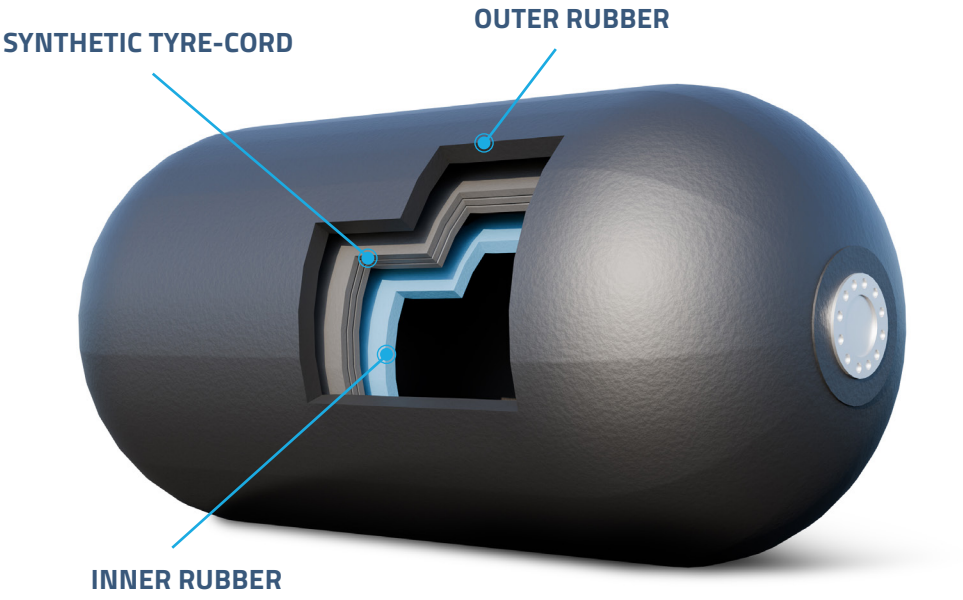
For more information on foam fenders, visit our website by scanning the qr code or click the button below.

www.therubbercompany.com

VISIT WEBSITE

DESIGN & STRUCTURE

Our pneumatic rubber fenders are constructed to ISO 17357-1:2014 compliance and follow the three main elements of construction. The have a tough outer rubber layer, synthetic tyre-cord reinforcing layer and inner rubber layer. These layers are then vulcanised under high pressure to bond them together before being subjected to a hydraulic pressure test to ensure they meet standards.



OUTER RUBBER

The outer rubber layer is designed to protect the tyre-cord layer and inner rubber layer from abrasion and damaging external forces. This compound has sufficient tensile and tear strength to withstand the most challenging operating conditions.

SYNTHETIC TYRE-CORD

The synthetic type-cord layer provides reinforcement and each cord is arranged at the optimum angle to ensure stress is distributed evenly and the fender retains its shape. The cords are not braided like other synthetic canvas fabrics, so it is able to provide superior pressure retention and fatigue resistance extending lifetime performance.

INNER RUBBER

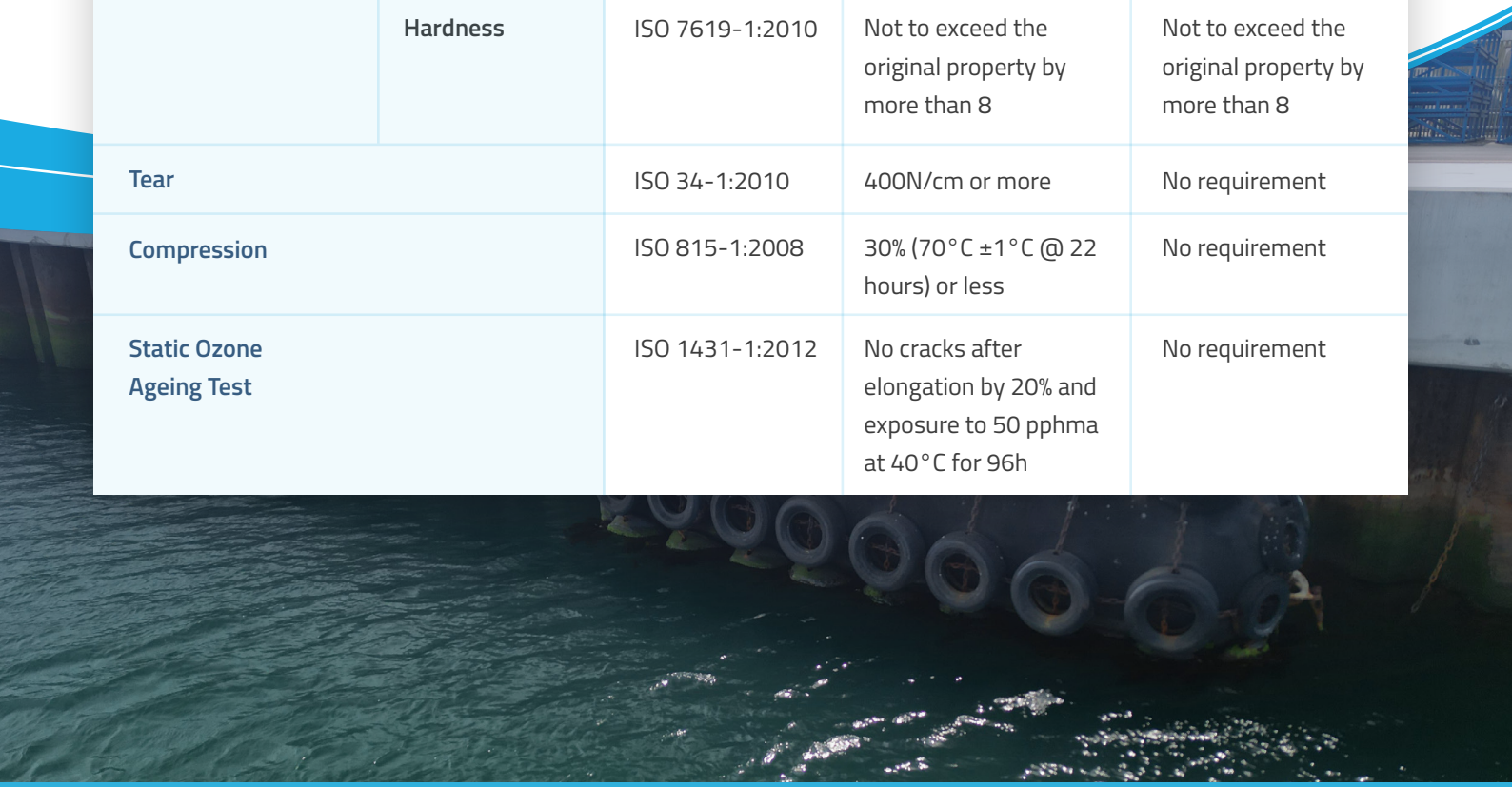
The inner rubber layers' main function is to seal the pressurised air inside the fender at 50kPa or 80kPa. It is constructed from a compound similar to that of a car tyre allowing the fender to have a consistent energy absorption.

STRUCTURE DATA

HIGH PERFORMANCE RUBBER

Our rubber is manufactured to comply with ISO 17357-1:2014 standards as detailed in the table below.

PROPERTY		TEST METHOD	REQUIRED VALUE	
			OUTER RUBBER	INNER RUBBER
Before Ageing	Tensile Strength	ISO 37:2011	18 Mpa or more	10 Mpa or more
	Elongation	ISO 37:2011	400% or more	400% or more
	Hardness	ISO 7619-1:2010	60° ±10° (Durometer Hardness Type A)	50° ±10° (Durometer Hardness Type A)
After Ageing ISO 188:2011 Air Oven Ageing 70°C ±1°C @ 96h	Tensile Strength	ISO 37:2011	Not less than 80% of the original property	Not less than 80% of the original property
	Elongation	ISO 37:2011	Not less than 80% of the original property	Not less than 80% of the original property
	Hardness	ISO 7619-1:2010	Not to exceed the original property by more than 8	Not to exceed the original property by more than 8
Tear		ISO 34-1:2010	400N/cm or more	No requirement
Compression		ISO 815-1:2008	30% (70°C ±1°C @ 22 hours) or less	No requirement
Static Ozone Ageing Test		ISO 1431-1:2012	No cracks after elongation by 20% and exposure to 50 pphma at 40°C for 96h	No requirement

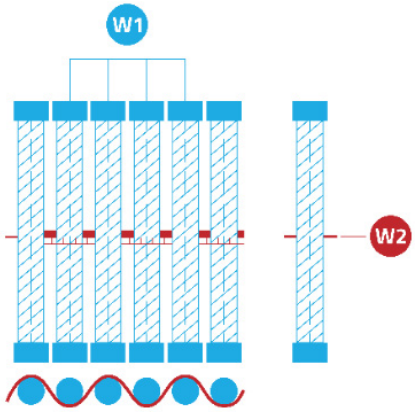


HIGH PERFORMANCE SYNTHETIC TYRE-CORD

Our synthetic tyre-cord is manufactured to comply with ISO 17357-1:2014 standards as detailed in the table below. This includes: density, tensile strength, breaking force, breaking elongation.

ITEM	UNIT	WARP	WEFT
Density	Ends/inch	24	2
Tensile Strength	N/mm2	20	0.02

High Strength Synthetic Tyre-Cord W1:Warp W2:Weft



AIR AND SAFETY VALVE

All small and medium sized pneumatic rubber fenders are equipped with an air valve that serves as an all-on-one solution to check air pressure, air charge and release. Our larger sized fenders have a small air valve, globe value and safety valve. The small air value allows for checking air pressure, while the globe value with a one touch joint coupler, is an air charge and release. The safety valve is used for releasing excess internal pressure if over compressed.

SAFETY VALVE

ENGINEERED FOR STRENGTH, BUILT FOR SAFETY

SIZE & PERFORMANCE DATA

Any size and type of fender can be customised to the customers requirement. Please contact us for any help on the correct solution.

PERFORMANCE DATA REQUIREMENTS 50KPA

NOMINAL SIZE		INTERNAL PRESSURE 50KPA AT 60% DEFLECTION			SAFETY VALVE PRESSURE SETTING	TESTING PRESSURE
DIAMETER	LENGTH	ENERGY ABSORPTION	REACTION FORCE	HULL PRESSURE		
mm	mm	kN-m	kN	kPa	kPa	kPa
500	1000	6	64	132	-	200
600	1000	8	74	126	-	200
700	1500	17	137	135	-	200
1000	1500	32	182	122	-	200
1000	2000	45	257	132	-	200
1200	2000	63	297	126	-	200
1350	2500	102	427	130	-	200
1500	3000	153	579	132	-	200
1700	3000	191	639	128	-	200
2000	3500	308	875	128	-	200
2500	4000	663	1381	137	175	250
2500	5500	943	2019	148	175	250
3000	6000	1309	2387	148	175	250
3300	4500	1175	1884	130	175	250
3300	6500	1814	3015	146	175	250
3300	10600	3067	5257	158	175	250
4500	9000	4752	5747	146	175	250
4500	12000	6473	7984	154	175	250

PERFORMANCE DATA REQUIREMENTS 80KPA

NOMINAL SIZE		INTERNAL PRESSURE 50KPA AT 60% DEFLECTION			SAFETY VALVE PRESSURE SETTING	TESTING PRESSURE
DIAMETER	LENGTH	ENERGY ABSORPTION	REACTION FORCE	HULL PRESSURE		
mm	mm	kN-m	kN	kPa	kPa	kPa
500	1000	8	85	174	-	250
600	1000	11	98	166	-	250
700	1500	24	180	177	-	250
1000	1500	45	239	160	-	250
1000	2000	63	338	174	-	250
1200	2000	88	390	166	-	250
1350	2500	142	561	170	-	250
1500	3000	214	761	174	-	250
1700	3000	287	840	168	-	250
2000	3500	430	1150	168	-	250
2500	4000	925	1815	180	230	300
2500	5500	1317	2653	195	230	300
3000	6000	1890	2906	196	230	300
3300	4500	1640	2476	171	230	300
3300	6500	2532	3961	191	230	300
3300	10600	4281	6907	208	230	300
4500	9000	6633	7551	192	230	300
4500	12000	9037	10490	202	230	300

The Rubber Company manufacture fenders with two pressures: 50kPa (Pneumatic 50) and 80Kpa (Pneumatic 80). Performance data is given below.

PRESSURE RATINGS 50KPA

NOMINAL SIZE		INTERNAL PRESSURE		MINIMUM ENDURABLE PRESSURE		SAFETY VALVE PRESSURE SETTING	TESTING PRESSURE AT 0% DEFLECTION
DIAMETER	LENGTH	AT 0% DEFLECTION	AT 60% DEFLECTION	AT 0% DEFLECTION	AT 60% DEFLECTION		
mm	mm	kPa	kPa	kPa	kPa	kPa	kPa
500	1000	50	132	300	462	-	200
600	1000	50	126	300	441	-	200
700	1500	50	135	300	473	-	200
1000	1500	50	122	300	427	-	200
1000	2000	50	132	300	462	-	200
1200	2000	50	126	300	441	-	200
1350	2500	50	130	300	455	-	200
1500	3000	50	132	300	462	-	200
1700	3000	50	128	300	448	-	200
2000	3500	50	128	300	448	-	200
2500	4000	50	137	350	480	175	250
2500	5500	50	148	350	518	175	250
3300	4500	50	130	350	455	175	250
3300	6500	50	146	350	511	175	250
3300	10600	50	158	350	553	175	250
4500	9000	50	146	350	511	175	250
4500	12000	50	154	350	539	175	250

PRESSURE RATINGS 80KPA

NOMINAL SIZE		INTERNAL PRESSURE		MINIMUM ENDURABLE PRESSURE		SAFETY VALVE PRESSURE SETTING	TESTING PRESSURE AT 0% DEFLECTION
DIAMETER	LENGTH	AT 0% DEFLECTION	AT 60% DEFLECTION	AT 0% DEFLECTION	AT 60% DEFLECTION		
mm	mm	kPa	kPa	kPa	kPa	kPa	kPa
500	1000	80	174	480	609	-	250
600	1000	80	166	480	581	-	250
700	1500	80	177	480	620	-	250
1000	1500	80	160	480	560	-	250
1000	2000	80	174	480	609	-	250
1200	2000	80	166	480	581	-	250
1350	2500	80	170	480	595	-	250
1500	3000	80	174	480	609	-	250
1700	3000	80	168	480	588	-	250
2000	3500	80	168	480	588	-	250
2500	4000	80	180	560	630	230	300
2500	5500	80	195	560	683	230	300
3300	4500	80	171	560	599	230	300
3300	6500	80	191	560	669	230	300
3300	10600	80	208	560	728	230	300
4500	9000	80	192	560	672	230	300
4500	12000	80	202	560	707	230	300

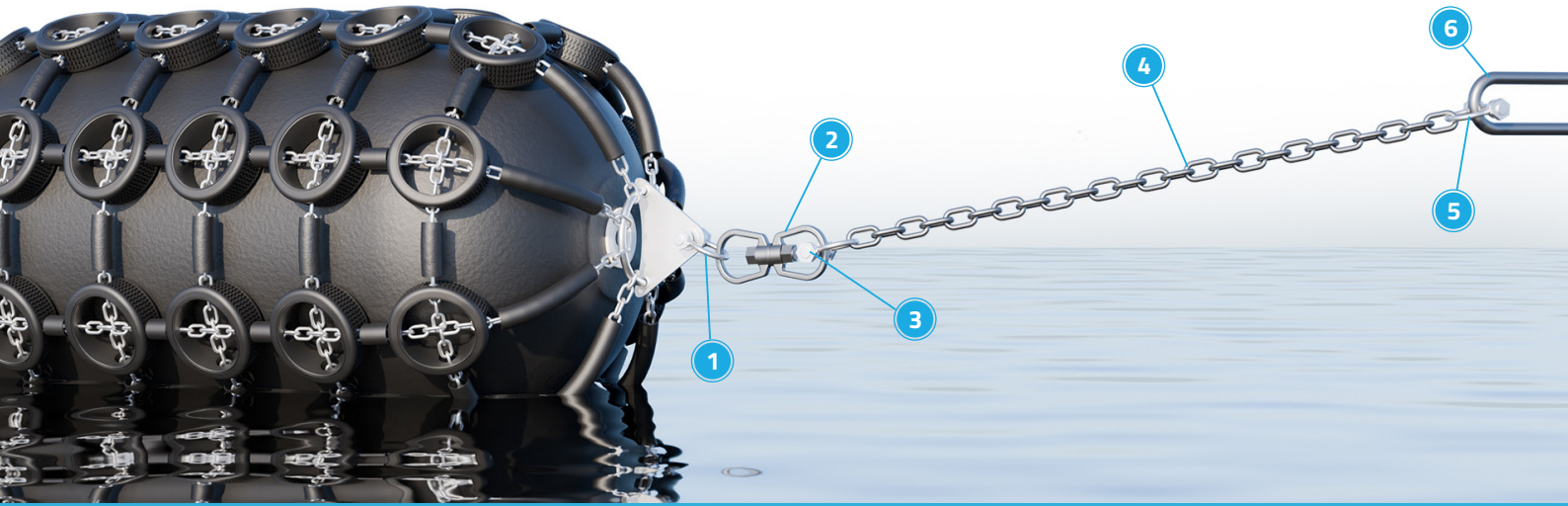
FIXINGS

Pneumatic rubber fenders are often suspended using guy chains, ropes and shackles. The recommended dimensions of the standard fittings are given in the table below.

It is important to note that mooring ropes manufactured from nylon, polypropylene, etc will provide much less strength than a steel guy chain or guy rope. The mooring rope diameter should be at least double the size of a steel guy chain or rope to compensate for this. For fenders with a diameter larger than 3300 we recommend speaking with The Rubber Company directly to enable us to provide the best fixing advice.

FENDER FIXING SIZES

NO.	1		2		3		4				5		6	
SIZE MM X MM DIAMETER X LENGTH	SHACKLE MM		SWIVEL MM		SHACKLE MM		GUY ROPE MM		GUY CHAIN MM		SHACKLE MM		ANCHOR MM	
Initial Pressure kPa	50	80	50	80	50	80	50	80	50	80	50	80	50	80
500 x 1000	13	13	13	13	13	13	16	16	16	16	13	13	26	26
600 x 1000	13	13	13	13	13	13	16	16	16	16	13	13	26	26
700 x 1500	16	16	16	16	16	16	16	16	16	16	16	16	26	26
1000 x 1500	16	16	16	16	16	16	16	16	16	16	16	16	26	26
1000 x 2000	16	16	16	16	16	16	16	18	16	16	16	16	26	26
1200 x 2000	16	16	16	16	16	16	16	18	16	16	16	16	26	30
1350 x 2500	16	16	16	16	16	16	16	20	16	19	16	16	26	30
1500 x 3000	25	25	25	25	25	25	19	24	19	20	25	25	32	32
1700 x 3000	25	25	25	25	25	25	19	24	19	20	25	25	32	32
2000 x 3500	25	25	25	25	25	25	22	28	22	24	25	25	32	36
2500 x 4000	32	32	32	32	32	32	26	32	26	30	32	32	42	42
2500 x 5500	32	32	32	32	32	32	32	40	32	36	32	32	44	50
3300 x 4500	38	38	38	38	38	38	32	38	32	34	38	38	44	50
3300 x 6500	38	38	38	38	38	38	38	46	38	42	38	38	55	60
3300 x 10600	44	48	44	50	44	48	42	46	48	54	44	48	75	75
4500 x 9000	46	52	65	72	46	52	54	65	50	58	46	52	75	75
4500 x 12000	46	52	65	90	46	52	56	65	58	68	46	52	80	85



INSTALLATION & MAINTENANCE

The Rubber Company pneumatic rubber fenders are easy to install with a low-cost maintenance. They are shipped deflated and folded on pallets or in containers for larger models. This helps to keep shipping costs to a minimum and greatly reduces the risk of damage during transportation.

Once inflated they are supported by the water and can be moored using a guy rope or chain. This enables them to be easily moved to another mooring point when not in use.

Our fenders are manufactured to very high standards, thus reducing the need for significant repairs and minimising maintenance requirements even in demanding marine environments. It is advisable however, to inspect them every three to six months as seasonal changes can affect the internal pressure. Ensure the valve is not damaged, pressure is correct and the chains are in good working order. The chain net should last three to four years before needing to be replaced.

SIMPLE TO INSTALL,
BUILT TO LAST

The RUBBER company

Manufacturers · Designers · Distributors

THE RUBBER COMPANY

THE RIGHT CHOICE FOR RUBBER FENDERS

Offering only the highest performance fender systems, at the most competitive market pricing. Contact us now with your requirement:

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Working with companies worldwide

DISLAIMER

The Rubber Company has made every effort to ensure that the technical specifications and product descriptions in this brochure are correct. We cannot accept any responsibility or liability for errors and omissions, nor damages from incorrect installation. We hereby reserve the right to change technical information and specifications without prior notice. The information provided does not constitute a guarantee of any sort. All dimensions and property values are subject to standard tolerances.

Please contact us for certified drawings and performance data in regards to specific projects. We will be happy to provide guidance on the correct fender system.