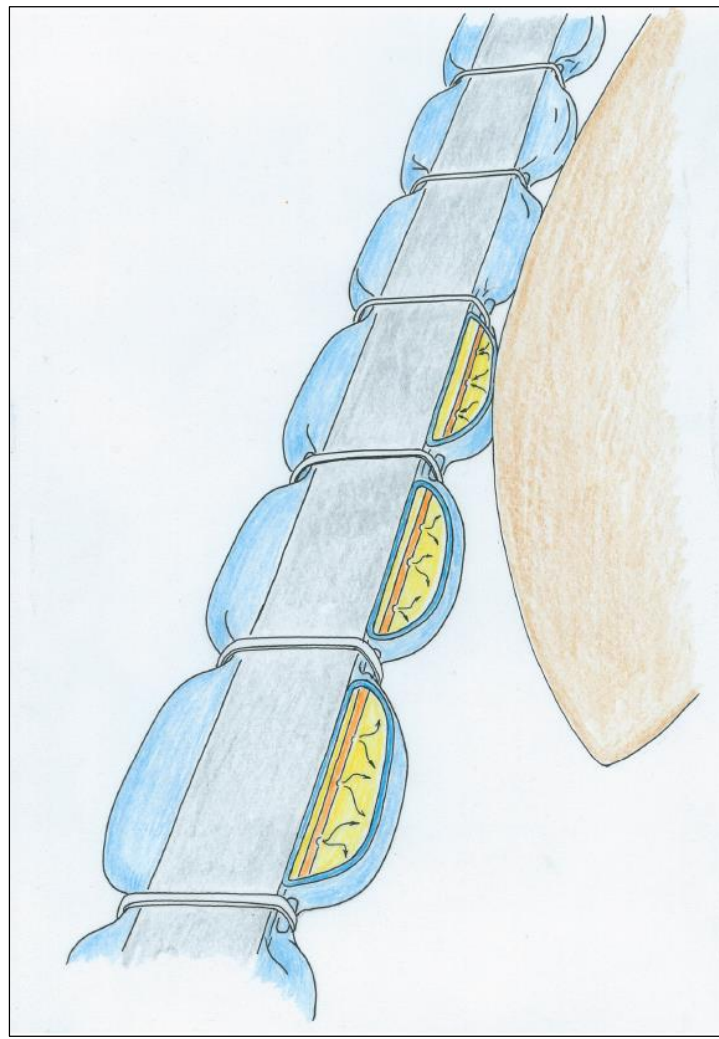




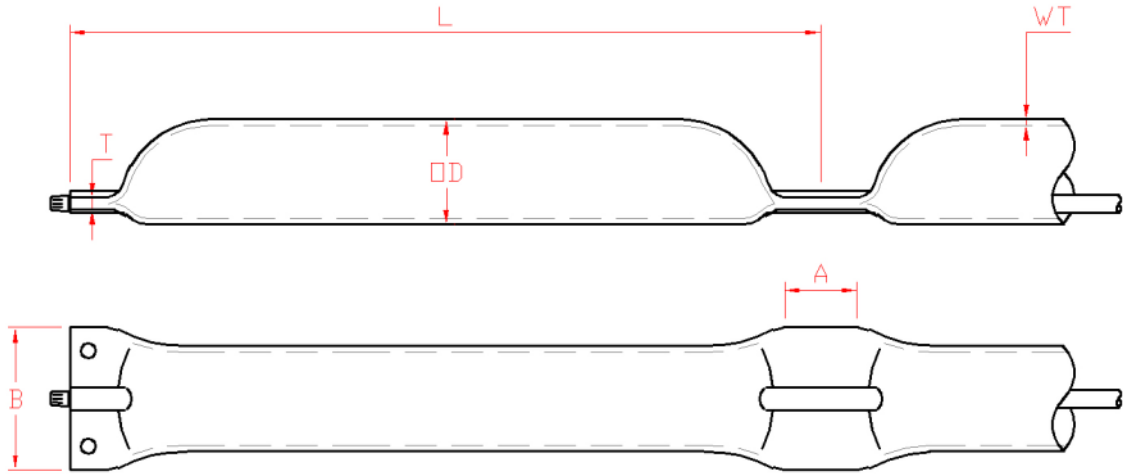
TECHNICAL INFORMATION

GENERAL INFORMATION

The patented ParmaFender® system represents a chain of air-filled elastic chambers, which are mutually linked, allowing air to flow between the individual chambers. The air-flow between the chambers is restricted in order to create optimum energy absorption when compressing one or more chambers.

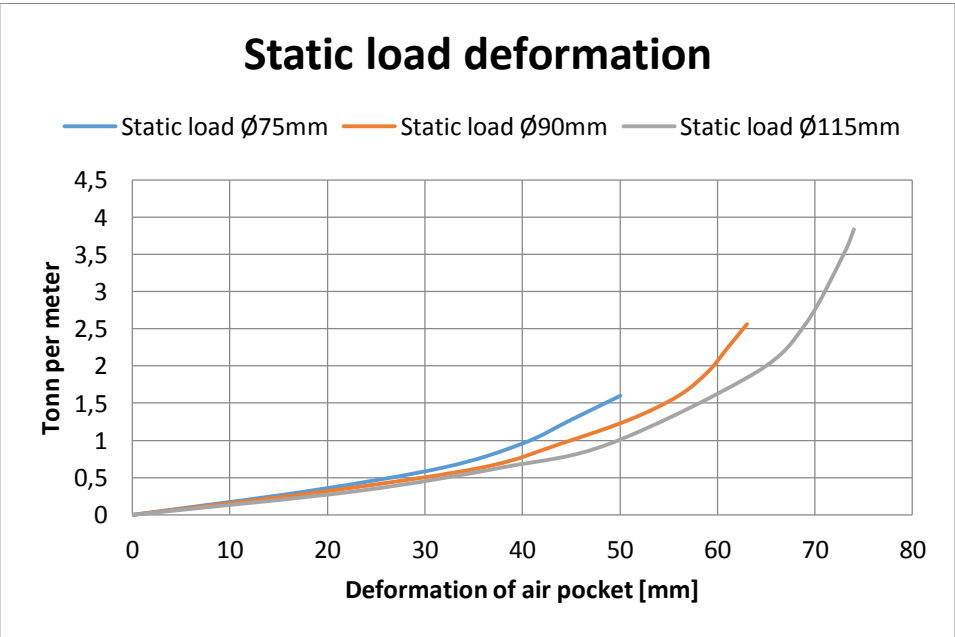
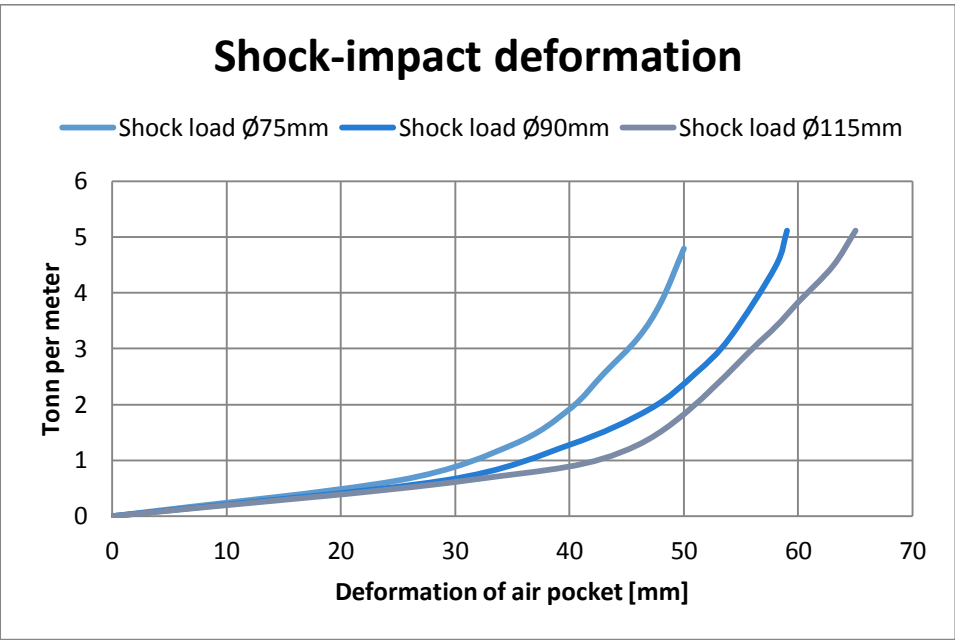
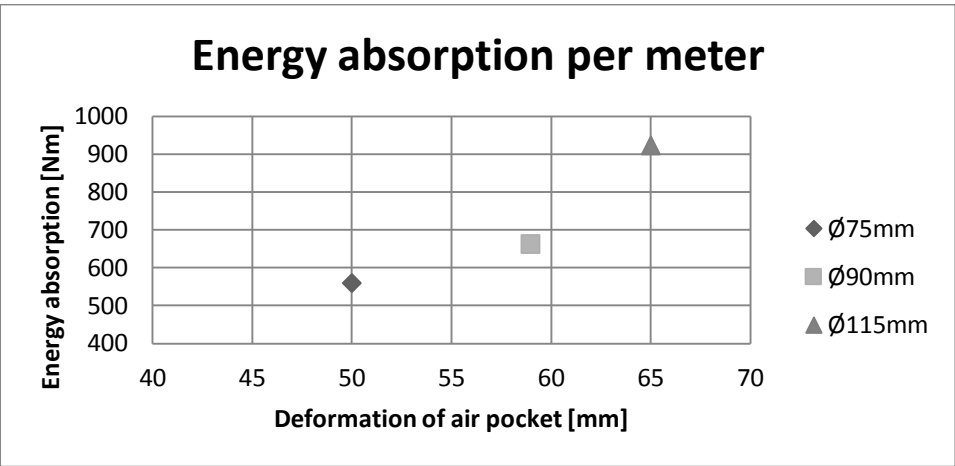


SPECIFICATIONS



Item Number	O0750AUT002D-D0005	O0750AUT002C-D0005	O0900AUT002E-D0005	O0900AUT001C-D0005	O1150AUT002E-D0005
Item Name / Color	ParmaFender Ø75 Black	ParmaFender Ø75 Grey	ParmaFender Ø90 Black	ParmaFender Ø90 Grey	ParmaFender Ø115 Black
Diameter (OD)	75	75	90	90	115
Segment Length (L)	500	500	500	500	500
Wall Thickness (WT)	> 3,5	> 3,5	> 4,5	> 4,5	> 4,5
Mounting Plate Thickness (T)	≈ 9	≈ 9	≈ 9,5	≈ 9,5	≈ 9,5
Mounting Plate Length (A)	70	70	70	70	70
Mounting plate Width	115	115	140	140	175
Segment Weight	0,63	0,63	0,88	0,88	1,10
Recommended pressure	1	1	1	1	1
1 mm Transparent outerlayer	Yes	No	Yes	No	Yes
Continious Fender Chain	Yes	Yes	Yes	Yes	Yes
Valves premounted	No	No	No	No	No

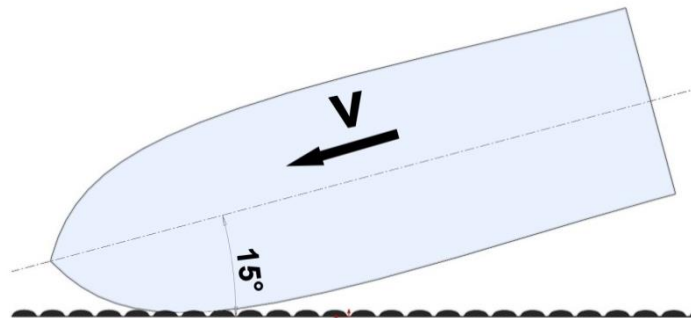
O0900AUT002E-D0008VM	O0900AUT001C-D0008VM	O1150AUT002E-D0008VM	Unit
ParmaFender Ø90 Black Single	ParmaFender Ø90 Grey Single	ParmaFender Ø115 Black Single	
90	90	115	mm
800	800	900	mm
> 4,5	> 4,5	> 4,5	mm
≈ 9,5	≈ 9,5	≈ 9,5	mm
70	70	70	Mm
140	140	175	mm
1,40	1,40	2,00	kg
1	1	1	Bar
Yes	No	Yes	
No	No	No	
Yes	Yes	Yes	



The tables represent indicative guidance only, theoretically calculated based on laboratory test results. Due to the many variables affecting a practical fender installation, the performance of each individual installation has to be carefully evaluated by the owner who is fully responsible for taking necessary precautions. Please note that the fastening system chosen for heavy duty fendering systems often represents the weakest spot of the installation.

SELECTION GUIDE

The table below indicates how many chambers (contact length) are needed to absorb all impact energy caused by hitting a fendered rigid quay, depending on vessel speed, size and weight. The table is calculated on basis of a typical 15° colliding angle during docking, as visualized in the sketch to the right.



Proportions: ParmaFender Ø115, Vessel 35 feet

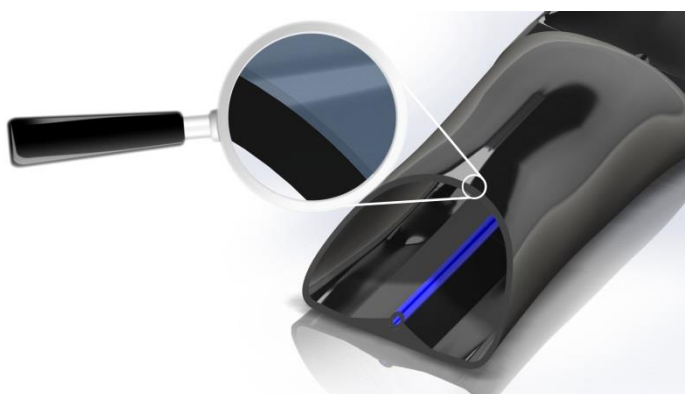
Vessel weight [Tons]	1	2	3	5	10	15	20
V=1 knots (0,5 m/s)							
Ø75mm	1	1	1	1	2	2	3
Ø90mm	1	1	1	1	1	2	2
Ø115mm	1	1	1	1	1	1	2
V=1,5 knots(0,8 m/s)							
Ø75mm	1	1	1	2	3	4	6
Ø90mm	1	1	1	1	3	4	5
Ø115mm	1	1	1	1	2	3	4
V=2,0 knots(1,2 m/s)							
Ø75mm	1	1	2	3	5	*	*
Ø90mm	1	1	2	2	4	6	*
Ø115mm	1	1	1	2	3	5	6

* Length exceeds maximum theoretical contact area

The tables represent indicative guidance only, theoretically calculated based on laboratory test results. Due to the many variables affecting a practical fender installation, the performance of each individual installation has to be carefully evaluated by the owner who is fully responsible for taking necessary precautions. Please note that the fastening system chosen for heavy duty fendering systems often represents the weakest spot of the installation.

MATERIAL INFORMATION:

ParmaFender® represents a 100% TPU construction (Thermoplastic Polyurethane) which can be recycled.



All black ParmaFender produced in 2013 and later are equipped with an unpigmented glossy coating that adds shine to the surface and that under no circumstances can discolor on boat hulls. Additionally, friction-reducing additives are used in the ParmaFender® outer-layer TPU recipe.

Soot and other contaminants however, can collect on piers as well as on fenders, and we therefore recommend regular washing of the fenders.

UV stabilized polyether-based TPU used for the ParmaFender® has a unique molecular structure that provides good compression set and high resilience, along with superior resistance to impacts, abrasion, tear and weathering. The material offers great flexibility and constancy at a wide temperature range (-40°C up to 80°C), combined with excellent hydrolytic stability and fungus resistance.

Typical applications of TPU's are for example "seismic streamers" that are exposed to extreme stresses when they are towed behind seismic vessels in search of oil all around the world in all kind of weather conditions.

In most heavy-duty applications, which demand a combination of above-mentioned characteristics, polyurethane is superior to other fendering materials (e.g. PVC and foamed PE, EVA etc.) because of its outstanding general properties and wear characteristics.

Properties	Test Method	Typical Value		
		English	SI	
Physical				
Specific Gravity	gr./cm ³	ASTM D-792	1,12	1,12
Hardness	Shore A	ASTM D-2240	86A	86A
Mechanical				
Tensile Strength (Ultimate)	psi / MPa	ASTM D-412	4800 psi	33 MPa
Tensile Stress	@100% Elong.	ASTM D-412	1100 psi	7.6 MPa
Tensile Stress	@300% Elong.	ASTM D-412	1750 psi	12 MPa
Elongation at Break	%	ASTM D-412	640%	640%
Tensile Set at Break	%	ASTM D-412	70%	70%
Compression Set, %	22 hrs @ 23°C	ASTM D-395 (B)	25%	25%
Compression Set, %	22 hrs @ 70°C	ASTM D-395 (B)	45%	45%
E-Modulus	psi / MPa	ASTM D-412	3000 psi	20.7 MPa
Flexural Modulus	psi / MPa	ASTM D-790	4500 psi	31 MPa
Tear Strength	lb./in. N/mm	ASTM D-624, Die C	600 lb./in.	105 N/mm
Taber Abrasion Resistance / mg loss	1000 gr./H-18	ASTM D-1044	30 mg	30 mg
<i>Data extracted from TPU raw material TDS. For guidance only as the mechanical properties will be affected by processing and product geometry etc</i>				

REPAIR

Due to the heavy duty TPU material the ParmaFender® very seldom punctures, even when exposed to extreme loads. Likewise all thermoplastic fender systems however, severe heat may melt the material and cause a damage, typically caused by the cabin heater exhaust outlet blowing directly onto a fender segment.



One or more damaged fender-segments are easily replaced by cutting off the damaged segments, and splice in new replacement segments by using ParmaFender® air-channel splice plugs.

This method can also be used for extending the length of a fender-chain.

TECHNICAL SUPPORT

ParmaFender® is a patented pneumatic dock-fendering system developed and produced in Norway by Parma Plast as. On our web-site you will find information related to a wide variety of rubbing-strikes, including original replacement profiles for Norwegian pleasure boats produced as far back as in the 1960's.

Parma Plast develops and manufactures hoses, tubes, profiles and pipes in a variety of thermoplastic materials. Our production is mainly related to products developed in collaboration with our customers. With an enquiry of development of a new product, we can contribute from concept phase up to finished product.

If any questions or feedback related to the ParmaFender® or other services provided by Parma Plast, please do not hesitate to contact us.



Your extrusion partner



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