

Multi-purpose Fenders

Cylindricals
Extrusions
Composites
Fender Bars
MPP
Ramp & Cope
Shear

Section 3



Trelleborg Marine Systems

www.trelleborg.com/marine

Ref. M1100-S03-V1.1-EN


TRELLEBORG

CYLINDRICAL FENDERS

Cylindrical Fenders have protected ships for more years than any other fender type. Cylindrical fenders are simple and versatile as well as being easy to install. Their progressive reaction makes them ideal for berths serving large and small vessels. The wide range of available sizes (as well as almost any intermediate size) means Cylindrical Fenders can be closely matched to each application.

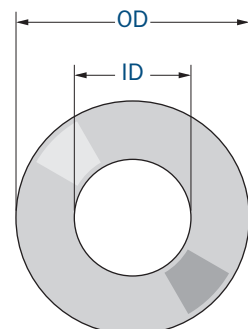
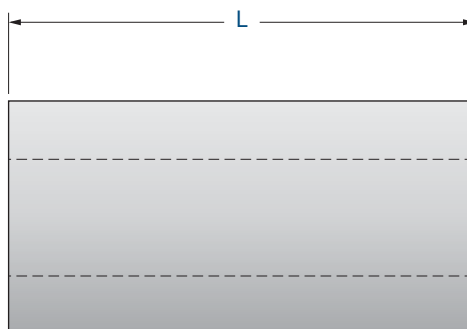


Features

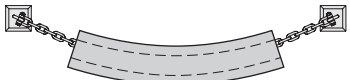
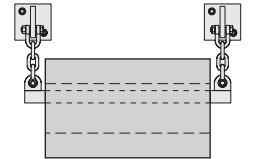
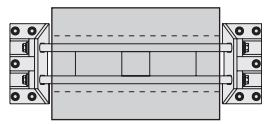
- | Simple and economical design
- | Easy to install and maintain
- | All sizes up to 2700mm diameter
- | Thick wall resists abrasion and wear
- | Progressive load-deflection curve

Applications

- | Bulk cargo berths
- | General cargo quays
- | RoRo and ferry terminals
- | Fishing and workboat berths
- | Pontoons and floating structures
- | Tug havens

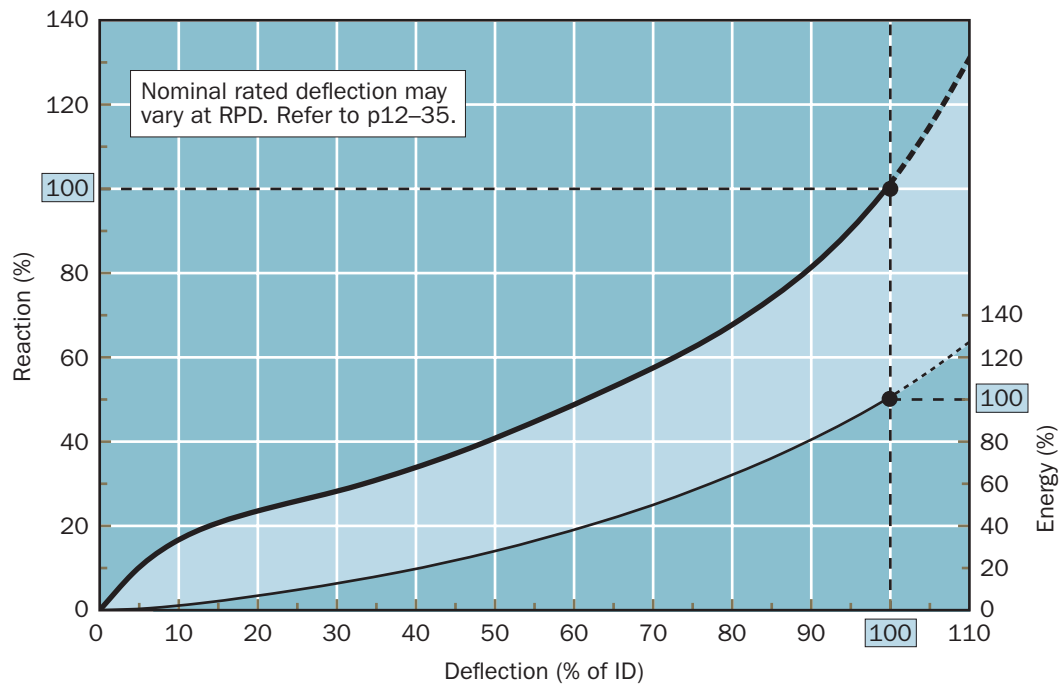


CYLINDRICAL FENDERS

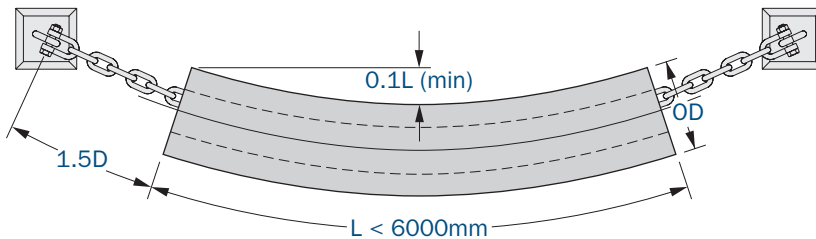
OD × ID (mm)	OD/ID	E (kNm)	R (kN)	P* (kN/m ²)	Weight (kg/m)	Typical fixing arrangements	
100 × 50	2.00	0.8	43	547	7.2		
125 × 65	1.92	1.3	51	500	11.0		
150 × 75	2.00	1.8	65	552	16.3		
175 × 75	2.33	2.7	92	781	24.1		
200 × 100	2.00	3.3	86	547	29.0		
250 × 125	2.00	5.1	108	550	45.3		
300 × 150	2.00	7.4	129	547	65.2		
380 × 190	2.00	11.8	164	550	105		
400 × 200	2.00	13.1	172	547	116		
450 × 225	2.00	16.6	194	549	147		
500 × 250	2.00	28	275	700	181		
600 × 300	2.00	40	330	700	255		
800 × 400	2.00	72	440	700	453		 
1000 × 500	2.00	112	550	700	707		
1200 × 600	2.00	162	660	700	1018		
1400 × 700	2.00	220	770	700	1386		
1400 × 800	1.75	208	649	516	1245		
1500 × 750	2.00	253	825	700	1591		
1600 × 800	2.00	288	880	700	1810		
1750 × 900	1.94	340	929	657	2124		
2000 × 1200	1.67	415	871	462	2414		
2400 × 1200	2.00	647	1321	701	4073		
2700 × 1300	2.08	818	1486	728	5154		

*excludes effect of fixing accessories.

Deflection, (D) = ID. Performance per metre length.



CYLINDRICAL FENDERS

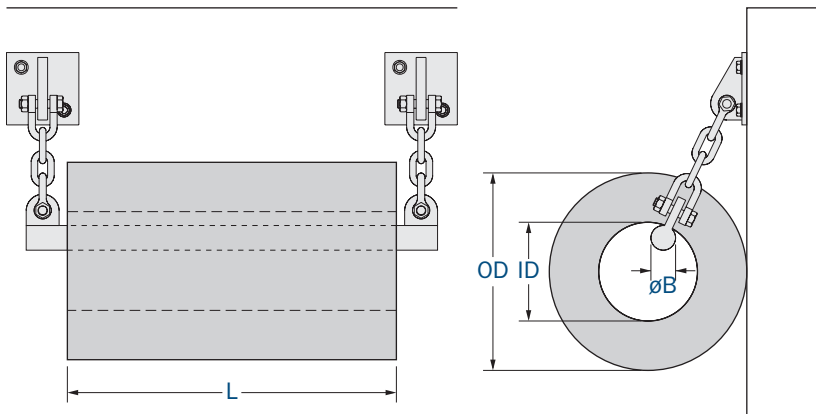


Small cylindricals ($\leq \text{Ø}600\text{mm}$) are often suspended from chains connected to brackets or U-anchors on the quay wall.

Small cylindricals

OD	ID	Chain	Shackle
100	50	14	16
125	65	14	16
150	75	16	16
175	75	16	16
200	90	18	19
200	100	18	19
250	125	20	22
300	150	24	28
380	190	28	35
400	200	28	35
450	225	28	35
500	250	32	38
600	300	35	44

[Units: mm]



Large cylindricals ($\text{Ø}900\text{--}\text{Ø}1600\text{mm}$) often use a central support bar connected at each end to chains which go back to brackets or U-anchors on the quay wall.

Large cylindricals

OD	ID	L	ØB	Chain	Shackle
800	400	1000	35	24	28
		1500	45	28	35
		2000	55	32	38
		2500	65	34	44
		3000	70	40	50
1000	500	1000	45	28	35
		1500	55	32	38
		2000	65	38	44
		2500	75	40	50
		3000	85	44	50
1200	600	1000	50	28	35
		1500	65	34	44
		2000	75	40	50
		2500	85	44	50
		3000	100	50	56
1400	800	1000	65	38	44
		1500	70	38	44
		2000	80	44	50
		2500	90	48	56
		3000	100	52	64
1600	800	1000	75	40	50
		1500	80	40	50
		2000	90	46	50
		2500	110	48	56
		3000	120	54	64

[Units: mm]

Very large cylindricals ($\geq \text{Ø}1600\text{mm}$) may require special ladder brackets due to their weight. These are specially designed for each application.

CYLINDRICAL FENDERS

**Proven
in practice**




EXTRUDED FENDERS

Extruded fenders are simple rubber profiles, usually attached with bolts to the structure. Extrusions can be made in virtually any length then cut and drilled to suit each application. Pre-curved sections and special sizes are available on request.

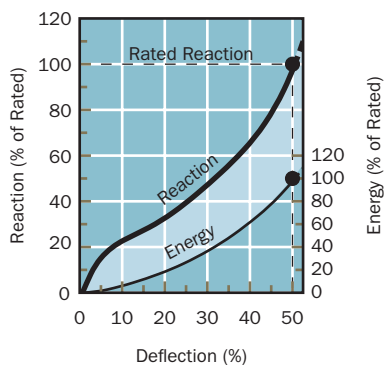
Usually black in colour, extruded fenders can also be supplied in creamy white as an option.

Applications

- ▮ Jetties and wharves for small craft
- ▮ Tugs and workboats
- ▮ Pontoon protection
- ▮ Inland waterways
- ▮ General purpose fendering

Fender size				
	E (kNm)	R (kN)	E (kNm)	R (kN)
100	1.9	157	2.7	157
150	4.2	235	6.4	235
200	7.5	314	11.3	314
250	11.7	392	17.7	392
300	16.9	471	25.5	471
350	22.9	549	34.3	589
400	29.4	628	45.1	628
500	46.0	785	70.5	785

Values are per metre.



DC-fenders

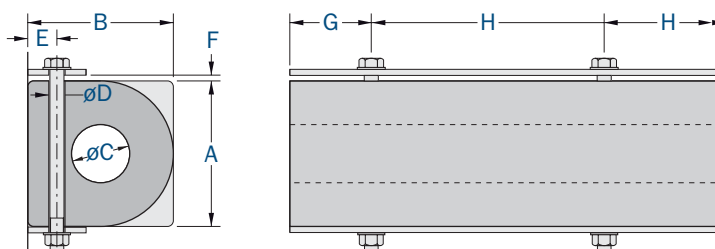
A	B	øC	øD	E	F	G	H	Flat bar	Bolt size	Weight
100	100	30	15	25	10	90-130	200-300	50 × 6	M12	10.1
150	150	65	20	30	12	110-150	250-350	60 × 8	M16	20.6
200	200	75	25	45	15	130-180	300-400	80 × 10	M20	38.5
250	250	100	30	50	20	140-200	350-450	100 × 10	M24	59.0
300	300	125	30	60	25	140-200	350-450	110 × 12	M24	83.7
350	350	150	35	70	25	140-200	350-450	120 × 12	M30	113
400	400	175	35	80	30	140-200	350-450	130 × 15	M30	146
400	400	200	35	80	30	140-200	350-450	130 × 15	M30	137
500	500	250	35	100	30	140-200	350-450	130 × 15	M36	214

[Units: mm, kg/m]

SC-fenders

A	B	øC	øD	E	F	G	H	Flat bar	Bolt size	Weight
100	100	30	15	25	10	90-130	200-300	50 × 6	M12	11.4
150	150	65	20	30	12	110-150	250-350	60 × 8	M16	23.6
165	125	65	20	30	15	110-150	250-350	60 × 8	M16	21.3
200	200	75	25	45	15	130-180	300-400	80 × 10	M20	43.8
200	200	100	25	40	15	130-180	300-400	80 × 10	M20	39.5
250	200	80	30	45	20	140-200	350-450	90 × 10	M24	55.3
250	250	100	30	50	20	140-200	350-450	100 × 10	M24	67.2
300	250	100	30	50	25	140-200	350-450	100 × 10	M24	82.6
300	300	125	30	60	25	140-200	350-450	110 × 12	M24	95.6
350	350	150	35	65	25	140-200	350-450	120 × 12	M30	126
350	350	175	35	65	25	140-200	350-450	120 × 12	M30	121
400	400	200	35	70	30	140-200	350-450	130 × 15	M30	158
500	500	250	45	90	40	150-230	400-500	150 × 20	M36	247

[Units: mm, kg/m]



EXTRUDED FENDERS



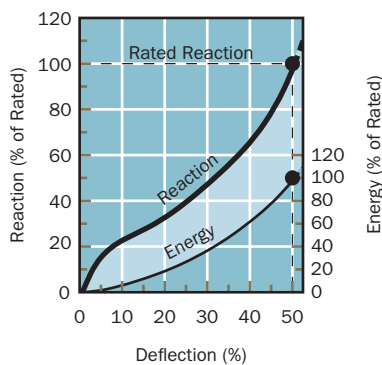
DD-series

A	B	C	D	øE	øF	G	H	Flat bar	Bolt size	Weight
80	70	45	30	30	15	90-130	200-300	35 x 5	M12	4.8
100	100	50	45	30	15	90-130	200-300	40 x 5	M12	8.5
125	125	60	60	40	20	110-150	250-300	50 x 6	M16	13.2
150	150	75	75	40	20	110-150	250-300	60 x 8	M16	18.5
200	150	100	80	50	25	130-180	300-400	80 x 10	M20	23.1
200	200	100	100	50	25	130-180	300-400	80 x 10	M20	32.9
250	200	125	100	60	30	140-200	350-450	90 x 12	M24	39.9
250	250	125	125	60	30	140-200	350-450	90 x 12	M24	51.5
300	300	150	150	60	30	140-200	350-450	110 x 12	M24	74.1
350	350	175	175	75	35	140-200	350-450	130 x 15	M30	101
380	380	190	190	75	35	140-200	350-450	140 x 15	M30	119
400	300	175	150	75	35	140-200	350-450	130 x 15	M30	99
400	400	200	200	75	35	140-200	350-450	150 x 15	M30	132
500	500	250	250	90	45	160-230	400-500	180 x 20	M36	206

[Units: mm, kg/m]

Fender size				
	E (kNm)	R (kN)	E (kNm)	R (kN)
100	1.4	77	2.7	136
150	3.2	115	6.4	206
200	5.7	153	11.3	275
250	8.9	191	17.6	343
300	12.9	230	25.5	412
350	17.6	268	34.3	471
400	23.0	306	45.2	589
500	35.9	383	70.7	736

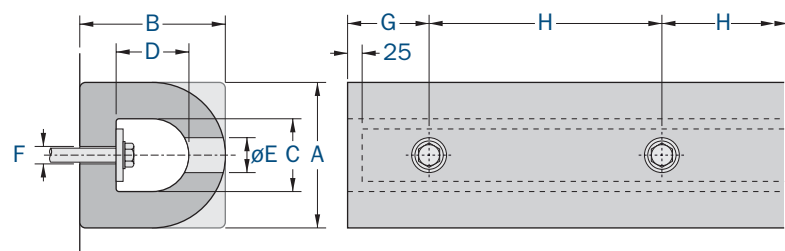
Values are per metre.



SD-series

A	B	C	D	øE	øF	G	H	Flat bar	Bolt size	Weight
100	100	50	45	30	15	90-130	200-300	40 x 5	M12	9.9
150	150	70	65	40	20	110-150	250-300	50 x 8	M16	22.7
165	125	80	60	40	20	110-150	250-300	60 x 8	M16	20.3
200	150	90	65	50	25	130-180	300-400	70 x 10	M20	30.8
200	200	90	95	50	25	130-180	300-400	70 x 10	M20	39.8
250	200	120	95	60	30	140-200	350-450	90 x 12	M24	49.4
250	250	120	120	60	30	140-200	350-450	90 x 12	M24	61.1
300	250	140	115	60	30	140-200	350-450	100 x 12	M24	75.0
300	300	125	135	60	30	140-200	350-450	100 x 12	M24	92.0
400	400	200	200	75	35	140-200	350-450	150 x 15	M30	153
500	500	250	250	90	45	160-230	400-500	180 x 20	M36	239

[Units: mm, kg/m]



COMPOSITE FENDERS

Composite fenders* are composites of rubber for resilience and UHMW-PE for low-friction and wear resistant properties. The two materials are bonded with a special vulcanising method which is stronger and more reliable than a mechanical joint.

Composite fenders are used where the simplicity of extrusions are required but with lower shear forces.

Features

- ▮ Resilient rubber body
- ▮ Low-friction UHMW-PE face
- ▮ Strong molecular bond
- ▮ Easily drilled and cut
- ▮ Many standard sizes

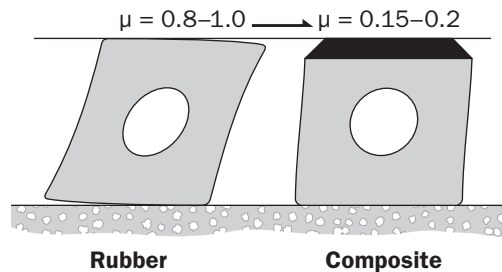
Applications


- ▮ Jetties and wharves for small craft
- ▮ Mooring pontoons
- ▮ Pile guides on floating structures
- ▮ Inland waterways

* Also called Rubbylene®




Shear deformations



	E	R
100 × 100	4.0	222
200 × 200	11.5	334
250 × 250	24.3	565
300 × 300	42.0	624

Values are per metre. [Units: kNm, kN]
Performance values are at bore closure.

	E	R
80 × 80	1.6	76
100 × 100	2.2	154
120 × 120	3.0	188
150 × 150	6.0	377

Values are per metre. [Units: kNm, kN]
Performance values are at bore closure.

COMPOSITE FENDERS



CF-A series

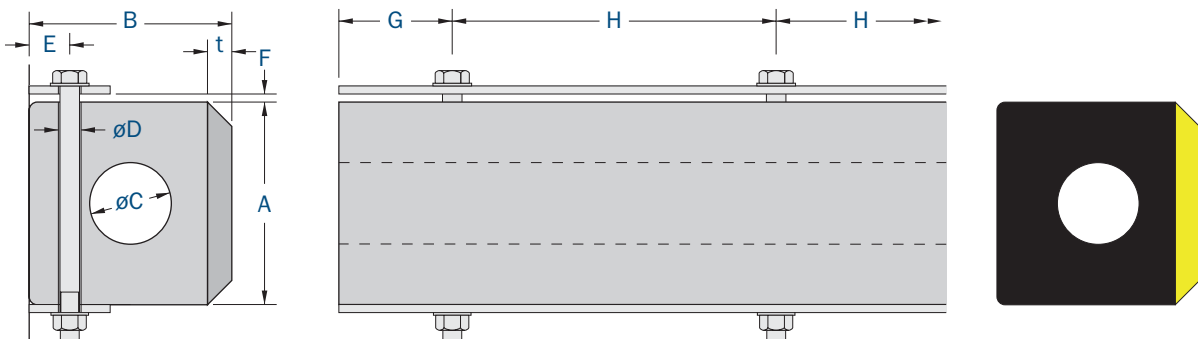


CF-B series

A	B	øC*	t	øD	E	F	G	H	Flat bar	Bolt size	Std Length	Weight	
												CF-A	CF-B
100	100	30	20	15	25	10	90-130	200-300	50 × 6	M12	3000	10.3	11.1
150	150	65	20	20	30	12	110-150	250-350	60 × 8	M16	3000	21.5	27.0
165	125	65	20	20	35	15	110-150	250-350	60 × 8	M16	3000	19.2	24.8
200	200	75	25	25	45	20	130-180	300-400	80 × 10	M20	3000	40.2	48.0
200	200	100	25	25	45	20	130-180	300-400	80 × 10	M20	3000	36.2	48.0
250	250	100	30	30	50	25	140-200	350-450	100 × 10	M24	2000	60.2	75.0
300	300	125	30	30	60	30	140-200	350-450	110 × 12	M24	3700	92.1	108

* Dimension only applies to CF-A fender.

[Units: mm, kg/m]



CF-C series

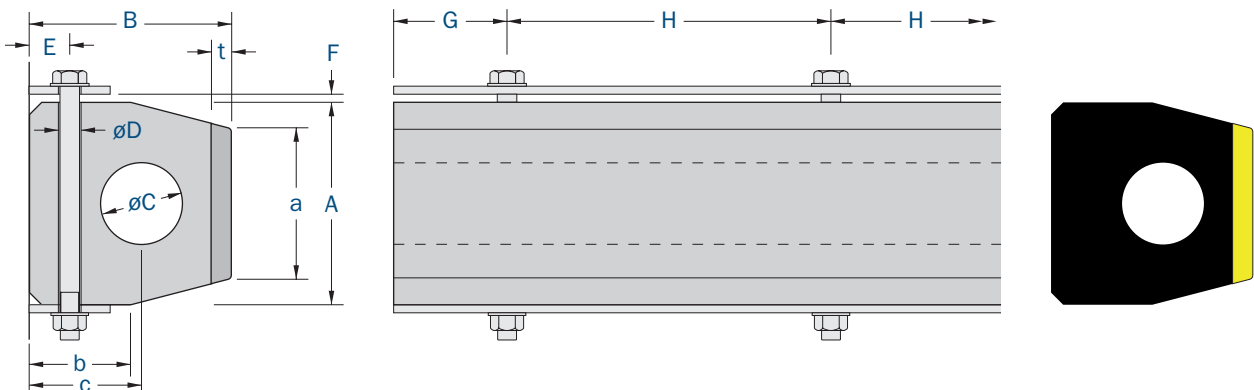


CF-D series

A	B	øC*	a	b	c	t	øD	E	F	G	H	Flat bar	Bolt size	Std Length	Weight	
															CF-C	CF-D
80	80	42	60	40	44	10	15	25	6	90-130	200-300	45 × 6	M12	2000	5.4	7.0
100	100	45	74	50	56	10	15	25	8	90-130	200-300	45 × 6	M12	2000	8.4	11.0
120	120	62	88	60	67	12	20	30	10	110-150	250-350	60 × 8	M16	2000	12.2	15.8
150	150	73	110	75	83	15	20	30	12	110-150	250-350	60 × 8	M16	3000	19.7	24.8

* Dimension only applies to CF-C fender.

[Units: mm, kg/m]



Composite fenders are supplied undrilled. Drilled and counterbored holes, special cuts, etc are available on special request.

FENDER BARS

Fender Bars are available in three different versions:

- ▮ ML-type for exposed locations
- ▮ MLS-type for low reaction
- ▮ Delta PU for visibility and non-marking

All Fender Bars can resist high impacts and are suitable for a wide range of general purpose applications.



ML Fender Bars

The ML Fender Bar are intended for heavy duty applications – everything from ferry berths to bumpers on barges. The vulcanised internal steel plate provides very strong fixing points and reduces bending moments in the bolts.



MLS Fender Bars

MLS Fender Bars have a special modified profile to reduce reaction forces and allow a high degree of flexibility in all directions. Being softer, MLS Fender Bars are ideal for protecting smaller workboats, pontoons and load-sensitive structures.



Delta PU Bars

The Delta PU Bar meets the challenges of berthing light craft with aluminium or GRP hulls by combining high performance and low friction properties in a competitively priced unit. Available in highly visible, non-marking colours, the Delta PU Bar can also improve safety or identify berths and danger areas.



FENDER BARS

Dimensions

Type	W	H	L	A	B	Anchors	Weight
ML	150	150	1000	250	500	2 × M24	38
ML	150	150	1500	250	500	3 × M24	56
ML	150	200	1000	250	500	2 × M24	43
ML	150	200	1500	250	500	3 × M24	65
ML	200	200	1000	250	500	2 × M30	65
ML	200	200	1500	250	500	3 × M30	98
ML	200	250	1000	250	500	2 × M30	77
ML	200	250	1500	250	500	3 × M30	116
ML	200	300	1000	250	500	2 × M30	88
ML	200	300	1500	250	500	3 × M30	132
MLS	200	300	1000	250	500	2 × M30	63
MLS	200	300	1500	250 <td 500	3 × M30	95	
DPU	140/80	100	1000	50	450	3 × M12	9.5

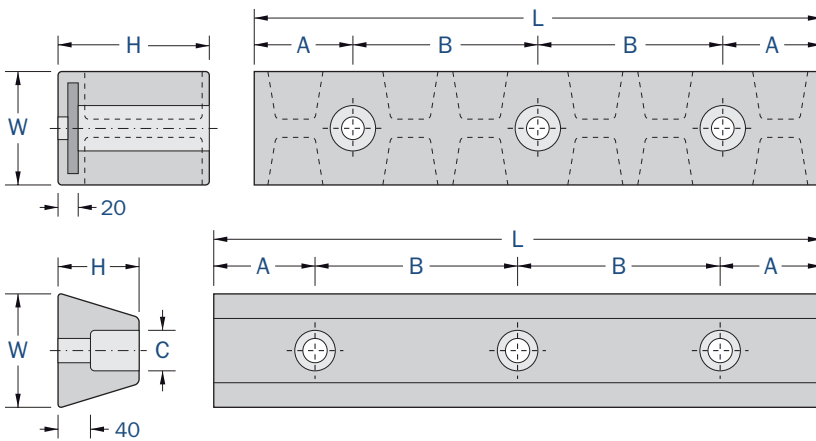
Please ask for other dimensions

[Units: mm, kg]

Performance

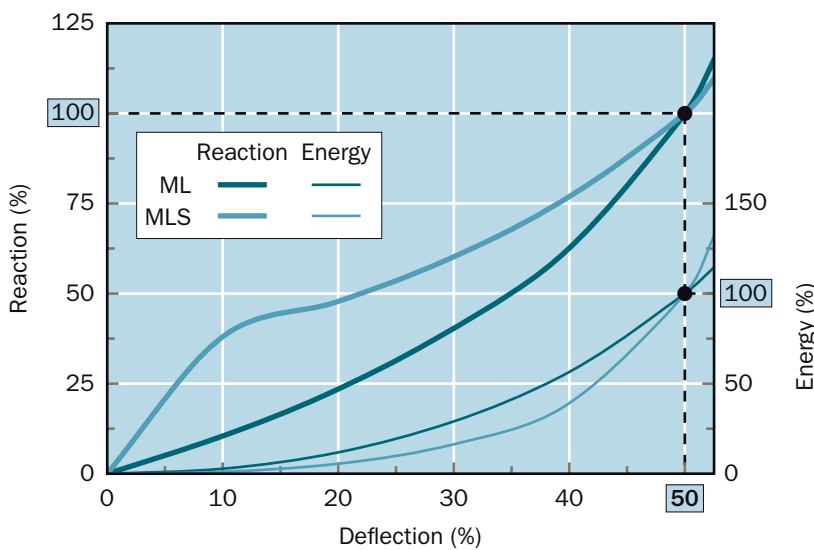
E	R
16.7	638
24.5	961
16.7	441
24.5	667
26.5	824
40.2	1236
26.5	657
40.2	991
26.5	530
40.2	795
23.0	355
38.0	593
-	-

[Units: kNm, kN]



ML/MLS

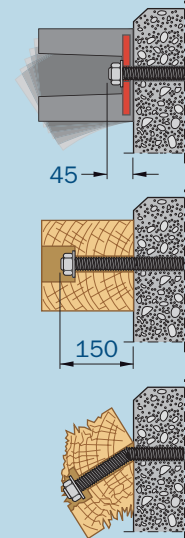
DPU



Nominal rated deflection may vary at RPD. Refer to p12-35.

Strong Fixings

Fender Bars have a low-profile fixing which prevents bending of the bolt even under large deflections and shear. With timber fenders the bolts easily bend and the wood cracks and splinters.

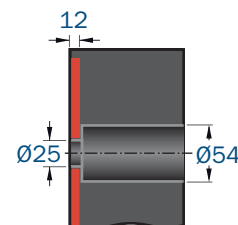
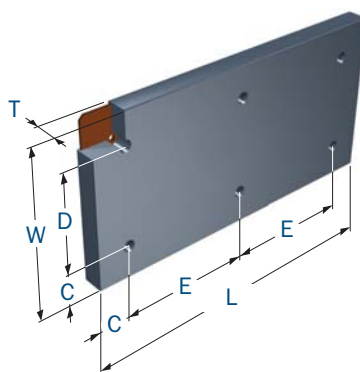


MARINE PROTECTION PLATE (MPP)

Marine Protection Plates (MPP) are resilient bumpers designed for quays where small vessels are moored, protecting both the quay face and vessel from abrasion. MPP fenders have also been used at the push knee on some tugs.

MPP are ideal for applications where the distance between the boat and dock must be minimised. The design includes a heavy-duty steel back plate which is vulcanised into the rubber body so only a few fixing bolts are required.

MPP are available with a flat or wave-patterned surface design.



Type	T	W	L	C	D	E	Anchors	Weight
MPP	50	500	1000	100	300	800	4 × M20	45
		600		150		700		54
		750		450	67			
MPP	50	500	1500	100	300	650	6 × M20	67
		600		150		600		80
		750		100	450	100		
MPP	75	500	1000	100	300	800	4 × M20	59
		600		150		700		71
		750		450	88			
MPP	75	500	1500	100	300	650	6 × M20	88
		600		150		600		106
		750		100	450	132		
MPP	100	500	1000	100	300	800	4 × M20	73
		600		150		700		88
		750		450	109			
MPP	100	500	1500	100	300	650	6 × M20	109
		600		150		600		131
		750		100	450	164		
MPP	125	500	1000	100	300	800	4 × M20	87
		600		150		700		104
		750		450	130			
MPP	125	500	1500	100	300	650	6 × M20	130
		600		150		600		156
		750		100	450	195		
MPP	150	500	1000	100	300	800	4 × M20	100
		600		150		700		121
		750		450	151			
MPP	150	500	1500	100	300	650	6 × M20	151
		600		150		600		181
		750		100	450	227		

Tailor-made corner elements and other dimensions available on request.

[Units: mm, kg]

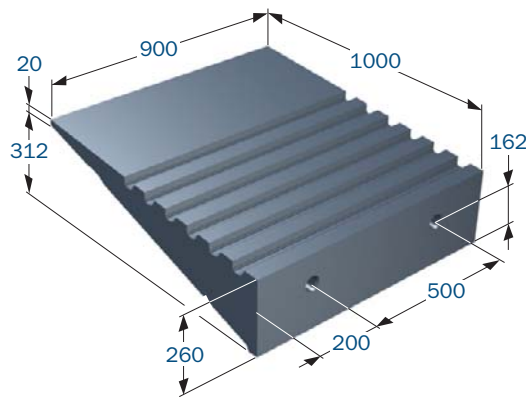
RAMP AND COPE PROTECTORS

Ramp and Cope Protectors are special wedge-shaped rubber elements which are fitted together to form a flexible extension to steel and concrete structures. Their internal steel plate gives a strong connection and the grooved rubber face provides a high friction surface that prevents slipping.



Ramp Protectors

Used as Ramp Protectors, they allow easy loading and unloading of vehicles and trailers whilst protecting the front edge of the ramp from wear. Noise levels are also much lower compared to steel ramps. Ramp Protectors weigh much less than steel too – so they are easier to install and place less stress on the structure.

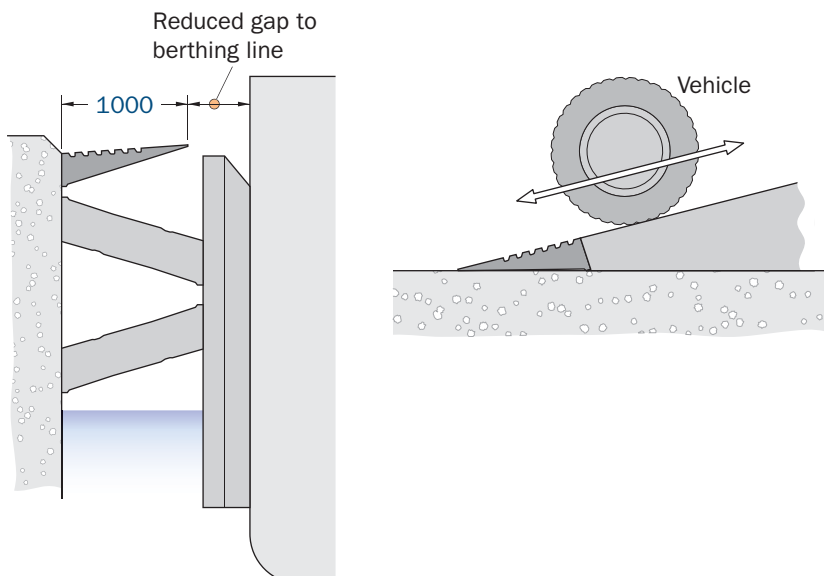


RCP-1000 shown.
Other dimensions are available on request.

Cope Protectors

Used as Cope Protectors, the elements form a flexible extension to the cope or top edge of the quay. This reduces the gap between quay face and ship where loose or bulk cargoes can fall into the harbour. Cope Protectors are also flexible, so will bend out of the way if hit by a ship during berthing.

Due to their flexibility, Cope Protectors are not designed to support the weight of people, vehicles, etc.



SHEAR FENDERS

Shear Fenders are unique because they have a linear load-deflection characteristic in shear but remain stiff in compression to support heavy loads. Their simple concept makes Shear Fenders easy to install and ideal for low energy applications. The top and bottom steel plates are fully encased in rubber which protects them from corrosion and minimises maintenance.

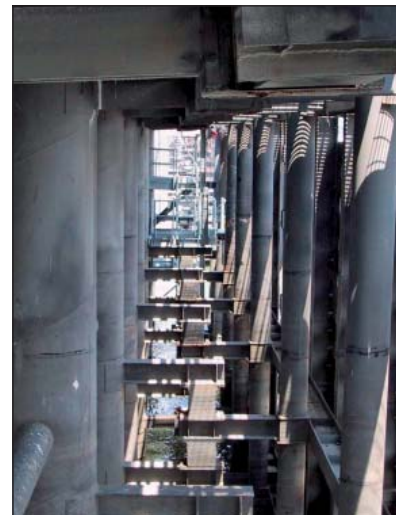
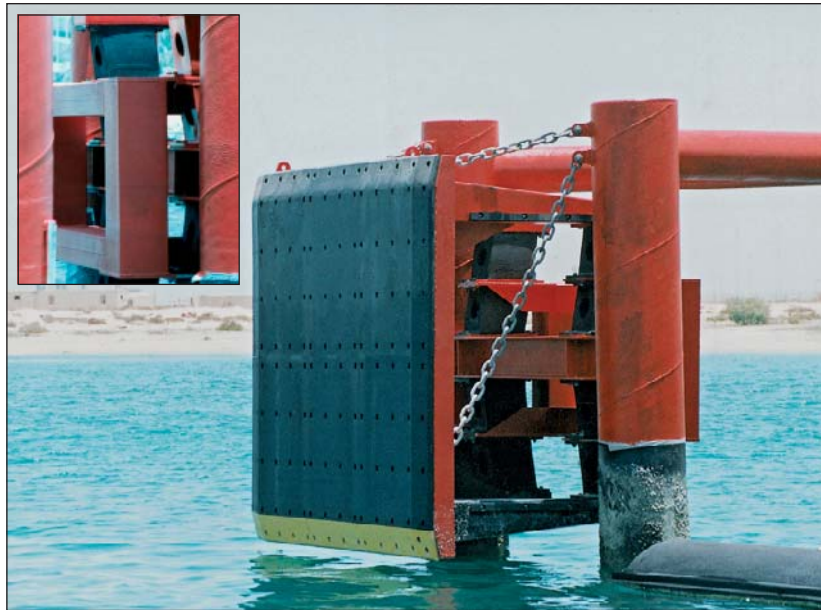
Piles and simple frontal panels are often used in conjunction with Shear Fenders. Movement in shear should be limited by chains or other mechanical stops to prevent overload.

Features

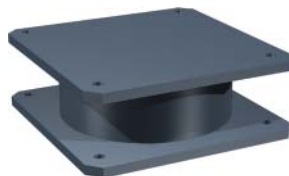
- ▮ Linear reaction curve
- ▮ Omnidirectional
- ▮ Supports large weights

Applications

- ▮ General cargo berths
- ▮ Ferry terminals
- ▮ Offshore boat landings
- ▮ Bridge protection
- ▮ Pontoon yokes



Type-SF



Type-E46



SHEAR FENDERS

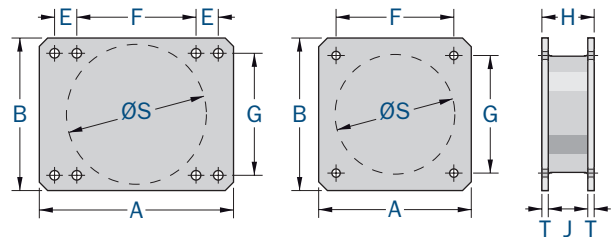
Type-SF Shear Fender

Fender	A	B	E	F	G	H	J	T	ØS	Bolt	Weight
SF 400-180	525	525	-	405	405	180	136	22	400	M24	115
SF 500-260	700	550	80	430	440	260	190	35	500	M30	190
SF 500-275	610	610	-	510	510	275	231	22	500	M24	183

[Units: mm, kg]

Fender	Shear			Compression		
	D _s	E _s	R _s	D _c	E _c	R _c
SF 400-180	136	10.0	147	20	1.2	118
SF 500-260	190	23.8	250	29	3.8	265
SF 500-275	231	24.9	216	35	4.5	255

[Units: mm, kNm, kN]



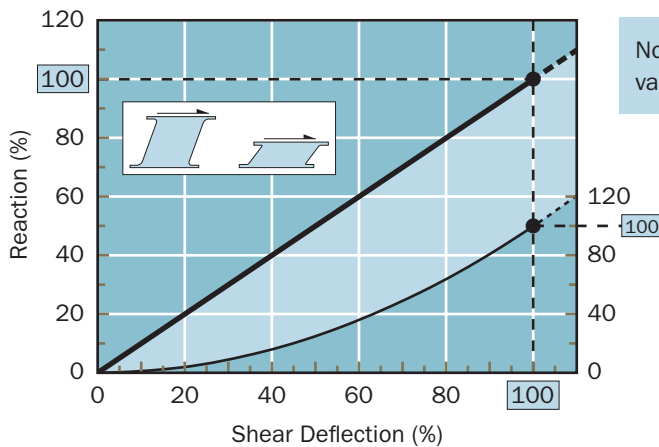
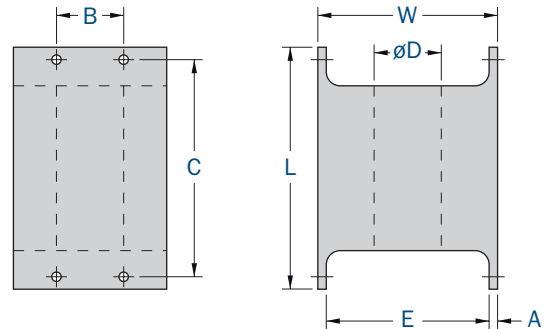
Type-E46 Shear Fender

Fender	W	H	L	A	B	C	ØD	E	Bolt	Weight
E46498	305	352	489	21	127	430	127	310	22	77
E46502	406	471	641	24	178	575	178	423	25	136

[Units: mm, kg]

Fender	Shear			Compression		
	D _s	E _s	R _s	D _c	E _c	R _c
E46498	484	14.0	57.9	155	2.5	61.8
E46502	660	32.7	99.1	212	6.2	116

[Units: mm, kNm, kN]



Nominal rated deflection may vary at RPD. Refer to p12-35.

Trelleborg Marine Systems is part of Trelleborg's Engineered Systems Business Area and specialises in the safe berthing and mooring of vessels within ports and harbours, on offshore structures and in waterways around the world.

We bring together the industry's best known and respected brands for fendering and mooring systems with the unrivalled

collective experience and knowledge of its sales and engineering staff. Our customers benefit from great choice and helpful support at every stage from initial concept and detailed design right through to supply, commissioning and after-sales service – all provided by our network of regional offices and local agents.



Americas

Tel: +1 540 667 5191
tms.americas@trelleborg.com

Asia

Tel: +65 6268 8005
tms.asia@trelleborg.com

Australia

Tel: +61 2 9285 0200
tms.australia@trelleborg.com

Benelux

Tel: +31 180 434040
tms.benelux@trelleborg.com

Central Asia

Tel: +91 79 4003 8700
tms.india@trelleborg.com

France

Tel: +33 1 41 39 22 20
tms.france@trelleborg.com

Germany

Tel: +49 40 600 4650
tms.germany@trelleborg.com

Japan

Tel: +81 3 3512 1981
tms.japan@trelleborg.com

Middle East

Tel: +971 4 886 1825
tms.middleeast@trelleborg.com

Scandinavia

Tel: +46 410 51 667
tms.scandinavia@trelleborg.com

Spain

Tel: +34 945 437 906
tms.spain@trelleborg.com

UK

Tel: +44 1666 827660
tms.uk@trelleborg.com

Harbour Marine

Tel: +61 3 9575 9999
sales@harbourmarine.com

Presented by

Trelleborg AB has made every effort to ensure that the technical specifications and product descriptions in this catalogue are correct. The responsibility or liability for errors and omissions cannot be accepted for any reason whatsoever. Customers are advised to request a detailed specification and certified drawing prior to construction and manufacture. In the interests of improving the quality and performance of our products and systems, we reserve the right to make specification changes without prior notice. All dimensions, material properties and performance values quoted are subject to normal production and testing tolerances. This catalogue supersedes the information provided in all previous editions. If in doubt, please check with Trelleborg Marine Systems.

www.trelleborg.com/marine
tms@trelleborg.com

