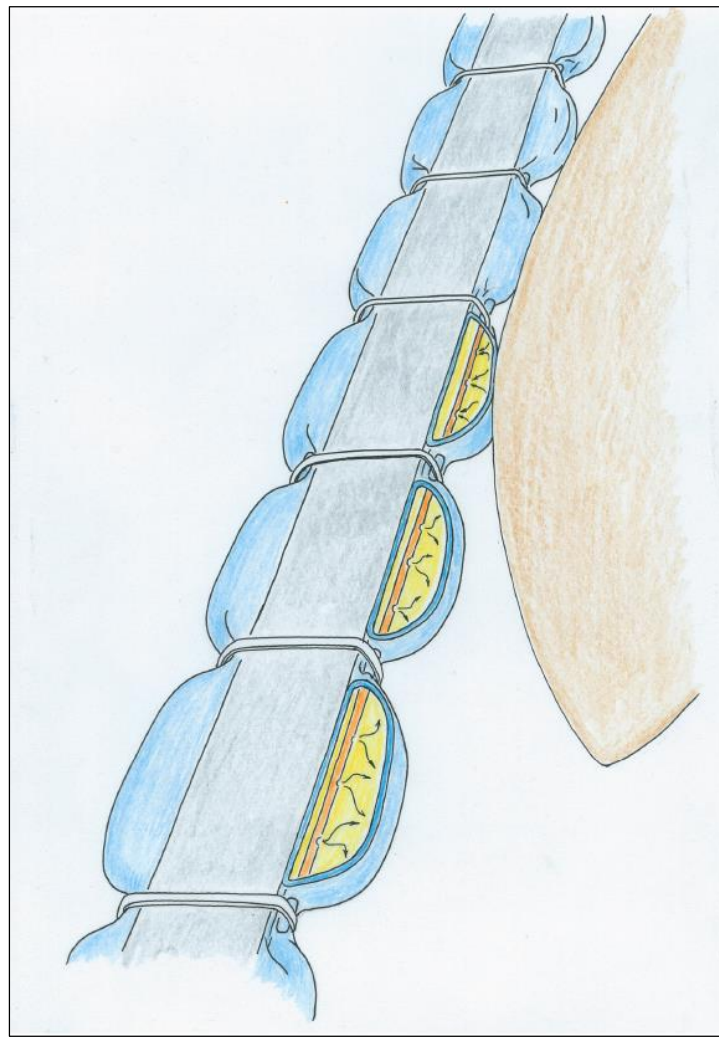




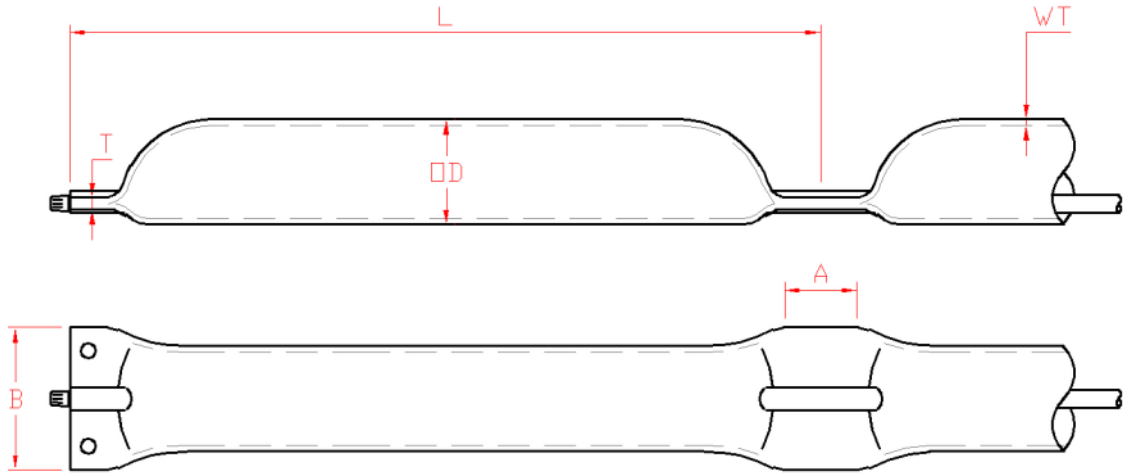
TECHNICAL INFORMATION

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.

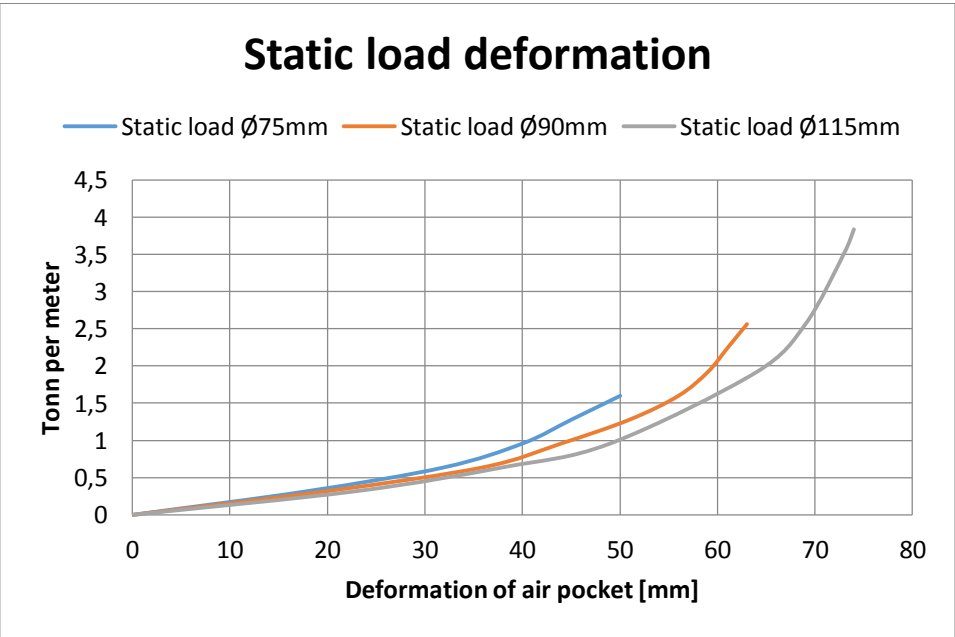
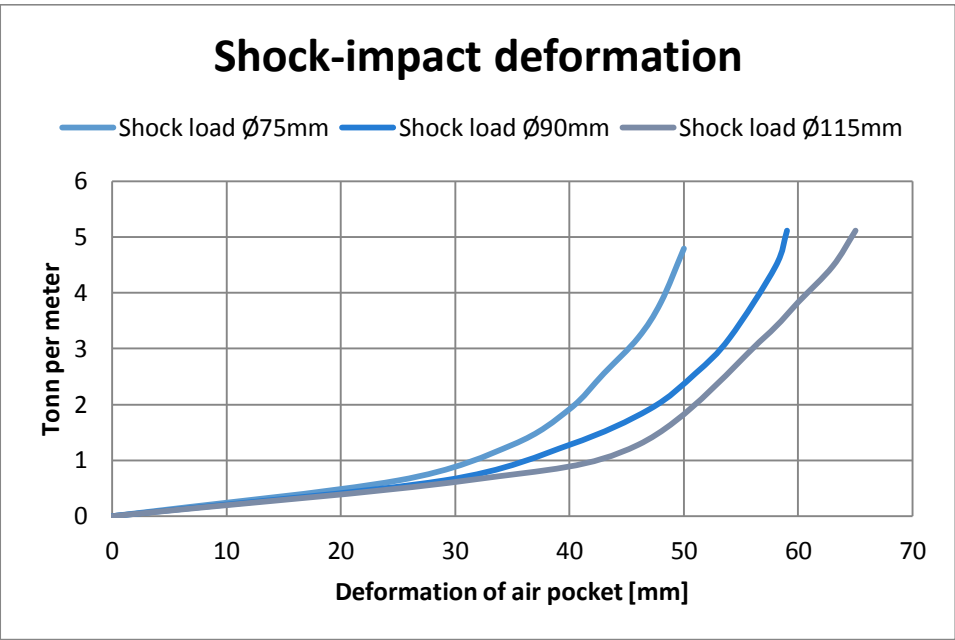
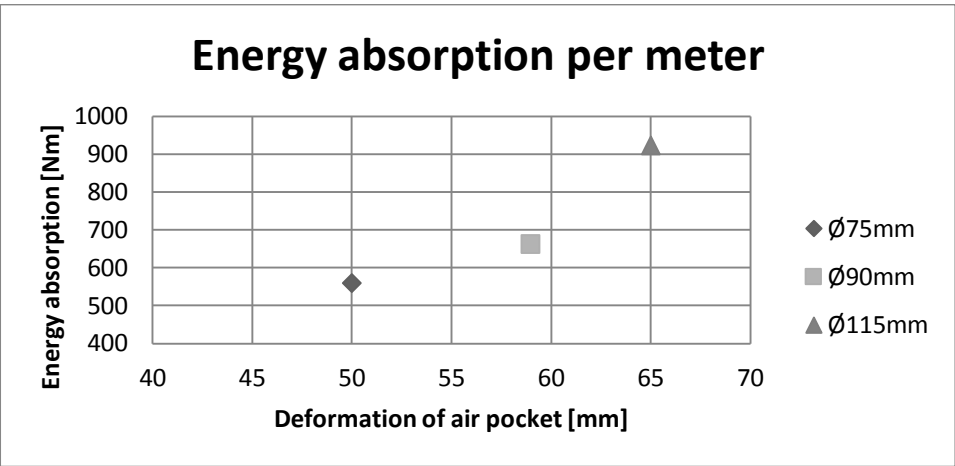


SPECIFICATIONS



| 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 |

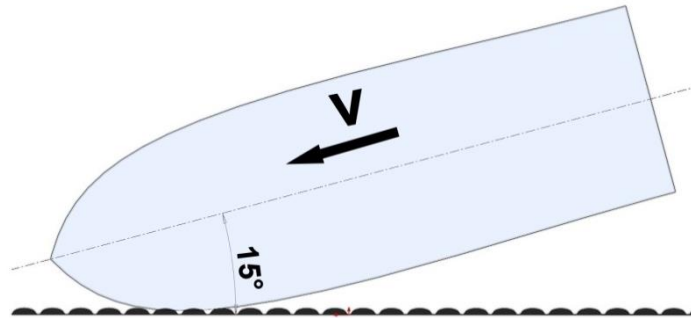
| O0900AUT002E-D0008VM | O0900AUT001C-D0008VM | O1150AUT002E-D0008VM | Unit |
|------------------------------|-----------------------------|-------------------------------|------|
| ParmaFender Ø90 Black Single | ParmaFender Ø90 Grey Single | ParmaFender Ø115 Black Single | |
| 90 | 90 | 115 | mm |
| 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

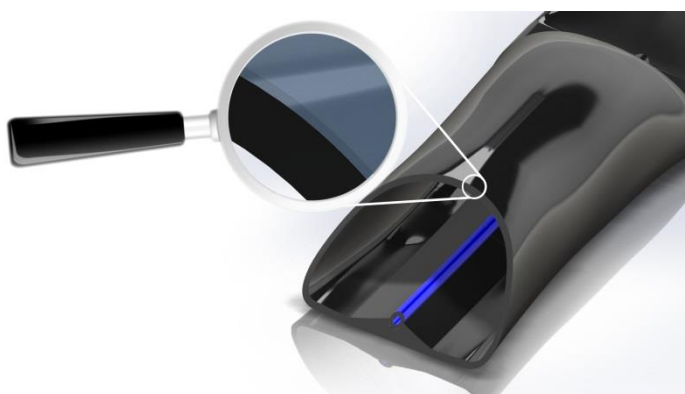
| Vessel weight [Tons] | 1 | 2 | 3 | 5 | 10 | 15 | 20 |
|-----------------------------|---|---|---|---|----|----|----|
| V=1 knots (0,5 m/s) | | | | | | | |
| Ø75mm | 1 | 1 | 1 | 1 | 2 | 2 | 3 |
| Ø90mm | 1 | 1 | 1 | 1 | 1 | 2 | 2 |
| Ø115mm | 1 | 1 | 1 | 1 | 1 | 1 | 2 |
| V=1,5 knots(0,8 m/s) | | |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