



# Ship To Ship Operations



# Creating complete flexible containment solutions

**Trelleborg Flexible Containment Solutions** (formerly Dunlop GRG), design, develop and manufacture polymer fabrications for many industries. For over 40 years we have been producing an extensive range of products, particularly in the field of heavy duty, rubber-coated textile, PU, TPU and PVC fabrications. Our experience in many challenging settings, industries and applications, has allowed us to continuously improve and develop our products for demanding commercial operations around the world.

Being part of the **Trelleborg Engineered Fabrics** division of the **Trelleborg Group**, one of the largest polymer processors in the world, puts us in a unique position. While working closely with you developing your project, we are supported by a large group of companies with a broad scope of technical expertise resulting in single ownership from raw material to finished product.

With direct access to a large inventory in the supply chain, we are able to maximise product availability, keeping costs and lead times to a minimum, while still providing a highly personal service delivered by an experienced team.

Based in Manchester in the UK, Trelleborg Flexible Containment Solutions has been part of the Trelleborg Group since 2005.

We supply a wide range of markets including the defence, maritime, petrochemical, power, security, agriculture and offshore industries. The Trelleborg Engineered Fabrics division works across technologically advanced industries to produce polymer-coated fabrics worldwide. By developing the optimum solution for your application we go further to engineer the fabric of industry.



## PRODUCT OVERVIEW

Trelleborg low-pressure (LP) floating pneumatic fenders play an essential role in the safe berthing of ships at sea in an emergency or other operations such as refuelling. Unlike other fenders, Trelleborg LP fenders are designed to spread berthing forces over a large area, achieving a far lower load reaction than any other fender system. This makes them ideal for use when berthing naval vessels with thin or weakened hulls.

While durable enough to stand up to the most hostile environments at sea, the LP fenders are considerably lighter than a high-pressure fender of equivalent performance, and can easily be carried, inflated and deployed in a range of emergency applications.

They are also easy to deflate and store for later use. Available in a range of standard sizes, they can also be custom made to a specific requirements. Trelleborg have been supplying LP pneumatic fenders to the maritime industry for over 30 years.



### FEATURES & BENEFITS

- Avoid high developed pressure upon the hull structure of vessels during berthing
- Effectively absorbs the kinetic energy of the moving vessel during the berthing operation
- Spreads berthing forces over a large area
- A far lower load reaction is achieved than any other fender system, including solid rubber, foam filled and high-pressure pneumatic fenders
- Ideal for use with thin-hulled or weakened vessels or those sensitive electronic systems requiring protection when berthing

**LP Fender units** can easily be carried, inflated and deployed in a range of emergency applications via air, sea or land. This flexibility makes them particularly suited to ship to ship operations and has a significant impact on time and costs of transport. As they can be transported and deployed quickly, the fenders are key to preventing oil spill from damaged vessels, thereby minimising damage to people and the environment.

**Easy to deflate and store** for later use. When deflated they can be rolled into small, lightweight packages and are therefore increasingly becoming a permanent Health and Safety requirement onboard ships. This can in turn reduce the insurance costs for vessel operation. As they operate at a nominal pressure of 70mbar (1Psi), any convenient air supply, compressor or blower, can be used for inflation. The low pressure also makes repairs and maintenance easier to carry out.

**Durable and unencumbered by external fittings**, the units can be towed while inflated and attachments suitable for towing and mooring can be provided at each end of the fender. In addition girthing ropes are fitted for ease of handling, and are easily maneuvered with ordinary ships' mechanical handling gear.

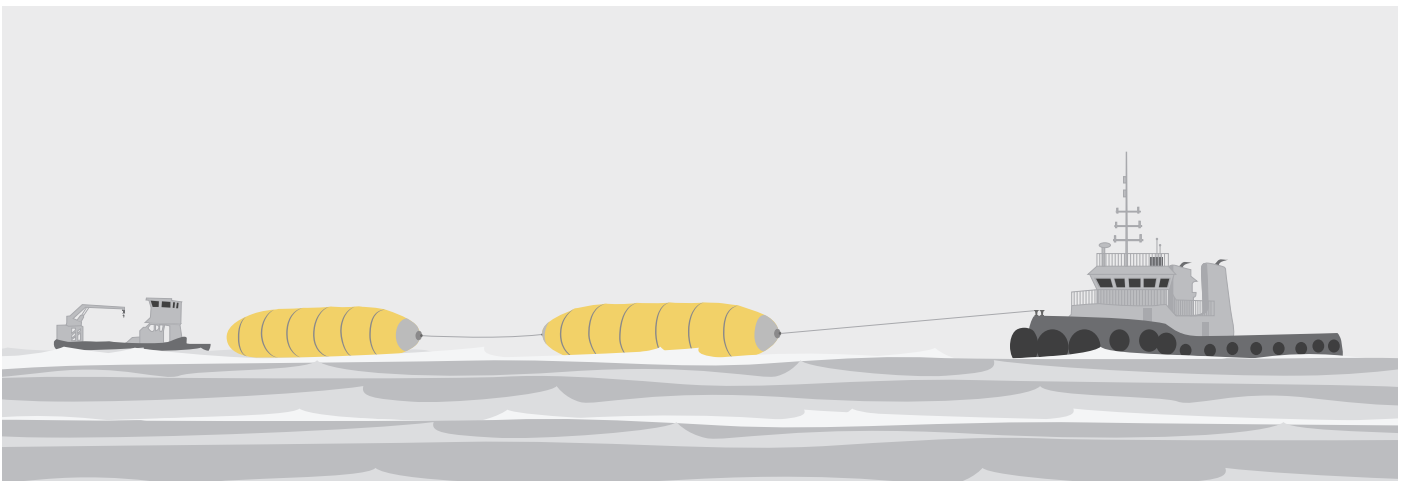
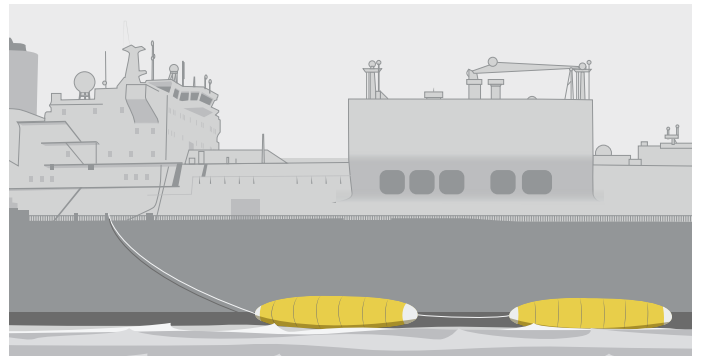


## APPLICATIONS

A high-energy absorbing capacity coupled with ease of handling enables ships of even the largest tonnage to be safely fendered in various conditions and berthing operations. Trelleborg LP pneumatic fenders are in operation worldwide in many applications both military and commercial.

These include ship to ship transfer and refuelling, offshore mooring, naval applications, salvage and cargo recovery and emergency floatation. They are in use for military operations at sea by both the UK and US Navy. Many commercial companies specialising in salvage and emergency response also use Trelleborg fenders.

They feature in the operations of the International Salvage Companies who specialise in providing a quick response to marine emergencies around the globe and by specialist shipbuilders.



## GENERAL DESCRIPTION

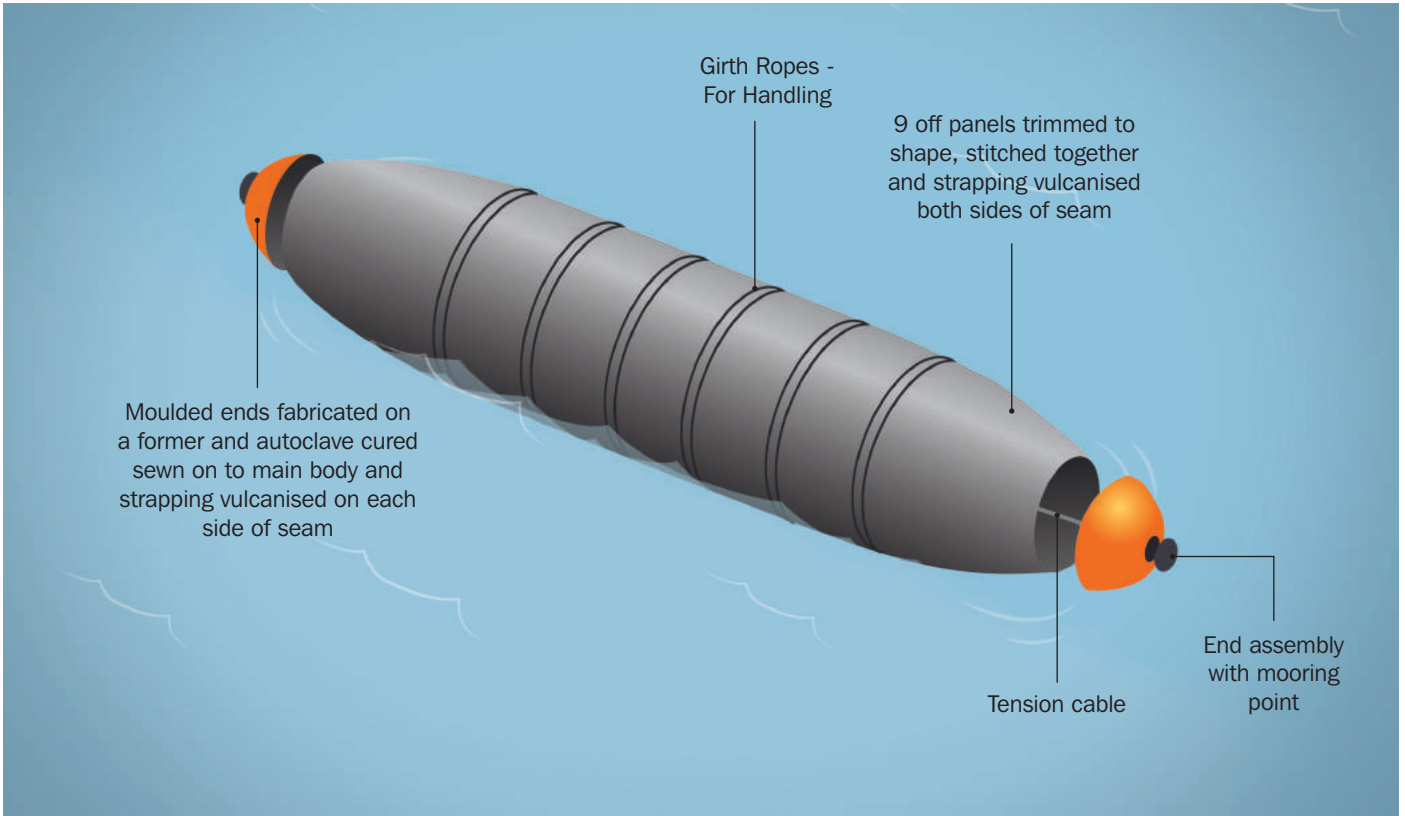
<b>UNIT SPECIFICATION</b>	Manufactured in diameters from 1.0m to 4.5m; lengths of fenders can be made to customer requirements.
<b>MATERIALS AND CONSTRUCTION</b>	Constructed from a woven high tenacity, continuous filament nylon-based fabric, coated on both sides with an abrasion resistant synthetic rubber compound. Individual sections are constructed such that they are of strength equivalent to the base material or fabric.
<b>LOAD REACTION</b>	The maximum specific load reaction pressure that can be developed from a LP fender occurs at at 60% compression and is 11 tonnes per m <sup>2</sup>
<b>ENERGY ABSORPTION</b>	Dependent on the size of the fender
<b>INFLATION AND DEFLATION</b>	Units operate at a nominal pressure of 70mbar (1Psi). Any convenient air supply, compressor or blower can be used for inflation.

Trelleborg LP pneumatic fenders are made to the ISO 17357-2:2014 specification

### Accessories

- Blower unit
- Inflation adaptor
- Repair kits
- Lifting slings
- Medium duty delivery and suction hose
- Transportation/storage case
- Pressure gauge assembly
- Cargo nets

NOMINAL SIZE (M)		NOMINAL WEIGHT (KG)	APPROX. FOLDED SIZE (M) LENGTH X WIDTH X HEIGHT	(TYPICAL) FENDER END CONSTRUCTION
DIAMETER	LENGTH			
1.0	5.0	90	1.5 x 0.8 x 0.7	}Parcel End
1.0	6.0	110	1.5 x 0.9 x 0.7	
1.0	8.0	140	1.5 x 0.9 x 0.8	
1.5	4.0	110	1.6 x 0.8 x 0.7	
1.5	5.0	135	1.6 x 0.9 x 0.8	
1.5	6.0	160	1.6 x 1.0 x 0.9	
1.5	8.0	210	1.6 x 1.0 x 1.0	
1.8	6.0	210	1.8 x 1.0 x 0.9	}Clamped End
1.8	8.0	270	1.8 x 1.0 x 1.0	
1.8	10.0	330	1.8 x 1.2 x 1.1	
1.8	12.0	390	1.8 x 1.2 x 1.2	
2.3	8.0	360	2.0 x 1.0 x 1.0	
2.3	10.0	440	2.0 x 1.2 x 1.0	
2.3	12.0	520	2.0 x 1.2 x 1.2	
2.3	16.0	680	2.0 x 1.4 x 1.3	}Moulded End
2.75	10.0	600	3.8 x 1.3 x 1.25	
2.75	14.0	800	3.8 x 1.45 x 1.35	
2.75	18.0	1200	3.8 x 1.6 x 1.4	
2.75	22.0	1600	3.8 x 1.7 x 1.55	
3.2	12.0	800	3.8 x 1.4 x 1.3	
3.2	16.0	1040	3.8 x 1.5 x 1.4	
3.2	20.0	1280	3.8 x 1.65 x 1.5	
3.2	24.0	1520	3.8 x 1.75 x 1.6	
4.5	18.0	1600	3.8 x 1.6 x 1.45	
4.5	22.0	2000	3.8 x 1.7 x 1.6	
4.5	26.0	2400	3.8 x 1.8 x 1.75	
4.5	30.0	2800	3.8 x 1.9 x 1.9	



	STANDARD	DESCRIPTION	REMARKS
Material Testing	Various international standards.	Properties of the rubber coating compound	Hardness/tensile/elongation before ageing to be tested on every batch.  Static Ozone Ageing, type approval for any new formulations
Dimensional Inspection		Properties of the coated textile  Length +10%, -5% Diameter +15%, -5%	Abrasion resistance/breaking and tear strength/Surface coat adhesion to be tested on every production lot.  Dimensional inspection to be carried out at the working pressure
Air Leakage	ISO 17357-2	Pressure drop and soapy water test carried out at the working pressure	All fenders to be tested for each and every order
Hydrostatic Test			The frequency of the test shall be one in 20 fenders for each size.

Dunlop low pressure fenders have also undergone third party type approval testing based on the requirements of ISO 17357:2002. These tests included parallel plate compression, compression recovery, angular compression and durability testing. The results of these tests confirmed previous test data and theoretical performance ratings and were witnessed, reviewed and endorsed by the American Bureau of Shipping. Further details of the testing procedures and the results can be provided on request.





Trelleborg Flexible Containment Solutions is part of the Engineered Fabrics division of Trelleborg, a world-leading engineering group developing advanced polymer technology solutions that seal, damp and protect people and processes. With 100 years of experience and continual research, we engineer the fabric of industry through customised and pre-conceived solutions adapted to your exact application.

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