www.irmome.com

HYDRO PNEUMATIC FENDERS

IRM OFFSHORE AND MARINE ENGINEERS PVT. LTD.

INDEX

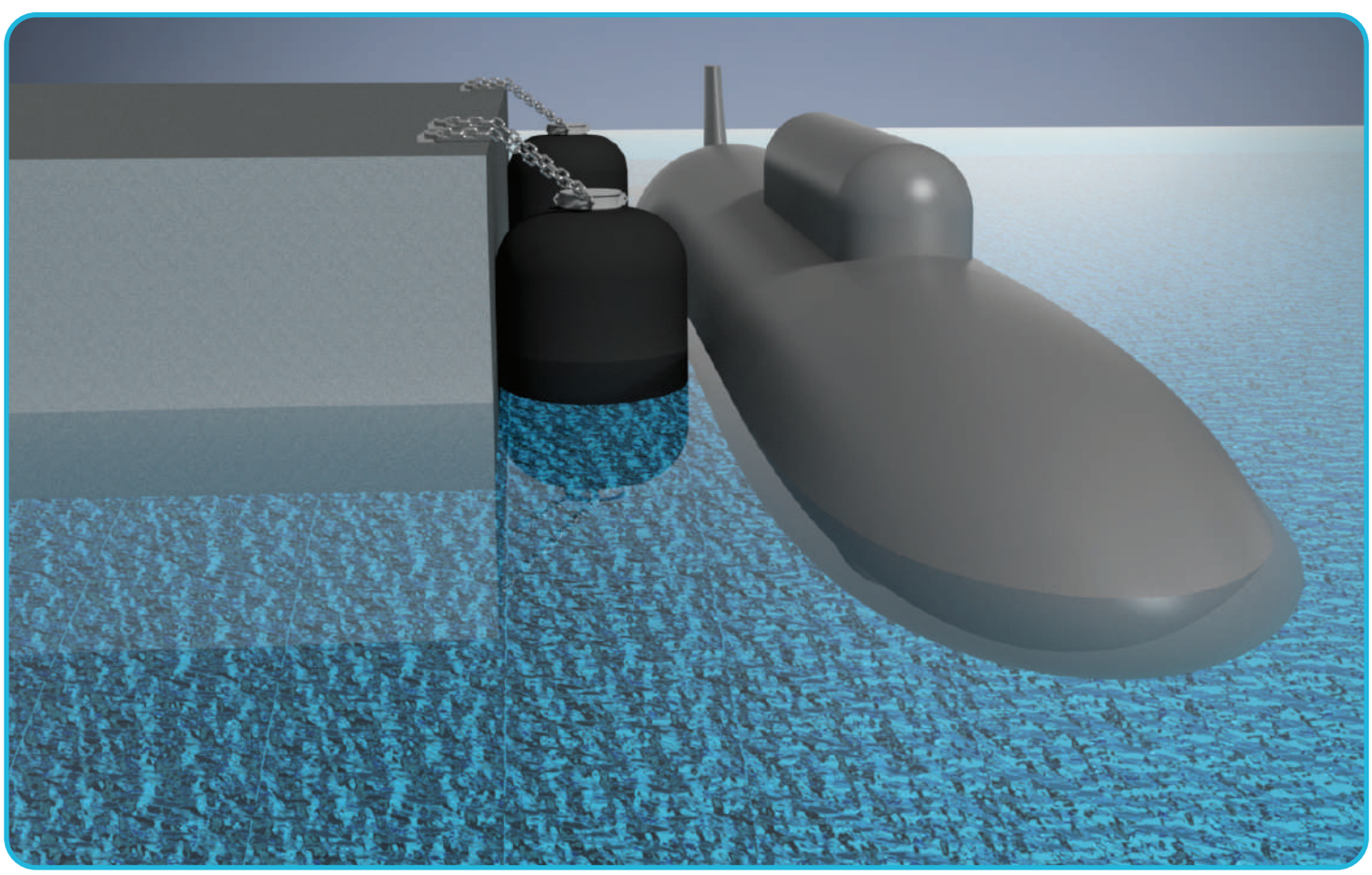
1.	Special Features	1
2.	Advantages	2
3.	Material & Construction	3
4.	Sizes, Performance & Accessories	4
5.	Installation Procedure	5
6.	Physical Properties of Rubber Compound	7
7.	Photo Gallery	8

HYDRO PNEUMATIC FENDERS

Hydro-Pneumatic Fenders are best employed for submarines. One of the most important criteria for using Hydro-Pneumatic Fenders is high energy absorption capacity and low reaction force, a vital factor for submarine applications. The Hydro-Pneumatic Fender provides a better contact area vertically which cannot be achieved through any other fendering systems and hence makes the Hydro-Pneumatic Fender the most ideal for submarine use.

Special Features:

- Performance can be adjusted by altering the air to water ratio.
- Required draft can be adjusted to suit berthing.
- Low hull pressure.
- Self-adjustment during tidal variation.
- Low installation and maintenance cost.



ADVANTAGES

FENDER PERFORMANCE:

IRM Hydro-Pneumatic Fenders offer high energy absorption capacity and lower reaction force. Due to this inherent property it absorbs most of the Kinetic energy of the submarines and offer very low reaction force to the wharf as well as submarine. Since the performance of the hydro-pneumatic fenders is due to compression of the air inside of the fenders at a fixed pressure, the fender offers the same performance and characteristics even after numerous years of service life.

EFFECTIVE RESISTANCE DURING COMPRESSION AND SHEAR:

During extreme weather condition in the sea i.e. High wave current the submarines approaches to the wharf with high momentum inducing shear force along with compression force in the fenders. Since the hydro-pneumatic fenders are made up of three composite layers it gives dual advantage to resist against the shear forces along with compression force.

LOW SUSTAINING CAPACITY OF JETTY REQUIRED FOR HOLDING THE HYDRO-PNEUMATIC FENDERS:

In case of Hydro-pneumatic fenders the fenders float due to the Buoyancy effect and the entire load of the fenders is sustained within the sea water. Hence unlike the solid fenders where the entire load of the fender and the heavy duty frontal frames comes on the jetty, in case of Hydro-pneumatic fender the jetty is free of any static load during the idle condition of the fender.

SELF ADJUSTMENT DURING TIDAL VARIATION:

The Hydro-Pneumatic fenders since floating due to Buoyancy effect floats along with the sea level. Thus the level of the fenders goes along with the tidal variation automatically and hence no need of enhanced length fenders, which make the fendering system economical.

EFFECTIVE SURFACE AREA IN VERTICAL DIRECTION:

The most important factor required for berthing of submarines is maximum coverage of vertical area on the wharf which is best achieved in Hydro-pneumatic fenders.

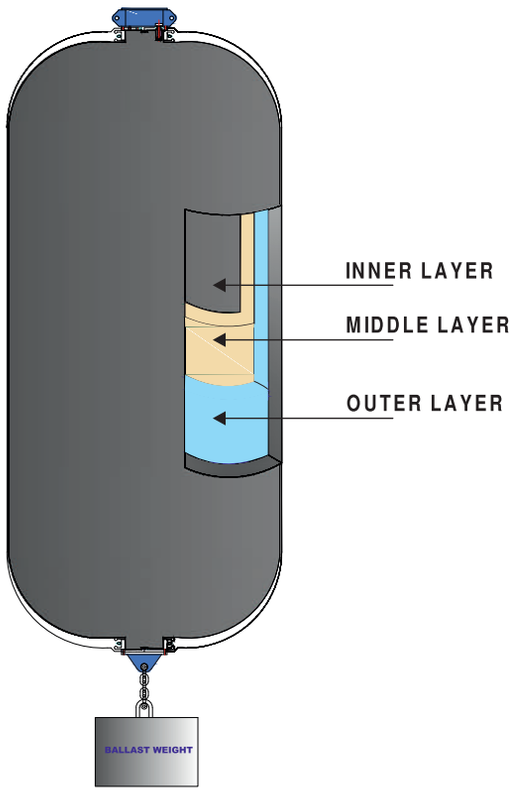
LOW INSTALLATION AND MAINTENANCE COST:

The hydro-pneumatic fenders are easy to install as they have to be just tied with the help of Guy chains which can further tied to bollards or any existing U hooks. This does not need any critical drilling or very heavy fasteners in the jetty. Hence the fenders can be installed very easily in a very short period with a very low cost. Moreover, the fenders have practically no maintenance.

SAFETY:

It is advisable to use the fenders within the prescribed limits of its stated load. However, in accidental condition in case of abnormal Berthing the total forces in the fenders gets distributed evenly in all the directions due to cylindrical shape and compressible air in the fender which minimizes the risk of damage. Hence in adverse condition the Hydro-pneumatic fender performs better unlike the Solid fenders which may damage the structure.

MATERIAL & CONSTRUCTION



The IRM Hydro-Pneumatic fender are made with high quality rubber reinforced with synthetic tyre cord fabric depending on the size and pressure requirement of the fenders. Basically the Hydro-Pneumatic Fender body is made up of 3 layers as under,

1. Outer Rubber Layer:

This rubber compound has sufficient tensile Strength, tear resistance, abrasion resistance and ozone resistance as per ISO 17357 to with stand the anticipated weather conditions, usage and external forces.

2. Middle Rubber Layer:

The middle portion is synthetic tyre cord in multiple layers to withstand and provide sufficient strength to hold the internal pressure and the fender endurable pressure in both, compressed and non compressed situation. The end of reinforcement cord layers enters the bead ring and is turned up outside the bead ring, which is built in at the flange opening.
Each single layer of synthetic tyre cord is coated with rubber compound on both the sides as well as in between synthetic tyre cord threads, hence isolating all cords from each other. As contact between synthetic tyre cord threads does not occur, synthetic tyre cord has the advantage over other reinforcement materials such as canvas fabric of reducing friction and wears between cord threads during compression, bending and stretching, and also greatly improves fatigue resistance, endurance life, and pressure holding performance.

3. Inner Rubber Layer:

The inner layer basically seals the pressurized air and water inside the fender. The rubber properties confirm to the minimum requirement of ISO 17357. The flange openings are at the both ends of the fender. The ballast weight is attached at one end and the other end has the provision for air charging, water filling and mooring of the Hydro-Pneumatic Fender. All the above layers along with the end flanges are vulcanized and molded in heavy duty steel molds under high temperature and pressure. This gives zero porosity, uniformity in the rubber compound and a consistent and high quality of rubber throughout the body of Hydro-Pneumatic Fender.
Once the fender is molded it is taken out from the mold and inspected for its conformance to the required quality standards. Thereafter the safety valves, flange covers, air charging valves, water valves etc. are fitted as per the size and requirement of the fender.

SIZES, PERFORMANCE & ACCESSORIES

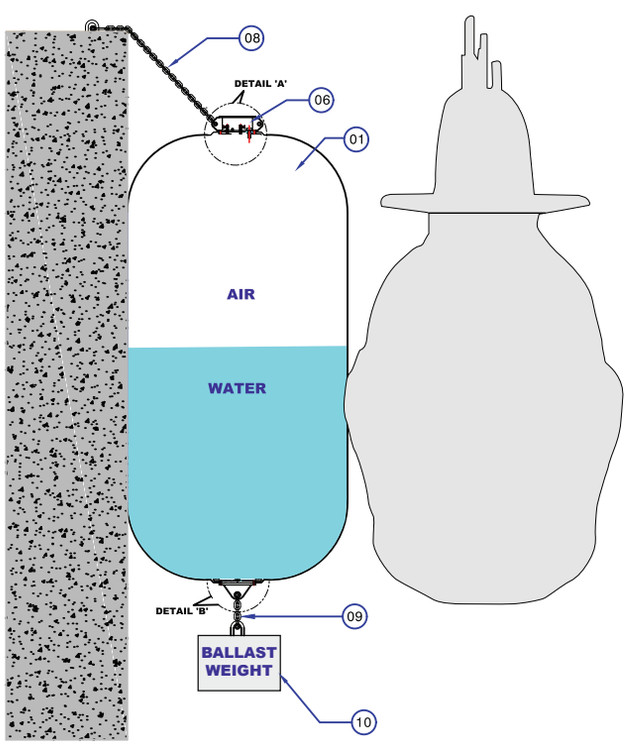
PERFORMANCE TABLE

MODEL NO	NOMINAL SIZE	ENERGY ABSORPTION (GEA)	REACTION FORCE	BALLAST WEIGHT
	DIA. X LENGTH	E	R	W
	mm X mm	kNm	kN	kg
DHP 1030	1000 x 3000	14.71	90.22	500
DHP 1240	1200 x 4000	40.21	152	500
DHP 1545	1500 x 4500	55.90	211.82	1000
DHP 1560	1500 x 6000	57.86	309.89	1000
DHP 1772	1700 x 7200	145.14	600.17	1500
DHP 2060	2000 x 6000	160.83	586.44	2000
DHP 2555	2500 x 5500	235.36	696.27	2150
DHP 3365	3300 x 6500	620.76	1214.06	3000
DHP 33106	3300 x 10600	795.32	1513.17	5000
DHP 45120	4500 x 12000	1057.16	1978.98	9000

THE ABOVE PERFORMANCE VALUES ARE BASED ON THE FOLLOWING:
AIR WATER PROPORTION : 40 : 60
INTERNAL AIR PRESSURE : 0.5 bar
THE PERFORMANCE OF THE HYDRO - PNEUMATIC FENDERS CAN BE VARIED BY ADJUSTING THE AIR WATER RATIO AND INTERNAL PRESSURE.

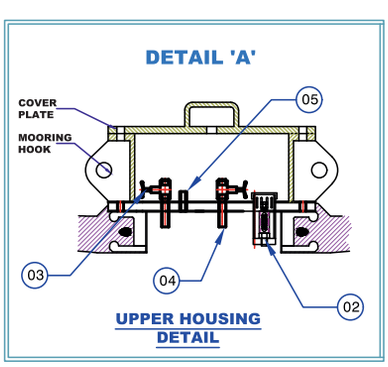
(R: REACTION FORCE (KN) , E: ENERGY ABSORPTION (KNM), TOLERANCE +10%.)

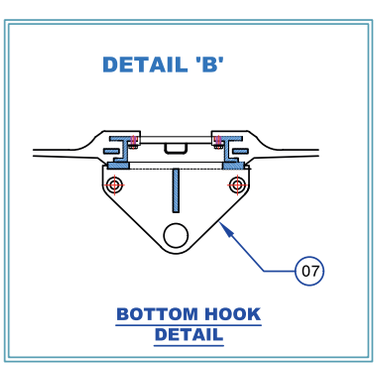
ACCESSORIES



1. RUBBER FENDER BODY
2. SAFETY VALVE
3. WATER CHARGING VALVE
4. AIR CHARGING VALVE
5. PRESSURE CHECK VALVE
6. UPPER HOUSING
7. LOWER TOWING RING
8. GUY CHAINS
9. BALLAST CHAIN
10. BALLAST WEIGHT

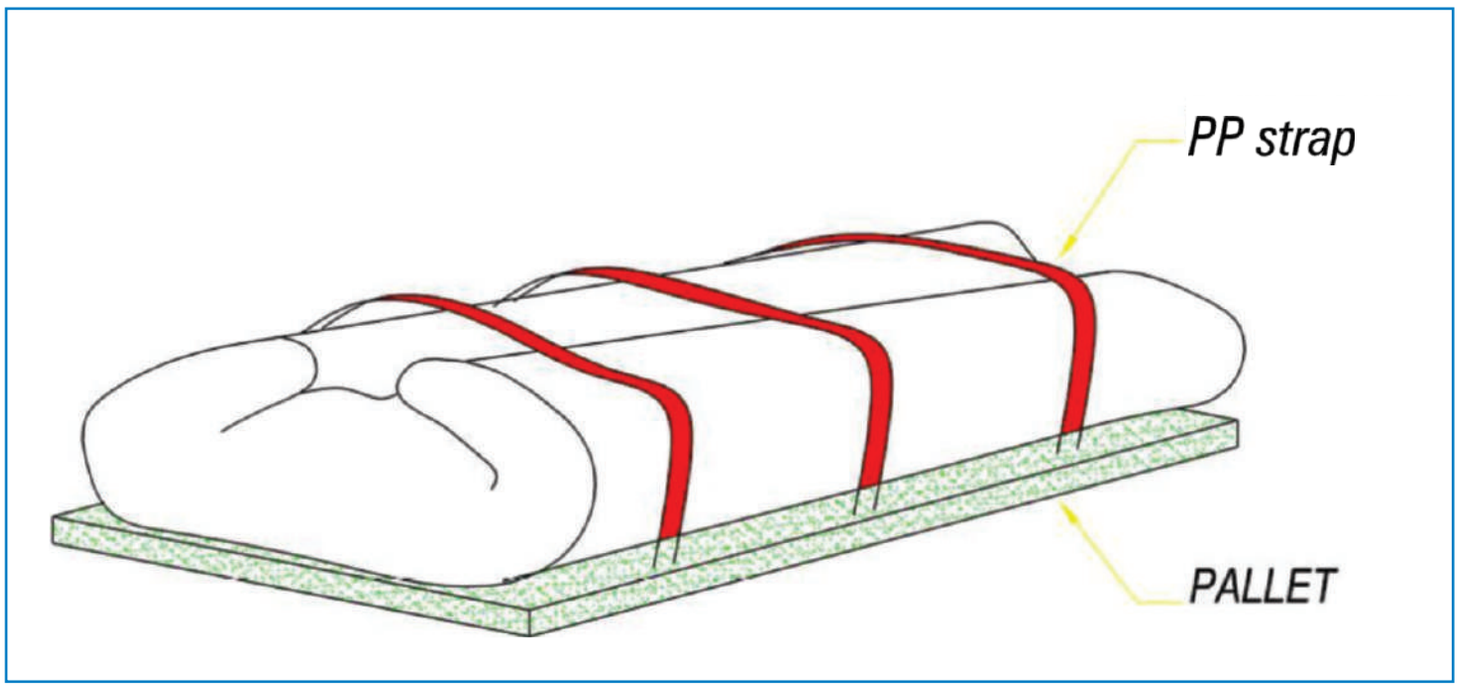
Note : For more details refer to our manufacturing drawing



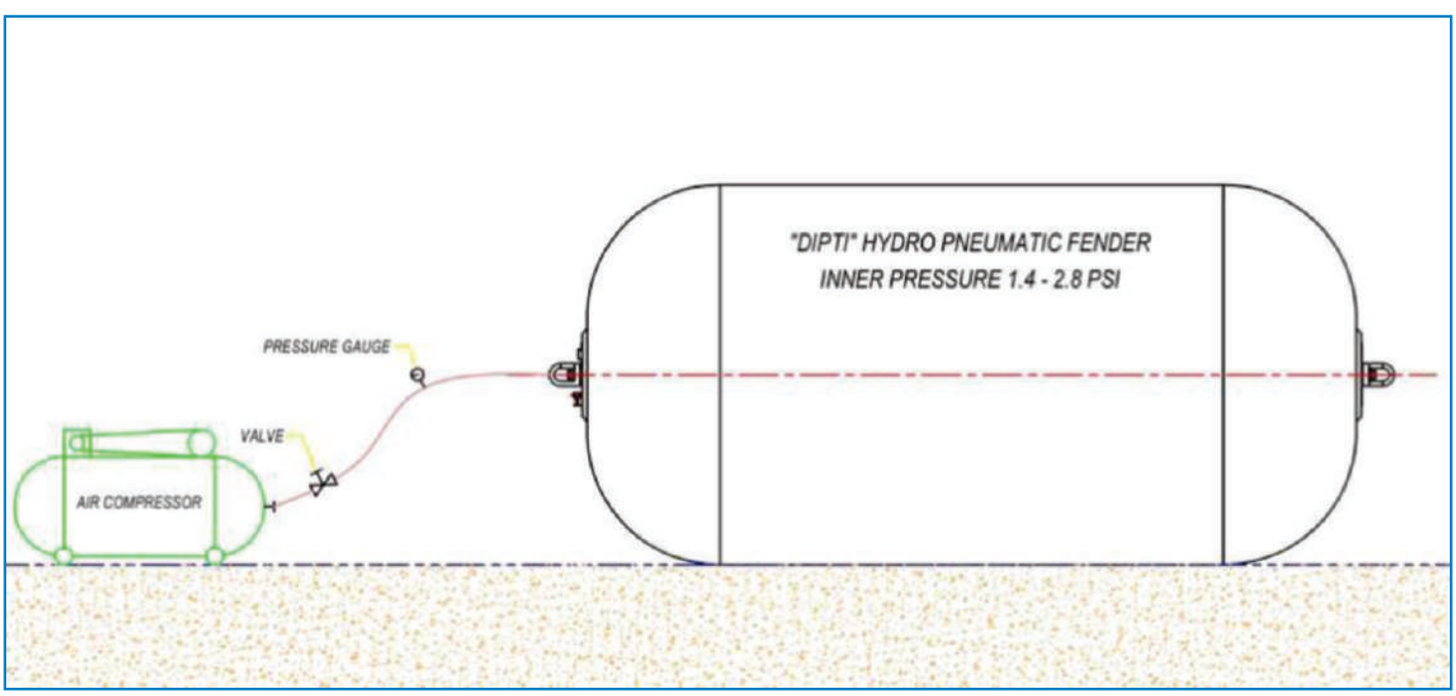


INSTALLATION PROCEDURE

1. Unpacking of fender

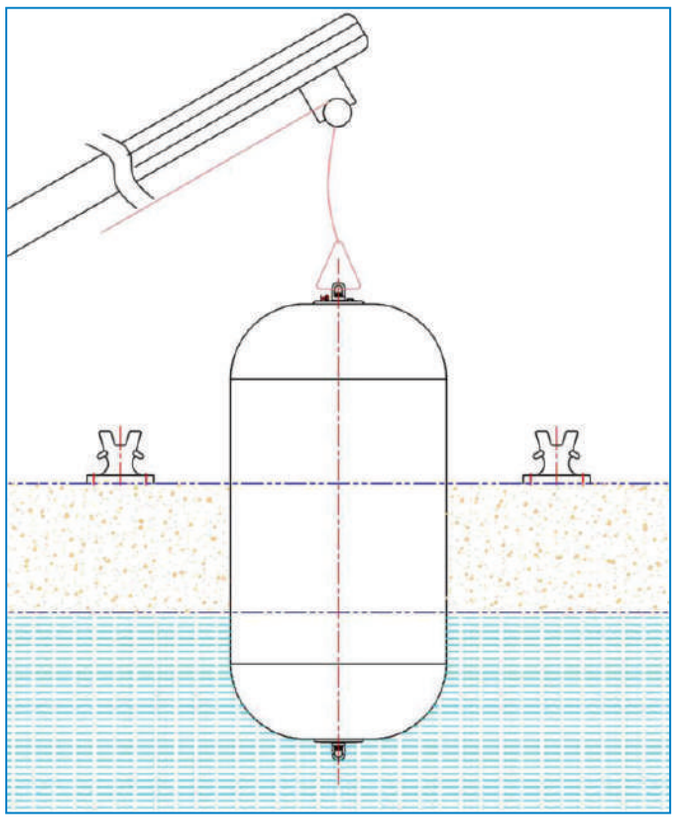


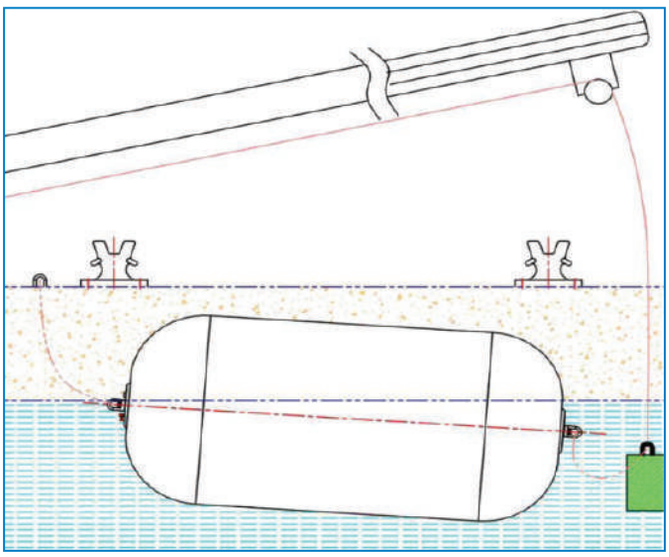
2. Pre air charging of fender



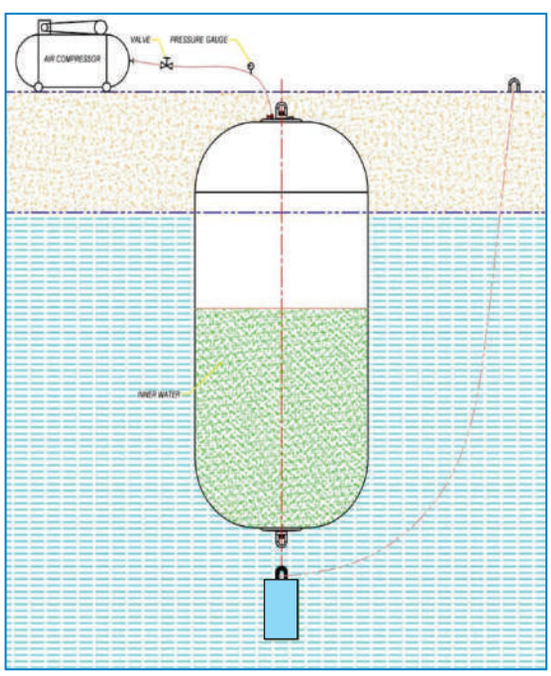
INSTALLATION PROCEDURE

3. Launching the fender on water

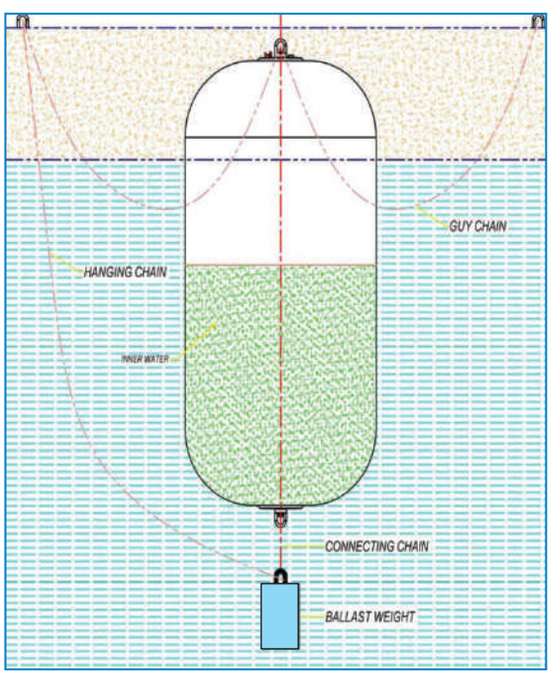




4. Water and Air Charging up to the desigred level and Air Pressure



5. Final Installation of Fender



Note : Detail Installation Manual is provided along with Supply of Fenders.

PHYSICAL PROPERTIES OF RUBBER COMPOUND

TEST ITEM	TEST METHOD	REQUIRED VALUE	
		OUTER RUBBER	INNER RUBBER
1.0 Before aging	—	—	—
1.1 Tensile strength	ISO 37:2011 / eqvt. ASTM standard	18 MPa or more	10 MPa or more
1.2 Elongation	ISO 37:2011 / eqvt. ASTM standard	400% or more	400% or more
1.3 Hardness	ISO 7619-1: 2010 / eqvt. ASTM standard	60 ± 10 (Durometer hardness Type A)	50 ± 10 (Durometer hardness Type A)
2.0 After aging	ISO 188:2011 / eqvt. ASTM standard	Air oven aging, 70°C ± 1°C, 96 hours	Air oven ageing, 70°C ± 1°C, 96 hours
2.1 Tensile strength	ISO 37:2011 / eqvt. ASTM standard	Not less than 80% of the original property	Not less than 80% of the original property
2.2 Elongation	ISO 37:2011 / eqvt. ASTM standard	Not less than 80% of the original property	Not less than 80% of the original property
2.3 Hardness	ISO 7619-1:2010 / eqvt. ASTM standard	Not to exceed the original property by more than 8	Not to exceed the original property by more than 8
3.0 Tear	ISO 34-1:2010 / eqvt. ASTM standard	400 N/cm or more	No requirement
4.0 Compression set	ISO 815-1:2008 / eqvt. ASTM standard	30% (70°C ± 1°C for 22 h) or less	No requirement
5.0 Static ozone aging test	ISO 1431-1:2012	No cracks after elongation by 20% and exposure to 50 pphm[a] at 40^0 C for 96 hours	No requirement

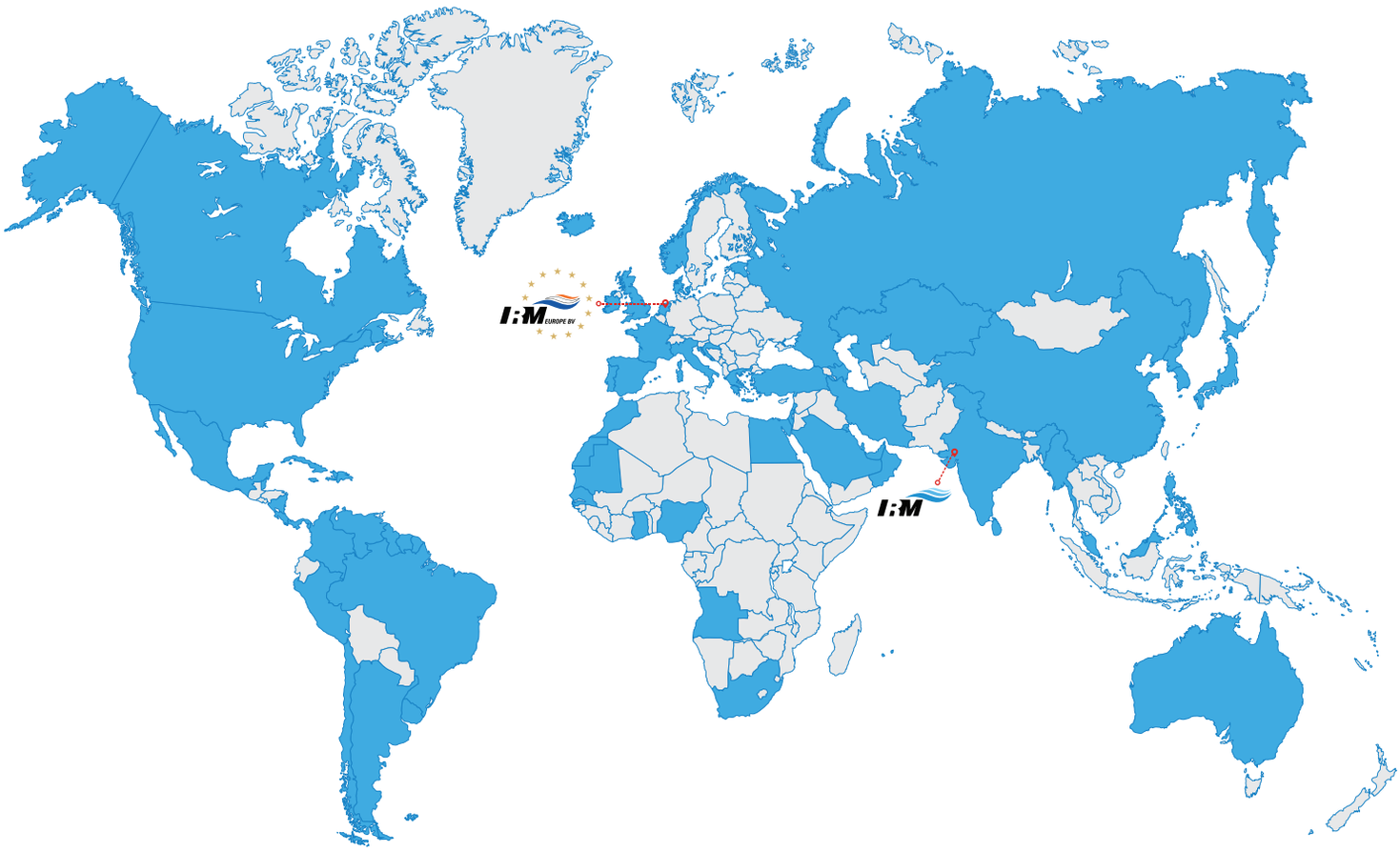
NOTE :

If the colour of the outer cover is not black, the material requirements will differ from those in this table.

[a]: Parts of ozone per hundred million of air by volume.

PHOTO GALLERY

IRM PRODUCTS WORLD WIDE



IRM OFFSHORE AND MARINE ENGINEERS PVT. LTD.

www.irmome.com

Block No. 707, Nandoli Road, Rancharda, Via Thaltej - Shilaj,
Ahmedabad - 382 115, Gujarat - India

M : +91 9825 067611 / +91 9727 738407

E : sales@irmome.com | marketing@irmome.com

IRM EUROPE BV

www.irmeurope.com

Concordiastraat 84, 1951 AS Velsen-Noord, The Netherlands

M : +31 6268 93082 / +39 3355 648598

E : sales@irmeurope.com | marketing@irmeurope.com

HPF R-03/2022

Connect with us:

- irmome
- irmome
- irm-offshore-marine-engineers
- IRM Offshore and Marine Engineers IRMOME

BUREAU VERITAS Certification
A COMPANY CERTIFIED FOR MCC BY BUREAU VERITAS

MEMBER

ISO 9001:2015
ISO 14001:2015
ISO 45001:2018
BUREAU VERITAS Certification

UKAS MANAGEMENT SYSTEMS 0008

Total Solutions to Protect Your Structures