

Hydro-Pneumatic Fenders

DESIGNED FOR GREATER DURABILITY



Trusted since 1905

With over 100 years of industry-leading expertise in engineered polymer solutions that seal, damp and protect critical applications in demanding environments, Trelleborg Marine and Infrastructure is one of the most trusted and reliable suppliers of high-quality marine solutions for all applications.

Trelleborg's Hydro-Pneumatic Fenders (HPNE) are manufactured based on ISO 17357-1:2014 standards and have unique and high-performance characteristics derived from Trelleborg's attention to detail during the manufacturing process. These characteristics combine low reaction force and hull pressure with high energy absorption for excellent berthing capabilities that remain consistent throughout varying angular compressions. The fenders incorporate a rugged construction to provide increased durability and performance, reducing the risk of operational downtime and increasing service life.

This comprehensive approach comprises research and development, superior design, high-quality materials, stringent quality control procedures, and testing.

Trelleborg's fender systems can be integrated with SmartPort technology, a digital platform that integrates data-driven assets to provide stakeholders a holistic view of operations and to improve communication and decision-making.

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Hydro-Pneumatic Fenders

Hydro-Pneumatic Fenders (HPNE) are primarily used for berthing submarines and vessels that have low free board and high draft, which may result in fender contact below the waterline.

Trelleborg's HPNE fenders are designed and manufactured to be stronger and more durable than standard pneumatic fenders due to added pressure requirements. The fender is partially water-filled and, then pressurized with air and ballasted to ensure the fender stays at the designed draft line, allowing it to operate efficiently in submerged conditions. The volume of the water within the fender is closely related to the reaction force, guaranteed energy absorption and minimum endurable pressure.



Benefits of HPNE fenders

- High energy absorption
- Low reaction force
- Low maintenance
- Improved air retention properties
- Customizable design
- Sub-surface contact face
- Very low hull pressures
- Variable draft
- Prevent acoustic tile damage

Applications

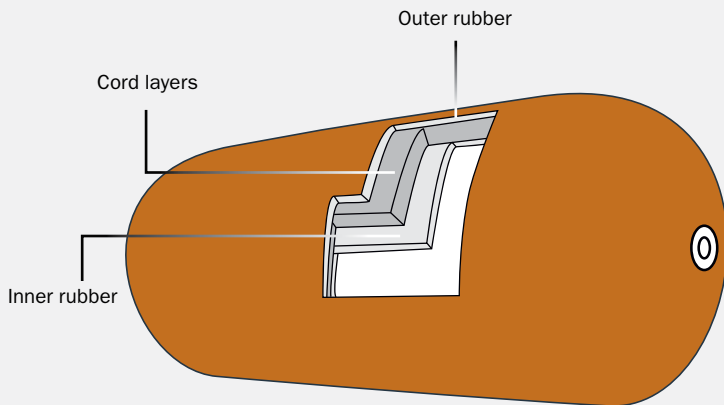
- Submarines
- Fast ferries (selected)
- Semi-submersible oil rigs

Better by design

DESIGNED TO ISO 17357-1:2014 STANDARDS

Trelleborg's Hydro-Pneumatic Fenders (HPNE) are designed, manufactured and certified based on ISO 17357-1:2014 standards.

ISO 17357-1:2014 details three major elements of construction and physical properties:



OUTER RUBBER

The tough abrasion-resistant, improved tensile strength and tear resistant outer rubber is designed to provide maximum strength, safety and to protect the inner rubber and tire-cord layers from damage by external forces. The material has mechanical properties to withstand the arduous operational conditions for which the fenders are designed.

TIRE-CORD LAYER

The reinforcement fabric is based on the ISO 17357-1:2014 standard and is layered with a

rubber compound to provide a 1.5x increase in burst pressure, reduce friction and wear during bending, compression and stretching. The same compound isolates each thread within the layer. This greatly enhances the ability of the fender to hold pressure as well as improve fatigue resistance and extend endurance life. It is crucial that tire-cord layers are arranged at an optimum angle, in order to ensure the distribution of load is even and to ensure high strength.

INNER RUBBER

The inner rubber's primary function is to conceal pressurized air inside the fender body at 50kPa or 80kPa. For this, Trelleborg has developed a unique inner layer utilizing a specific compound and special curing process to increase air retention properties up to six times higher than industry standards. The compound is designed to improve airtightness and help our customers to further reduce service interactions and maintenance costs.

These layers are vulcanized at a high pressure in a mold and hardened at a high temperature, which ensures superior bonding between layers of dissimilar characteristics.

Trelleborg takes many steps to ensure that the fenders are optimally designed and manufactured to the highest quality, that the performance is consistent throughout its lifetime, and that the design parameters are acceptable for each unique application.

Features

UNIQUE DESIGN OPTIMIZES SAFETY

Trelleborg has a newly-designed standard top plate that allows for easier safety valve service and maintenance inspections through isolating the valve while the fender remains pressurized. The top plate consists of several components, including an air valve, water charging valve and safety valve. The safety valve is a critical component that requires regular inspection, maintenance, calibration or replacement.

The function of the safety valve is to control the internal fender pressure and prevent fender damage in the event of over compression and abnormal berthing. The safety valve does this by releasing excessive pressure and protecting the long-term integrity of the fender. The selection of the top plate components and the mounting style directly impacts ease of accessibility and maintenance procedures.



Fender Selection

For assistance on fender selection suited to your application, please contact Trelleborg to ensure you are selecting the correct HPNE fender to protect your assets and optimize the lifespan of your fender.

ONSHORE/OFFSHORE TOP PLATE

Trelleborg's onshore/offshore mounting option is equipped with a three-way function for the isolation of critical components. It is operated by a rotating top plate and eliminates the need to remove the fender from the water.

Air Charging

When rotating the top plate to the air charging position, the operator can safely check the air pressure and inflate/deflate the fender to the required pressure level and water fill levels.

Safety Valve Testing

Rotating the top plate to the safety valve testing position will isolate the safety valve from the fender, allowing operators to proceed with inspection, maintenance, replacement or repair procedures.

Operational Mode

Rotating the top plate to the operational position and closing the rotating lid will re-engage the fender system back to the operational position.



HPNE SIZES AND PERFORMANCE

DIAMETER X LENGTH (mm x mm)	INITIAL INTERNAL PRESSURE (kPa)	SHIP RADIUS (mm)	WATER RATIO (%)	GUARANTEED ENERGY ABSORPTION (kJ)	REACTION FORCE AT GEA (kN)	HULL PRESSURE AT GEA (kPa)	DEFLECTION AT GEA (%)
1500 x 6100	50	3000	60%	131	562	140	51%
	80			186	754	188	
1700 x 7200	50	4000	65%	167	682	137	47%
	80			239	918	184	
2000 x 6000	50	4000	70%	135	544	131	41%
	80			194	736	177	
2500 x 5500	50	4500	65%	225	769	135	41%
	80			322	1035	182	
2500 x 7700	50	4500	70%	326	1016	136	41%
	80			470	1368	183	
3300 x 6500	50	4500	75%	307	887	127	35%
	80			442	1203	173	
3300 x 10600	50	5000	65%	1003	2137	142	47%
	80			1429	2863	190	
4500 x 9000	50	5000	60%	1439	2401	138	46%
	80			2059	3228	185	
4500 x 12000	50	6000	65%	1977	3198	141	46%
	80			2819	4277	189	

The table above is to be used for reference only. The required energy absorption and reaction forces can be manufactured to suit your application. Due to the very specialist nature of Hydro-pneumatic fenders, it is strongly advised that a detailed study be carried out for each case.



Maintenance

A major advantage of Trelleborg's Hydro-Pneumatic Fenders (HPNE) is its simple and minimal maintenance requirements.



REDUCED MAINTENANCE

At Trelleborg, we have designed our fenders to minimize the time needed for routine maintenance, which means less disruption to our customers' operations and more efficient throughput and transfer activities.

Inspection

Trelleborg's fenders are designed to last. It is advisable to carry out scheduled inspection of the fender condition in line with our Handling, Storage, Inspection and Maintenance instructions. Any minor cuts and abrasions on the fender's surface can be treated early, to prolong the lifespan of the fender.

Repair

A fender repair kit is provided with each Trelleborg fender, which includes materials and instruments for minor repairs. However, for fenders requiring major repairs, please contact your local Trelleborg office for assistance.

Aftersales

Trelleborg Marine and Infrastructure offers an after-sales service, providing maintenance, repairs and training to assist you with your needs.

HPNE SmartFenders

Trelleborg's HPNE SmartFenders continuously monitor fender performance, providing valuable insights that can help extend asset life, prevent downtime and optimize maintenance schedules.

The connected fender monitors internal pressure, temperature and geographical location. The data generated is accessible via a designated user interface, allowing users to be notified of any unusual fender parameters that may require attention, or to gain assurance that the fender is in good condition for berthing operations.

Benefits of using HPNE SmartFenders

HPNE SmartFenders help improve the operational efficiency of offshore mooring and transfer operations by:

- Ensuring asset operability, avoiding downtime linked to abnormal conditions or insufficient pressure
- Assessing fender status, facilitating preventative maintenance to extend asset life
- Providing insight into fender occupancy, infrastructure utilization and future investment needs
- Providing online asset records, maintenance schedules and history log



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Trelleborg is a world leader in engineered polymer solutions that seal, damp and protect critical applications in demanding environments. Its innovative solutions accelerate performance for customers in a sustainable way.

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