RUBBER PROPERTIES

ShibataFenderTeam rubber fender components are manufactured from the highest quality Natural Rubber (NR), optionally Styrene Butadiens SBR based compounds which meet or exceed the performance requirements of European Union specification EAU-E 62 "Acceptance Requirements for Fender Elastomers". Typical specifications are listed in the table below.

In addition to NR and SBR, other rubber compounds like Butyl, EPDM and Polyurethane are available on request for specialized applications. Please consult ShibataFenderTeam for further details.

Property	Testing Standard	Condition	Requirement
Tensile Strength	ASTM D412 Die C; AS 1180.2; BS 903.A2; ISO 37; JIS K6251 Item 3, Dumbel 3	Original Aged for 96 hours at 70°C	16.0 MPa (min) 12,8 MPa (min)
	DIN 53504	Original Aged for 168 hours at 70°C	15.0 N / mm² (min) 12.75 N / mm² (min)
Elongation at Break	ASTM D 412 Die C; AS 1180.2; BS 903.A2; ISO 37; JIS K 6251 Item 3; Dumbel 3	Original Aged for 96 hours at 70°C	400 % (min) 320 % (min)
	DIN 53504	Original Aged for 168 hours at 70°C	300 % (min) 280 % (min)
Hardness	ASTM D 2240; AS1683.15.2; BS 903.A6; JIS K 6301 Item 5A Tester	Original Aged for 96 hours at 70°C	78° (max) Shore A Original Value +6° points increase
	DIN 53505	Original Aged for 168 hours at 70°C	75° (max) Shore A Original Value +5°
Compression Set	ASTM D 395; AS 1683.13B; BS903. A6; ISO 815; JIS K6262 Item 10	Aged for 22 hours at 70°C	30 % (max)
	DIN 53517	Aged for 24 hours at 70°C	40 % (max)
Tear Resistance	ASTM D624; AS 1683.12; BS903.A3: ISO 34.1; JIS K6301 Item 9; Test Piece A	Die B	70 kN/m (min)
	DIN 53507		80 N/cm (min)
Ozone Resistance / Condition	ASTM D1149; AS 1683.24; BS 903.A43; DIN 53509; ISO 143/1	50 ppm at 20 % strain at 40° C for 100 hours	No cracking visible by eye
Seawater Resistance	DIN 86076; Section 7.7	28 days in artificial seawater at 95° C ±2° C	Hardness: ±10° (max) Shore A Volume: +10/-5 % (max)
Abrasion	BS 903.A9	Method B 1000 revolutions	0.5cc (max)
	DIN 53516		100 mm³ (max)
Bond Strength Steel to Rubber	BS 903.A21	Method B	7 N/mm (min)
Dynamic Fatigue*	ASTM D430-95, Method B	15,000 cycles	Grade 0-1

The above values are for tests carried out under strict laboratory conditions using specimens taken from batches of unvulcanised rubber compound.

* Dynamic fatigue testing is optional at extra cost.

TOLERANCES

All ShibataFenderTeam fenders are subject to standard manufacturing and performance tolerances. Smaller tolerances may be agreed if requested for special cases.

Manufacturing Tolerances		
Moulded Fenders	All dimensions	±3 % or ± 2 mm*
	Bolt hole spacing	±2 mm
Komposite Fenders	Cross-section	±3 % or ±2 mm*
	Length	±2 % or ±25 mm*
	Drilled hole centres	±4 mm (non-cumulative)
	Counterbore depth	±4 mm (under-head depth)
Block Fenders Cube Fenders W Fenders	Cross-section	±3 % or ±2 mm*
	Length	±3 % or ±20 mm*
	Fixing hole centres	±3 mm
	Fixing hole diameter	±3 mm
Cylindrical Fenders	Outside diameter	±4 %
	Inside diameter	±4 %
	Length	-0 / + 40 mm
Extruded Fenders	Cross-section	±4 %
	Length	±2 % or ±10 mm*
	Drilled hole centres	±4 mm (non-cumulative)
	Counterbore depth	±4 mm (under-head depth)
HD-PE Sliding Fenders **	Cross-section	±4 %
	Length	±2 % or ±20 mm*
	Drilled hole centres	±4 mm (non-cumulative)
	Counterbore depth	±4 mm (under-head depth)
UHMW-PE Plates **	Length and width	±5 mm (cut pads)
		±20 mm (uncut sheets)
	Thickness planed:	
	≤ 100 mm	±0.3 mm
	> 100 mm	±0.5 mm
	Thickness unplaned:	
	≤ 100 mm	±3.0 mm
	> 100 mm	±6.0 mm
	Drilled hole centres	±2 mm (non-cumulative)
	Counterbore depth	±2 mm (under-head depth)

Performance Tolerances		
SPC, CSS, SX, SX-P, SH	Reaction, Energy & Deflection	±10 %
Cylindricals (wrapped)	Reaction, Energy & Deflection	±10 %
Cylindricals (extruded)	Reaction, Energy & Deflection	±20 %
Extruded Fenders	Reaction, Energy & Deflection	±20 %
Pneumatic Fenders	Reaction, Energy	±10 %
Foam Fenders	Reaction, Energy	±15 %

* Whichever is the greater dimension

** Any HD-PE and UHMW-PE tolerances (length, cross section and machining) are strictly applicable to a material temparature of 20°C.