

**FIP ARTICOLI TECNICI SRL**



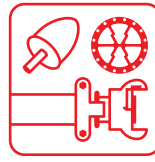
## **MARINE FENDERS**



[www.fipitaly.com](http://www.fipitaly.com)



**FIP ARTICOLI TECNICI Srl**



## IT |

**FIP Articoli Tecnici Srl**, fondata nel 1946, si è affermata e consolidata negli anni affiancando alla tradizionale attività commerciale la specializzazione, con un proprio know-how, in forniture di articoli altamente tecnici. La gamma dei prodotti si rivolge ai grandi cantieri delle imprese di costruzione e alle più svariate applicazioni industriali. Affidabilità, qualità e ampiezza del catalogo, unitamente alla grande potenzialità distributiva, fanno di FIP Articoli Tecnici Srl un partner strategico per gli acquisti delle aziende più prestigiose. Il sistema qualità di FIP Articoli Tecnici Srl è certificato ISO 9001:2008.

## ES |

**FIP Articoli Tecnici Srl**, empresa fundada en 1946, se ha ido afirmando y consolidando a lo largo de los años, acompañando la especialización a su tradicional actividad comercial, con su propio know-how, en el suministro de artículos altamente técnicos. La gama de productos se dirige a las grandes obras de las empresas de construcción, orientándose a las aplicaciones industriales más variadas. Fiabilidad, calidad y un amplio catálogo, junto a la gran potencialidad distributiva, convierten a FIP Articoli Tecnici Srl en un partner estratégico para las compras de las empresas más prestigiosas. El sistema de calidad de FIP Articoli Tecnici Srl ha sido certificado ISO 9001:2008.

## DE |

**FIP Articoli Tecnici Srl**, 1946 gegründet, hat sich etabliert und im Laufe der Jahre neben der traditionellen gewerblichen Tätigkeit Spezialisierung mit ihrem Know-how bei der Lieferung von hochtechnischen Artikeln konsolidiert. Die Produktpalette wird den Großbaustellen von Bauunternehmen und den verschiedensten industriellen Anwendungen zugewandt. Zuverlässigkeit, Qualität und Breite des Katalogs, zusammen mit dem großen Vertriebspotenzial, stellen FIP Articoli Tecnici Srl als einen strategischen Partner für die Käufe der renommiertesten Unternehmen. Das Qualitätssystem von FIP Articoli Tecnici Srl ist nach ISO 9001:2008 zertifiziert.

## AR |

فيب أدوات تقنيه شركة محدودة المسؤولية تأسست في سنة 1946، ووطدت وعززت مكانتها على مرور السنين مرفقة نشاطها التجاري التقليدي بالتخصص بتزويد أدوات ذوات التقنية العاليه ، علاوة على أالخبره وألمهاره أذاتيه تتوجه سلسلة أالمنتجات إلى ورشات شركات البناء أالكبيره ولختلف أالإستعمالات أالصناعيه أألوثوقيه ، أأنوعيه وسعة كاتالوج الشركة مع قدرة التوزيع أالكبيره ، جعلت من فيب أدوات تقنيه الشريك المثالي لمشتريات الشركات ذوات الإعتبار والجديه العاليه. نظام أأنوعيه لشركة فيب أدوات تقنيه تمت مصادقته ISO 9001:2008.

## EN |

**FIP Articoli Tecnici Srl**, founded in 1946, our company has consolidated its position on the market throughout the years by enriching its traditional commercial activity with a new one: the supply of highly technical items which has helped us to enhance our skill and know-how. Our products are designed for the jobsite activities of construction companies as well as for a wide range of industrial applications. The reliability and the quality of our catalogue, the wide variety of products it offers, together with our great distribution capacity, make FIP Articoli Tecnici Srl the ideal partner for the most important and respected companies on the market. FIP Articoli Tecnici Srl is an ISO 9001:2008 certified company.

## FR |

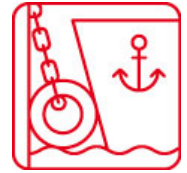
**FIP Articoli Tecnici Srl**, fondée en 1946, notre société s'est affirmée et consolidée au cours des années en associant à sa traditionnelle activité commerciale la fourniture d'articles très techniques qui nous ont permis de faire remarquer nos compétences et notre savoir-faire. Notre gamme de produits s'adresse aux grands chantiers des entreprises de construction et aux plus diverses applications industrielles. La qualité, la fiabilité et la grande variété de produits de notre catalogue, ainsi que notre forte potentialité de distribution, rendent FIP Articoli Tecnici Srl un partenaire idéal pour les achats des entreprises les plus prestigieuses. FIP Articoli Tecnici Srl a été certifiée par ISO 9001:2008.

## RU |

Фирма **FIP Articoli Tecnici Srl** - Технические Товары, была основана в 1946 году, Зарекомендовала себя на рынке на протяжении многих лет, создала собственный ноу-хау и наряду с традиционной коммерческой деятельностью укрепила свою специализацию по поставкам сугубо технических материалов и товаров. Ассортимент продукции направлен для крупных строительных компаний и для разнообразных отраслей промышленности. Надежность, качество и обширный каталог вместе с большим потенциалом распространения и сбыта товара, делают фирму FIP Articoli Tecnici Srl - Технические Товары стратегическим партнером для самых престижных компаний в приобретении специализированной продукции. Система качества Фирмы FIP Articoli Tecnici Srl - Технические Товары сертифицирована по стандарту ISO 9001:2008.

## CHN |

FIP 技术产品有限公司，成立于 1946 年，多年来公司的建立以及其传统业务在它专长供应专有的高技术产品的帮衬下已经巩固。此系列的产品是专用于建筑公司的大型建筑工地和多样化的工业应用。可靠性高，质量好和公司广泛的产品目录，再加上巨大的分销潜能，使 FIP 技术产品有限公司成为驰名企业具有战略的供应商。FIP 技术产品有限公司的质量体系已获得 ISO 9001:2008



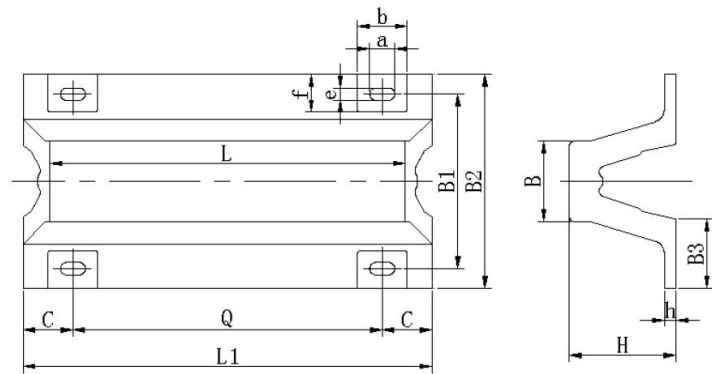
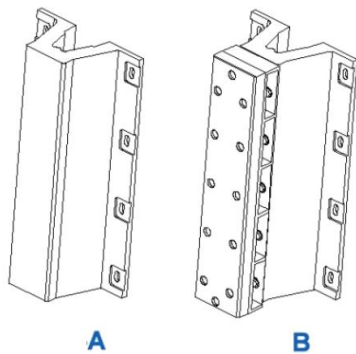
# Arch Fenders

The arch-A fender has a rubber contact face ideal for all general purpose applications. The higher friction of the rubber surface can be used to good effect to dampen the movements between vessel and wharf in sea swells and similar conditions. Where friction must be low or when a facing panel is required, the arch-B fender is ideal with its encapsulated steel head plate with integral bolting points. The arch-B has two fixing arrangements to suit either UHMW-PE low-friction face pads or for attaching to a steel fender panel or pile.



### Core Attributes

- ◆ Rugged single piece moulding for long service life
- ◆ Strong bolting arrangement is easy and quick to install
- ◆ Choice of arch-A and arch-B designs
- ◆ Excellent shear resistance means shear chains rarely needed
- ◆ Large range of sizes, lengths and Energy Indices



### Specification

#### Table



Size	L	L1	H	h	B	B3	B2	B1	f	e	C	b	a	Q	n
150	1000	1075	150	22.5	98	96	300	240	55	25	110	95	50	855	2
	1500	1575	150	22.5	98	96	300	240	55	25	112.5	95	50	675	3
	2000	2075	150	22.5	98	96	300	240	55	25	215	95	50	620	4
	2500	2575	150	22.5	98	96	300	240	55	25	220	95	50	785	4
	3000	3075	150	22.5	98	96	300	240	55	25	215	95	50	715	5
	3500	3575	150	22.5	98	96	300	240	55	25	220	95	50	671	6
200	1000	1100	200	30	145	128	400	320	75	29	120	105	58	860	1
	1500	1600	200	30	145	128	400	320	75	29	120	105	58	680	2
	2000	2100	200	30	145	128	400	320	75	29	120	105	58	620	3
	2500	2600	200	30	145	128	400	320	75	29	122.5	105	58	785	3
	3000	3100	200	30	145	128	400	320	75	29	120	105	58	715	4
	3500	3600	200	30	145	128	400	320	75	29	120	105	58	672	5
250	1000	1125	250	33	164	160	500	410	90	32	130	125	64	865	1
	1500	1625	250	33	164	160	500	410	90	32	132.5	125	64	680	2
	2000	2125	250	33	164	160	500	410	90	32	132.5	125	64	620	3
	2500	2625	250	33	164	160	500	410	90	32	127.5	125	64	790	3
	3000	3125	250	33	164	160	500	410	90	32	132.5	125	64	715	4
	3500	3625	250	33	164	160	500	410	90	32	130	125	64	673	5



300	1000	1150	300	33	225	195	600	490	105	35	140	140	70	870	1
	1500	1650	300	33	225	195	600	490	105	35	140	140	70	685	2
	2000	2150	300	33	225	195	600	490	105	35	137.5	140	70	625	3
	2500	2650	300	33	225	195	600	490	105	35	140	140	70	790	3
	3000	3150	300	33	225	195	600	490	105	35	145	140	70	715	4
	3500	3650	300	33	225	195	600	490	105	35	140	140	70	674	5
400	1000	1200	400	40	300	260	800	670	120	41	150	165	82	900	1
	1500	1700	400	40	300	260	800	670	120	41	150	165	82	700	2
	2000	2200	400	40	300	260	800	670	120	41	147.5	165	82	635	3
	2500	2700	400	40	300	260	800	670	120	41	150	165	82	800	3
	3000	3200	400	40	300	260	800	670	120	41	150	165	82	725	4
	3500	3700	400	40	300	260	800	670	120	41	150	165	82	680	5
500	1000	1250	500	45	375	325	1000	840	140	47	160	180	94	930	1
	1500	1750	500	45	375	325	1000	840	140	47	160	180	94	715	2
	2000	2250	500	45	375	325	1000	840	140	47	157.5	180	94	645	3
	2500	2750	500	45	375	325	1000	840	140	47	160	180	94	810	3
	3000	3250	500	45	375	325	1000	840	140	47	165	180	94	730	4
	3500	3750	500	45	375	325	1000	840	140	47	160	180	94	686	5
600	1000	1300	600	54	450	390	1200	1010	160	50	170	195	100	960	1
	1500	1800	600	54	450	390	1200	1010	160	50	170	195	100	730	2
	2000	2300	600	54	450	390	1200	1010	160	50	167.5	195	100	655	3
	2500	2800	600	54	450	390	1200	1010	160	50	170	195	100	820	4
	3000	3300	600	54	450	390	1200	1010	160	50	170	195	100	740	4
	3500	3800	600	54	450	390	1200	1010	160	50	170	195	100	692	5
800	1000	1400	800	72	600	520	1600	1340	260	68	180	270	136	1040	1
	1500	1900	800	72	600	520	1600	1340	260	68	180	270	136	770	2
	2000	2400	800	72	600	520	1600	1340	260	68	180	270	136	680	3
	2500	2900	800	72	600	520	1600	1340	260	68	182.5	270	136	845	3
	3000	3400	800	72	600	520	1600	1340	260	68	180	270	136	760	4
	1000	1000	1500	1000	90	750	650	2000	1680	300	68	200	290	136	1100
1500		2000	1000	90	750	650	2000	1680	300	68	200	290	136	800	2
2000		2500	1000	90	750	650	2000	1680	300	68	200	290	136	700	3

Performance Table

Model	FS		FH		FO		FL		
	52.5%	55%	52.5%	55%	52.5%	55%	52.5%	55%	
150	E	7.1	8.4	6.1	7.1	4.1	5.1	3.1	4.1
	R	135	182	147	157	87.7	117	58	79.6
200	E	11.2	14.3	11.2	12.2	8.2	9.2	5.1	6.1
	R	176	240	156	208	114	156	78.5	104
250	E	29	41.2	22.8	24	18.8	19.8	16.6	17.7
	R	281	391	216	300	179	249	154	213
300	E	41.8	44.8	31.6	33.7	25.5	27.4	22.4	24.5
	R	330	460	254	353	290	300	181	251
400	E	74.4	79.4	57.1	61.2	46.9	50	40.8	43.9
	R	441	612	339	469	281	361	241	334
500	E	115	123	89.5	94.9	73.4	78.5	69.4	67.3
	R	551	765	423	588	351	487	301	418
600	E	166	179	129	138	106	113	90.7	97
	R	660	917	508	706	420	590	361	502
800	E	296	317	228	254	189	202	162	173
	R	881	1224	677	940	561	779	481	669
1000	E	463	496	356	381	295	317	253	271
	R	1101	1529	846	1176	703	975	602	835

Note:

FS: Super High Reaction Force.

FH: High Reaction Force.

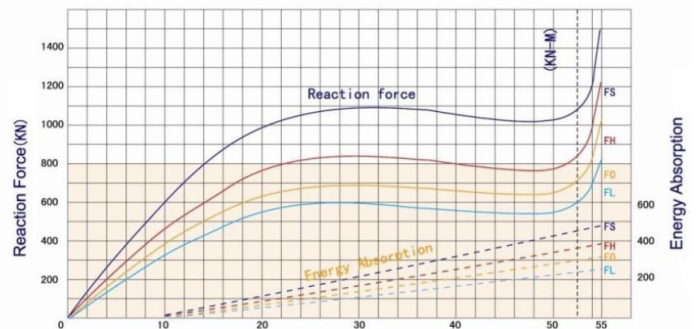
FO: Standard Reaction Force.

FL: Low Reaction Force

E: Energy Absorption

R: Reaction Force

Performance Curve





## Cone Fenders

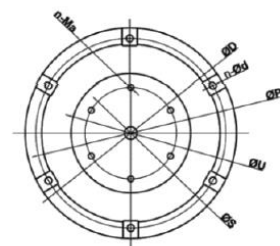
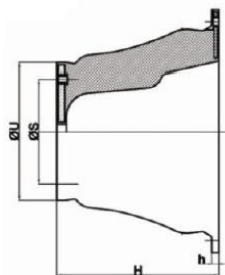
Cone Fenders are the latest generation of "Cell Fender" combining excellent energy capacity with low reaction force to give the most efficient performance of any fender type. The conical shape keeps the body stable under all combinations of axial, shear and angular loading, making it ideal for berths where large berthing angles and heavy impacts need to be accommodated. All Cone Fenders are single piece mouldings so they are robust, long lasting and easy to install. UHMW-PE faced steel frontal frames are generally used in conjunction with Cone Fenders.

### Core Attributes

- ◆ High efficient shape
- ◆ Excellent under large berthing angles and shear
- ◆ Versatile design suits numerous applications
- ◆ Choice of low, standard, intermediate and high compounds
- ◆ Stable geometry maintains performance under all loading combinations



### Specification Table



Size	H	h	ΦU	ΦS	ΦP	ΦD	n	n-Φd	n-Ma
500H	500	25	425	325	675	750	4	30	M24
600H	600	27	510	390	810	900	6	30	M24
700H	700	32	595	455	945	1050	6	38	M30
800H	800	36	680	520	1080	1200	6	44	M36
900H	900	41	765	585	1215	1350	6	44	M36
1000H	1000	45	850	650	1350	1500	6	56	M42
1100H	1100	50	935	715	1485	1650	6	50	M42
1150H	1150	52	998	750	1550	1725	6	56	M42
1200H	1200	54	1020	780	1620	1800	8	50	M42
1300H	1300	59	1105	845	1755	1950	8	60	M48
1400H	1400	66	1190	930	1890	2100	8	60	M48
1600H	1600	72	1360	1060	2160	2400	8	70	M48
1800H	1800	78	1530	1190	2430	2700	10	76	M56



Performance Table

Note:

**FS:** Super High Reaction Force.

**FH:** High Reaction Force.

**FO:** Standard Reaction Force.

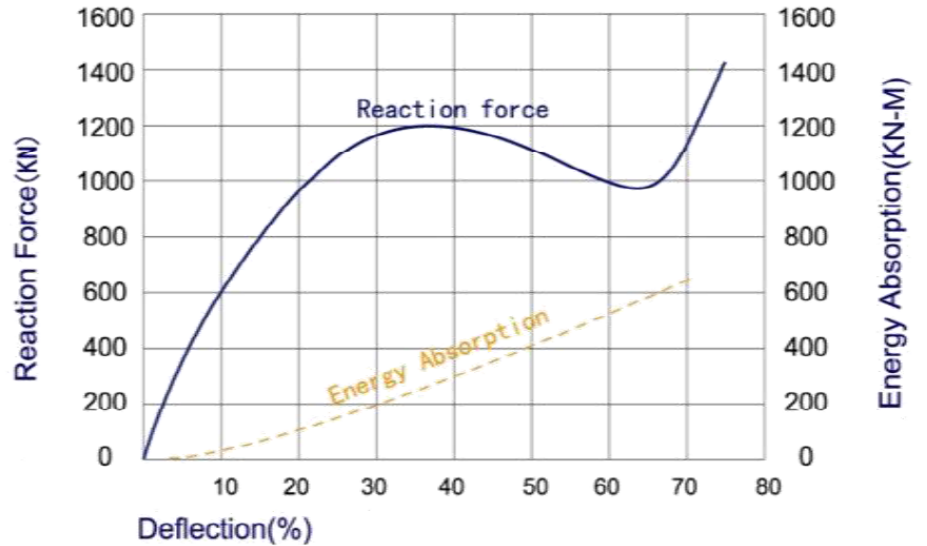
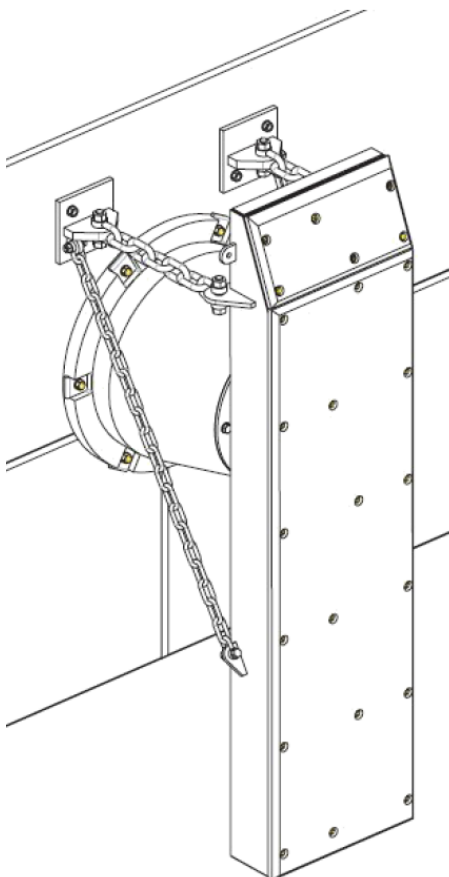
**FL:** Low Reaction Force

**E:** Energy Absorption

**R:** Reaction Force

Model		FS		FH		FO		FL	
		70.0%	72%	70.0%	72%	70.0%	72%	70.0%	72%
500	E	80.6	91.8	64.3	71.4	47.9	51	37.7	41.8
	R	342	388	273	317	204	237	168	197
600	E	160	164	130	132	95.9	106	76.5	86.7
	R	490	553	390	438	289	325	230	263
700	E	240	248	185	196	153	157	122	127
	R	665	705	532	579	320	435	314	348
800	E	375	388	300	322	229	257	183	212
	R	879	949	720	850	512	588	410	437
900	E	504	527	407	440	312	341	260	275
	R	1099	1213	879	976	648	717	518	569
1000	E	682	750	552	600	446	488	357	388
	R	1366	1537	1100	1237	800	900	641	712
1100	E	847	882	663	695	505	538	416	441
	R	1459	1601	1169	1284	946	1039	816	850
1150	E	1050	1125	900	957	679	731	543	600
	R	1799	2025	1420	1625	1059	1175	847	937
1200	E	1115	1172	971	1018	719	754	571	599
	R	1883	2086	1526	1698	1128	1252	908	1005
1300	E	1617	1673	1336	1387	1064	1099	765	816
	R	2168	2358	1739	1938	1346	1567	1148	1224
400	E	1720	1791	1376	1433	1101	1147	877	914
	R	2300	2556	1840	2045	1472	1636	1173	1304
1600	E	2467	2570	1974	2056	1579	1645	1259	1311
	R	3084	3213	2313	2570	1850	2056	1446	1606
1800	E	3609	3760	2887	3007	2309	2406	1840	1918
	R	3825	4249	3060	3400	2449	2720	1950	2168

Performance Curve





## Cylindrical Fenders

Cylindrical Fenders are simple to install and operate which makes these units an economical solution for remote locations and for multi user berths where vessel types cannot always be predicted.

Their progressive load-deflection characteristics make the same fender suitable for both large and small vessels, and with a wide choice of sizes and diameter ratios, performance can be closely matched to requirements in each case.

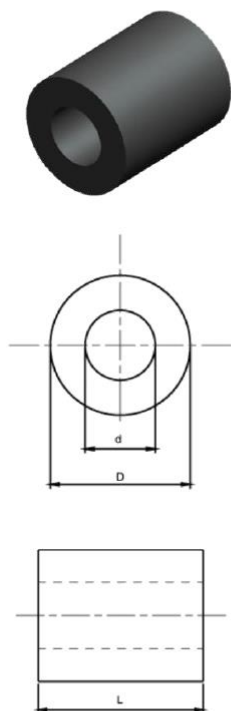


### Core Attributes

- ◆ Simple and economical design, easy to install
- ◆ Choice of mounting systems to suit different structures and applications
- ◆ Sizes from 150mm to 2000mm diameter in almost any length
- ◆ Thick fender wall resists abrasion, even after years of heavy use
- ◆ Progressive load-deflection characteristics



### Specification Table



Size	Outer Diameter D (mm)	Inner Diameter d (mm)	Approx. Weight kg/m
150xL	150	75	16
200xL	200	100	39
250xL	250	125	46
300xL	300	150	66
350xL	350	175	90
400xL	400	200	118
500xL	500	250	184
600xL	600	300	265
700xL	700	350	361
800xL	800	400	471
900xL	900	450	596
1000xL	1000	500	736
1100xL	1100	550	890
1200xL	1200	600	1060
1300xL	1300	650	1244
1400xL	1400	700	1442
1500xL	1500	750	1656
1600xL	1600	800	1884
1700xL	1700	850	2127
1800xL	1800	900	2384
1900xL	1900	950	2657
2000xL	2000	1000	2944



Performance Table

Note:

**FH:** High Reaction Force.

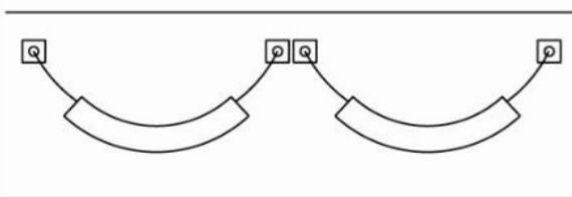
**FO:** Standard Reaction Force.

**E:** Energy Absorption

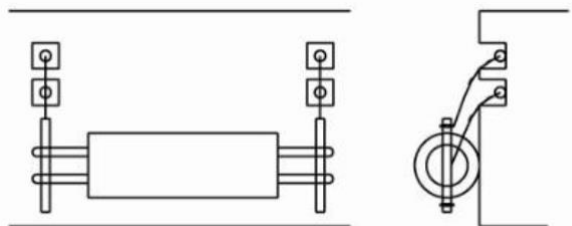
**R:** Reaction Force



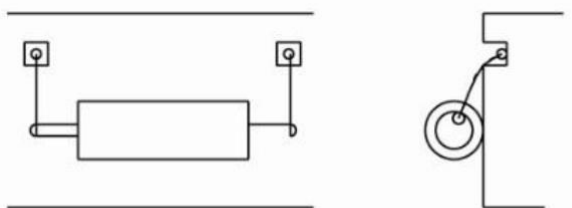
Installation arrangement



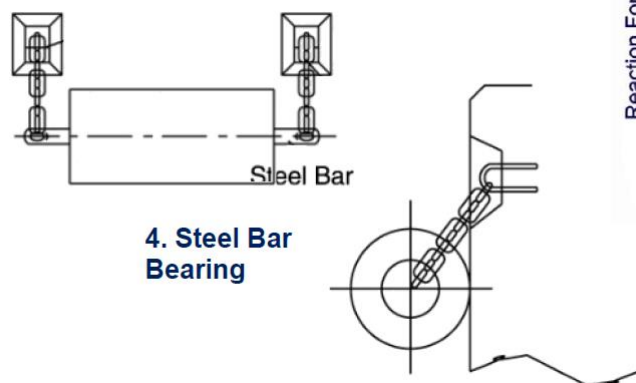
1.Chain Bearing



2.Trapezoid Bearing



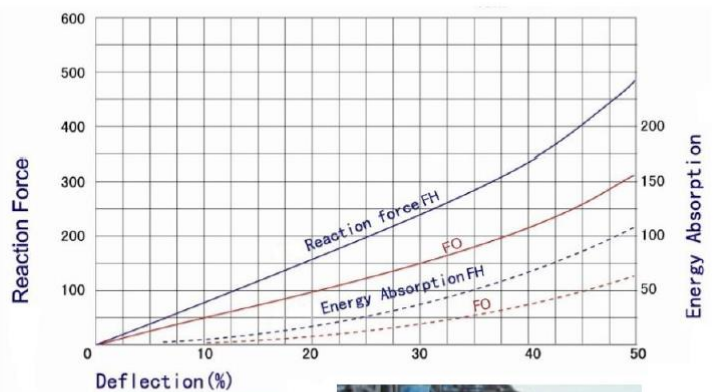
3.Chain and Steel Bar Bearing



4. Steel Bar Bearing

Model		FH 50%	FO 50%
150xL	E	2	1.5
	R	75	45
200xL	E	4	2.7
	R	97	61
250xL	E	6.6	4.1
	R	122	77
300xL	E	9	6.1
	R	146	91
350xL	E	13	8.2
	R	170	106
400xL	E	17	10.2
	R	195	121
500xL	E	26.5	16.3
	R	244	151
600xL	E	27.5	24.5
	R	292	183
700xL	E	51	31.6
	R	341	212
800xL	E	67.3	41.8
	R	391	242
900xL	E	85.7	53
	R	439	273
1000xL	E	105	65.3
	R	489	303
1100xL	E	132	78.5
	R	539	338
1200xL	E	155	96.9
	R	585	370
1300xL	E	183	110
	R	635	400
1400xL	E	212	131
	R	683	430
1500xL	E	243	150
	R	732	460
1600xL	E	288	180
	R	792	491
1700xL	E	345	210
	R	840	521
1800xL	E	414	252
	R	889	552
1900xL	E	497	294
	R	938	581
2000xL	E	596	327
	R	1075	666

Performance Curve







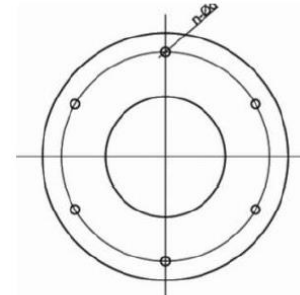
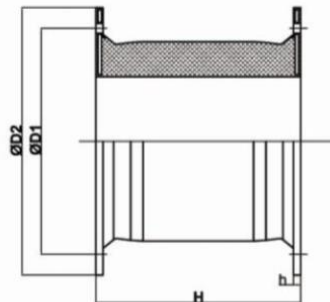
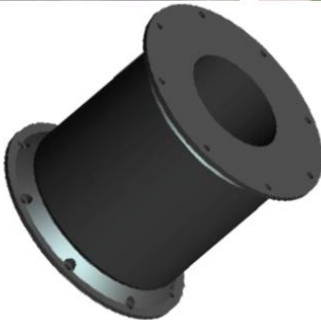
## Super Cell Fenders

Cell Rubber Fender here mentioned is improved over the ordinary type. It has high absorption energy per unit weight and low tilt compression performance change among all types of compressed fenders. In the front it is equipped with frontal frame which greatly reduce the face pressure on ship panel and the friction coefficient.



### Core Attributes

- ◆ Low reaction force and high capability of energy absorption.
- ◆ Due to its structure, the product has the characteristic of higher force absorption and long usage life.
- ◆ Choice of 5 standards of compounds.



### Specification Table

Size	H	ØD1	ØD2	h	n x Ød
400H	400	650	550	25	4 x Ø30
500H	500	650	550	25	4 x Ø32
630H	630	840	700	30	4 x Ø39
800H	800	1050	900	30	6 x Ø40
1000H	1000	1300	1100	35	6 x Ø47
1150H	1150	1500	1300	40	6 x Ø50
1250H	1250	1650	1450	45	6 x Ø53
1450H	1450	1850	1650	47	6 x Ø61
1600H	1600	2000	1800	50	8 x Ø61
1700H	1700	2100	1900	55	8 x Ø66
2000H	2000	2200	2000	55	8 x Ø74
2250H	2250	2550	2300	60	10 x Ø74
2500H	2500	2950	2700	70	10 x Ø90
3000H	3000	3350	3150	75	12 x Ø90





Performance Table

Note:

**FE:** Super High Reaction Force

**FS:** Super High Reaction Force.

**FH:** High Reaction Force.

**FO:** Standard Reaction Force.

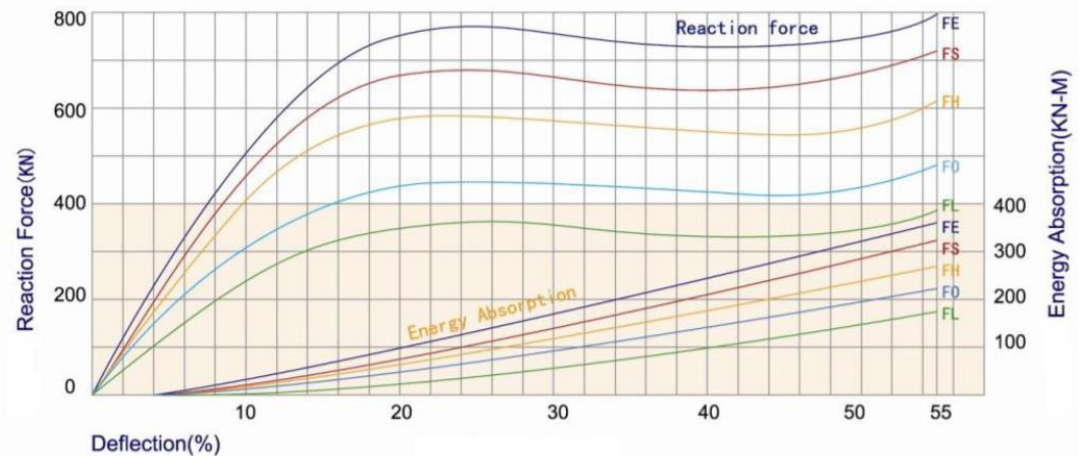
**FL:** Low Reaction Force

**E:** Energy Absorption

**R:** Reaction Force

Model		FE 52.5%	FS 52.5%	FH 52.5%	FO 52.5%	FL 52.5%
400H	E	19.4	17.3	14.3	11.2	9.2
	R	112	97.9	85	65.3	52
500H	E	40.8	36.7	30.6	23.5	18.4
	R	186	165	143	110	87.7
630H	E	81.6	73.4	63.2	47.9	38.8
	R	296	263	229	175	141
800H	E	166	148	128	97.9	76.5
	R	473	420	341	281	215.2
1000H	E	331	293	254	195	156
	R	752	668	578	445	356
1150H	E	502	446	387	297	238
	R	995	882	765	590	471
1250H	E	645	572	496	382	305
	R	1176	1042	903	696	557
1450H	E	1007	894	775	597	477
	R	1582	1404	1217	936	750
1600H	E	1353	1201	1040	802	641
	R	1926	1710	1482	1139	912
1700H	E	1623	1441	1279	960	768
	R	2174	1930	1673	1287	1029
2000H	E	2643	2346	2034	1565	1252
	R	3000	2671	2315	1781	1426
2250H	E	4177	3701	3213	2473	2101
	R	4228	3753	3252	2503	2127
2500H	E	5730	5087	4408	3392	2883
	R	5220	4634	4016	3089	2625
3000H	E	/	/	5605	5790	4995
	R	/	/	5801	4400	3751

Performance Curve





## D Type Fenders

D Fenders can be pre-curved, chamfered and drilled to aid installation at a relatively low cost and can also be cut to the length required. They provide an excellent barrier against damage from all sizes and shapes of vessels. They are ideal for smaller quays and wharves serving fishing boats, tugs, barges and other work craft. D Fenders are also commonly used on pontoons and on inland waterways for lock protection.

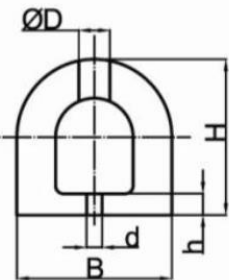
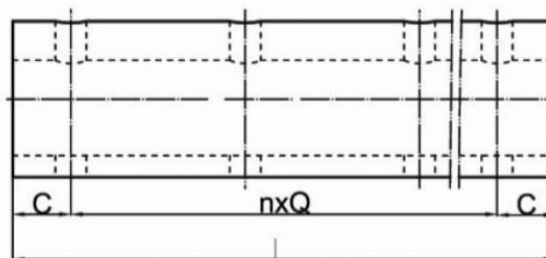


### Core Attributes

- ◆ Ideal for smaller quays and wharves
- ◆ Easy to install with a flat bar down the bore



### Specification Table



Size	H	B	L	Holes	Q	C	h	D	d
150x150x1000L	150	150	1000	3	350	150	25	40	24
200x200x1000L	200	200	1000	3	350	150	35	55	30
200x200x3000L	200	200	3000	8	400	100	35	55	30
250x250x1000L	250	250	1000	3	350	150	35	60	30
250x250x3000L	250	250	3000	8	400	100	35	60	30
300x300x1000L	300	300	1000	3	350	150	40	65	32
300x300x3000L	300	300	3000	8	400	100	40	65	32
300x360x1000L	300	360	1000	3	350	150	40	65	32
300x360x3000L	300	360	3000	8	400	100	40	65	40
400x400x1000L	400	400	1000	3	350	150	55	80	32
400x400x3000L	400	400	3000	8	400	100	55	80	40
500x500x1000L	500	500	1000	3	350	150	90	97	45
500x500x3000L	500	500	3000	8	400	100	90	97	45



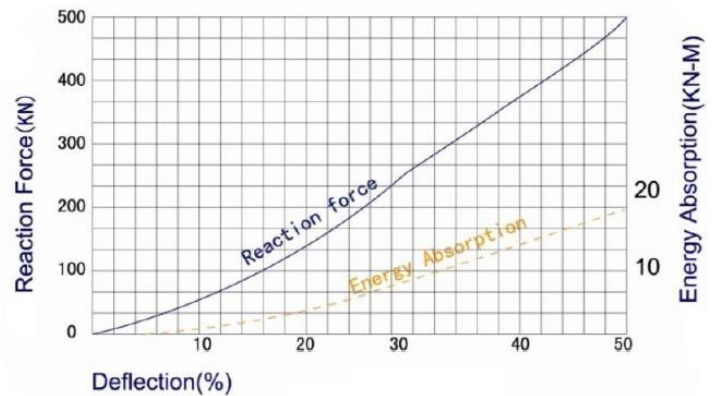
Performance Table

Model (mm)	Rated deflection 50%	
	Reaction force (KJ)	Energy absorption (KN · M)
150x150x1000L	115	3.2
200x200x1000L	211	8.6
250x250x1000L	252	9.2
300x300x1000L	300	12
300x360x1000L	330	14.28
400x400x1000L	390	20
500x500x1000L	460	32



D Fenders are also called Extrusion Fenders. Extrusion is a manufacturing process involving pushing unvulcanized rubber through a special die to form a constant cross-section profile. This is a simple and cost effective production method for smaller fenders and allows sections to be made in very long lengths. Special profiles can also be produced economically to customer's specific

Performance Curve



Core Applications

D Fenders suits a wide variety of general purpose applications.

- ◆ Smaller jetties and wharves
- ◆ Workboats and service craft
- ◆ Mooring pontoon protection
- ◆ Inland waterways
- ◆ General purpose applications

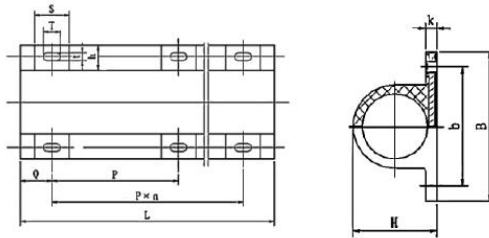




## Wing Fenders



Wing Type Rubber Fenders are developed on the basis of D Type Fenders. They can be fixed with double line anchors which greatly increase the installation stability. Furthermore, their anchoring bolt is bigger than D type so that the anchoring grip is double to D type.



### Specification

Table

Size	H	B	b	L	Q	p	s	h	T	t	K	n
280H x 540 x 1000L	280	540	430	1000	150	700	165	120	82	41	40	2
280H x 540 x 1500L	280	540	430	1500	150	600	165	120	82	41	40	3
280H x 540 x 2000L	280	540	430	2000	145	570	165	120	82	41	40	4
280H x 540 x 2500L	280	540	430	2500	150	550	165	120	82	41	40	5
280H x 540 x 3000L	280	540	430	3000	150	540	165	120	82	41	40	6
300H x 600 x 1000L	300	600	490	1000	150	700	165	120	82	41	40	2
300H x 600 x 1500L	300	600	490	1500	150	600	165	120	82	41	40	3
300H x 600 x 2000L	300	600	490	2000	145	570	165	120	82	41	40	4
300H x 600 x 2500L	300	600	490	2500	150	550	165	120	82	41	40	5
300H x 600 x 3000L	300	600	490	3000	150	540	165	120	82	41	40	6

### Performance

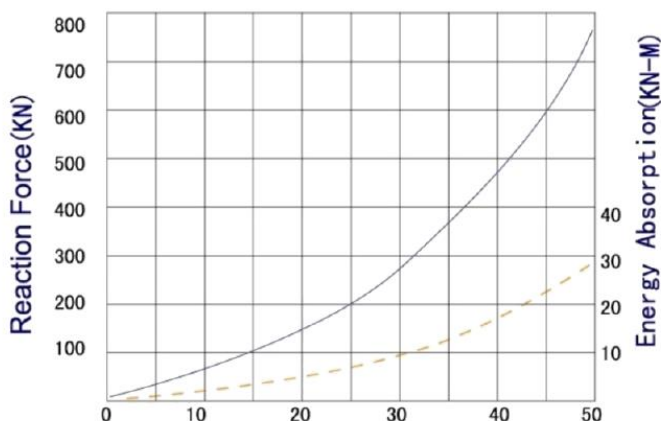
Table



Model	Rated Compression Reaction Force KN	Deflection 50% Energy Absorption KN·M
280Hx540x1000L	382.5	14.28
300Hx600x1000L	504.9	20.4

### Performance

Curve





## Square Fenders

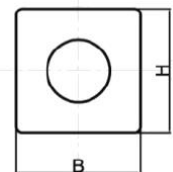
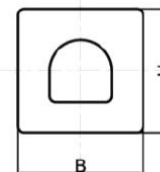
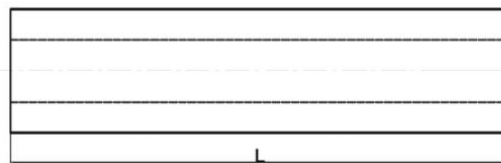
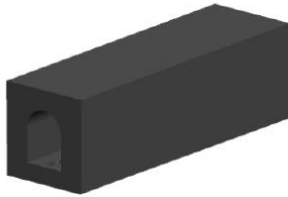
Square Rubber Fenders offer similar advantages to D fenders and are typically used where a stiffer fender is required. The square profile gives these fenders heavier shoulders which make them ideal for tougher service environments.

Square fenders are commonly used as beltings and also on the bow or stern of smaller tugs as pushing fenders since they can be fitted closely together to reduce the risk of ropes or protrusions catching between adjacent sections.



### Core Attributes

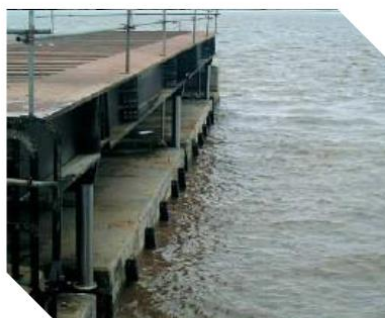
- ◆ Ideal for tougher service environments
- ◆ Easy to be mounted quay by means of anchor belts
- ◆ Can be supplied in long lengths and be cut to length, angle cut at the ends



### Specification Table

Item	150HB	200HB	250HB	300HB	350HB	400HB	500HB	600HB
H	150	200	250	300	350	400	500	600
B	150	200	250	300	350	400	500	600
ΦD	75	100	125	150	175	200	250	300
Φ1	60	65	75	80	85	95	105	115
Φ2	27	30	33	36	40	45	50	55
Bolt Size	M22	M26	M30	M32	M36	M38	M45	M52
Bolt Space	260~330	260~330	250~320	275~330	275~350	300~370	300~400	300~450

### Performance Table



Model	Rated Deflection 40%	
	Reaction force (KN)	Energy absorption (KN·M)
150HB	117	3.83
200HB	156	6.85
250HB	195	10.6
300HB	234	15.4
350HB	273	20.9
400HB	312	27.4
500HB	390	42.8
600HB	468	61.6



## Unit Element Fenders

Unit Element Fenders are a high performance, modular system. Element Fenders can be combined in unlimited permutations of length, orientation and Energy Index to suit a wide variety of applications.

The simplest Unit Element system is the UE-V fender which employs pair(s) of elements and a structural UHMW-PE face. UE-V fenders combine high energy capacity with low friction face and high wear resistance. The versatility of Unit Element fenders makes them suitable for almost all applications.

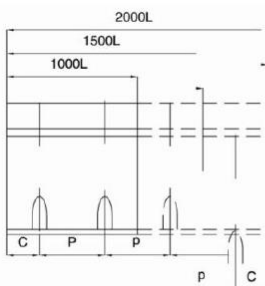
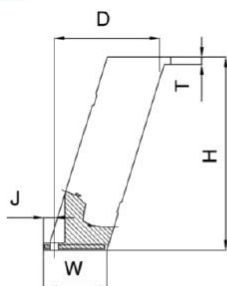


### Core Attributes

- ◆ Modular design allows limitless setting out arrangements
- ◆ Excellent shear resistance in lengthwise plane
- ◆ Sizes to suit every application
- ◆ Easy and quick to install
- ◆ UE-V fender shields can be bolted from the front using asymmetric elements

### Specification

Table



Size	H	J	W	T	D	L	C	P	Bolt
300	300	47	94	15	94	2000	250	500	M20
400	400	63	125	17	124	2000	250	500	M24
500	500	87	158	20	142	2000	250	500	M30
550	550	87	172	20	170	2000	250	500	M30
600	600	87	188	20	199	2000	250	500	M30
750	750	118	235	26	230	2000	250	500	M36
800	800	129	250	26	240	2000	250	500	M36
1000	1000	162	322	31	310	2000	250	500	M42
1250	1250	202	401	36	388	2000	250	500	M48
1450	1450	228	454	41	445	2000	250	500	M48
1600	1600	257	500	50	480	2000	250	500	M56



Performance

Table

Model		FH 57.5%	FO 57.5%	FL 57.5%
300	E	22.4	15.3	11.2
	R	164	112	93
400	E	39.8	27.5	20.8
	R	218	153	112
500	E	62.2	43.9	32
	R	272	191	141
550	E	76.5	53	40
	R	300	210	156
600	E	90.8	63.2	47
	R	326	229	172
750	E	140	97.9	72.6
	R	410	288	212
800	E	160	112	83
	R	437	305	225
1000	E	250	175	130
	R	545	382	283
1250	E	391	273	185
	R	680	476	341
1450	E	526	368	255
	R	791	554	396
1600	E	641	449	335
	R	872	611	453

Note:

**FH:** High Reaction Force.

**FO:** Standard Reaction Force.

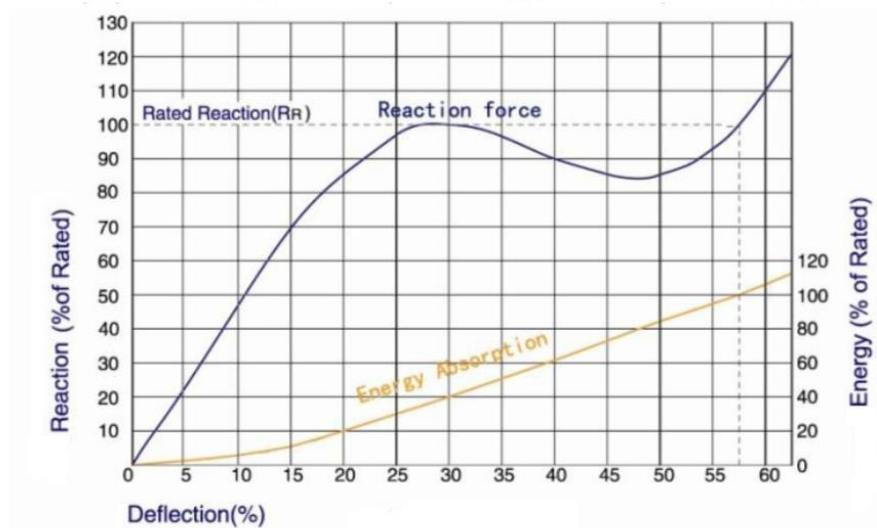
**FL:** Low Reaction Force.

**E:** Energy Absorption

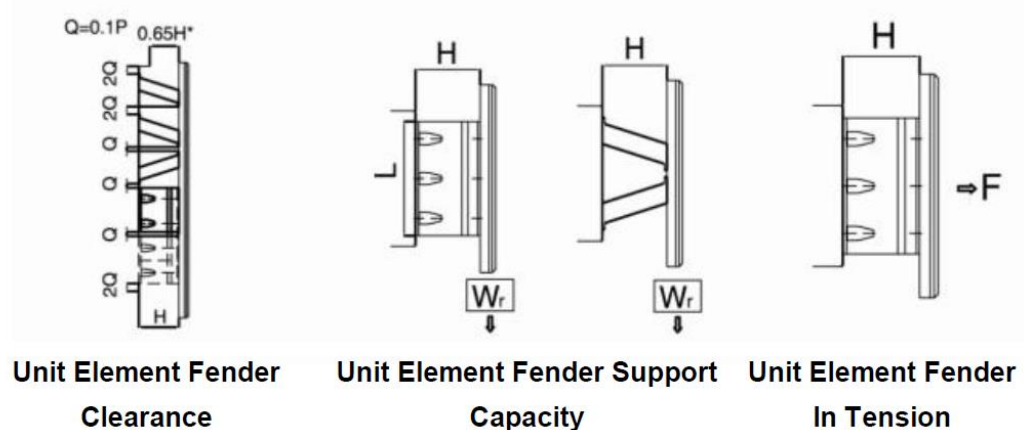
**R:** Reaction Force

Performance

Curve



Installation





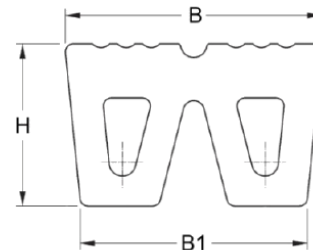


# Tug Fenders

Tug fenders must work harder, for longer and under more adverse conditions than any other fender type. Tug fenders can be divided into three main types, W-Fender, M-Fender and Tugboat Fender.

## W Fenders

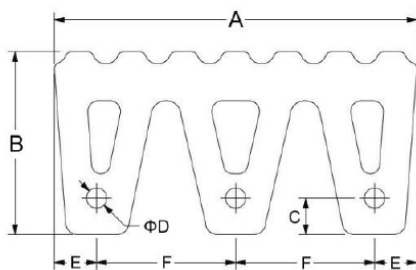
W Type Rubber Fenders are specially designed as vertical fenders for the bow and stern of tugs. The unique profile of W Fender is able to accommodate the tight radius and closely follow the ship's contours.



Size	B	B1	H	L
320	320	280	200	≤2000
480	480	426	300	≤3600
500	500	420	330	≤2000
500	500	420	450	≤2500
500	500	450	400	≤2000
600	600	560	300	≤2000
600	600	550	400	≤2000

## M Fenders

M Type Rubber Fenders are also used for pushing. They provide a large flat contact face for very low hull pressures – useful when working with soft hulled ships such as tankers and bulk carriers. The grooved profile gives extra grip and the M Fender can easily be mounted around on straight sections and fairly small radii at the bow and stern quarters of a tug.

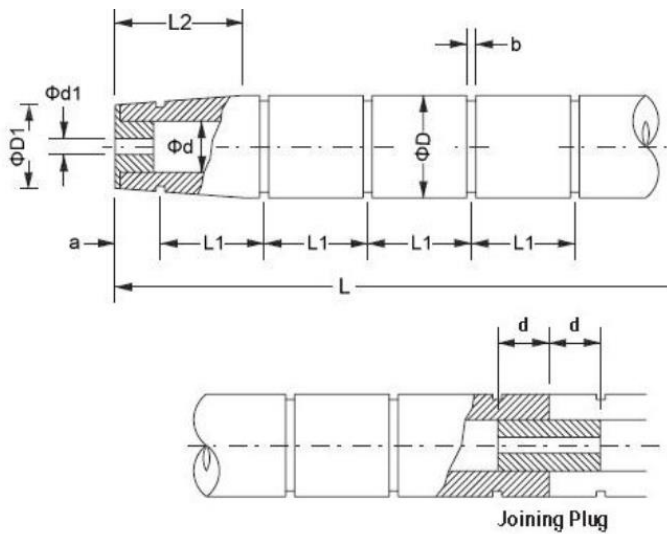


Size	A	B	C	ΦD	E	F	ΦP	L
400	400	200	40	23	50	150	20	2000
500	500	250	50	27	60	190	24	2000
600	600	300	60	33	70	230	30	2000

## Tugboat Fenders

Tugboat Rubber Fenders are made of high abrasion resistance rubber with good resilience properties for required applications. These fenders are easy to install and dismantle with users friendly fixtures, tool tackles. They are very popular with small port craft owners and tug owners. They are compression molded in high pressure thermic fluid heated moulds and have excellent sea water resistance.





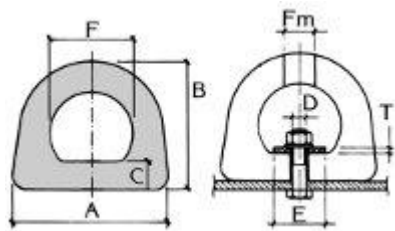
Type	ΦD	Φd	ΦD1	Φd1	a	b	L1	L2
Φ300xΦ150xL	300	150	225	75	225	50	600	700
Φ300xΦ100xL	300	100	225	75	225	50	600	700
Φ400xΦ200xL	400	200	300	100	300	50	670	800
Φ400xΦ150xL	400	150	300	100	300	50	670	800
Φ400xΦ100xL	400	100	300	100	300	50	670	800
Φ500xΦ250xL	500	250	375	100	300	60	730	900
Φ500xΦ220xL	500	220	375	100	300	60	730	900
Φ500xΦ200xL	500	200	375	100	300	60	730	900
Φ500xΦ150xL	500	150	375	100	300	60	730	900
Φ600xΦ300xL	600	300	450	125	350	60	800	900
Φ600xΦ250xL	600	250	450	125	350	60	800	900
Φ600xΦ220xL	600	220	450	125	350	60	800	900
Φ600xΦ200xL	600	200	450	125	350	60	800	900
Φ700xΦ350xL	700	350	525	125	350	60	860	1000
Φ700xΦ300xL	700	300	525	125	350	60	860	1000
Φ700xΦ250xL	700	250	525	125	350	60	860	1000
Φ700xΦ220xL	700	220	525	125	350	60	860	1000
Φ800xΦ400xL	800	400	600	125	350	70	930	1000
Φ800xΦ350xL	800	350	600	125	350	70	930	1000
Φ800xΦ300xL	800	300	600	125	350	70	930	1000
Φ900xΦ450xL	900	450	675	150	350	70	1000	1100
Φ900xΦ400xL	900	400	675	150	350	70	1000	1100
Φ900xΦ350xL	900	350	675	150	350	70	1000	1100

Other spec. and sizes can be customized upon request.  
L=3000mm~26000mm

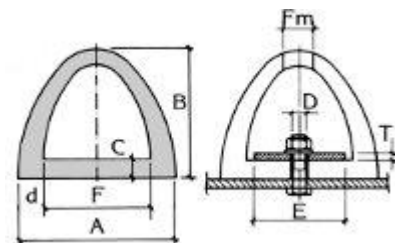


# RUBBER FENDERS

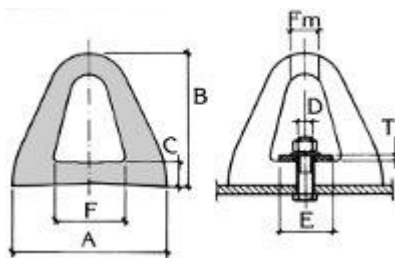
The rubber fenders of this category are primarily used for protection from small entities' impacts in the marine industry, trucking and for bank protection of warehouses in loading/unloading designated areas.



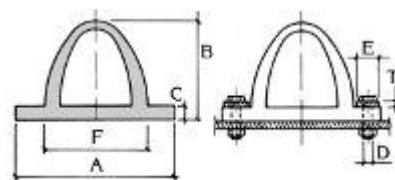
TYPE	A	B	C	F	Weight kg./m.	ASSEMBLY				
						D	Fm	E	T	Axle spacing
EU/19	254	203	48	134	37.6	18	Ø superior to Ø outer of the spanner	80	8	500
EU/09	305	254	60	162	57	27		100	10	600



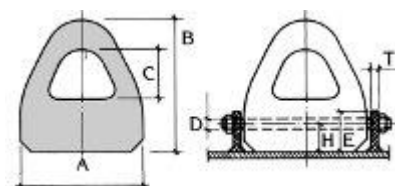
TYPE	A	B	C	F	Weight kg./m.	ASSEMBLY				
						D	Fm	E	T	Axle spacing
EP/95	160	128	17	110	7	8	Ø superior to Ø outer of the spanner	80	8	500
EP/90	160	128	28	96	12.5	10		80	8	500
EE/14	160	128	32	82	17	12		70	8	500



TYPE	A	B	C	F	Weight kg./m.	ASSEMBLY				
						D	Fm	E	T	Axle spacing
EU/16	60	51	11	28	1.9	6	Ø superior to Ø outer of the spanner	22	4	250
EP/83	80	70	15	40	3	6		30	5	300
EU/02	110	95	22	50	7.5	8		40	6	400
EU/07	150	130	30	70	13	10		50	8	500
EU/18	170	150	34	80	16.5	12		60	8	500



TYPE	A	B	C	F	Weight kg./m.	ASSEMBLY			
						D	E	T	Axle spacing
EU/05	125	70	15	77	4.1	6	20	6	250
EU/06	200	100	15	138	7	8	25	8	300
EU/08	240	150	22	160	13.5	10	30	10	400



TYPE	A	B	C	Weight kg./m.	ASSEMBLY				
					D	H	E	T	Axle spacing
EU/41	150	150	60	18	14	35	50	10	400



## Roller & Wheel Fenders

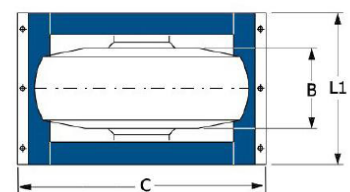
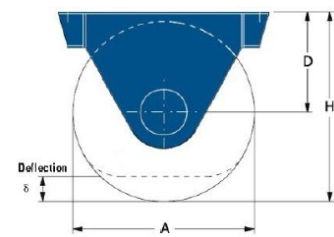
Roller and Wheel Fenders are commonly used on the berth corners and dock entrances, also widely installed along the walls of dry docks and other restricted channels to help guide vessels and prevent hull damage. They can be divided into two types, JZD-A Roller Fender and JZD-B Wheel Fender.

### A Roller Fender

These Fenders are commonly installed along the walls of dry docks and other restricted channels to help guide vessels and prevent hull damage.

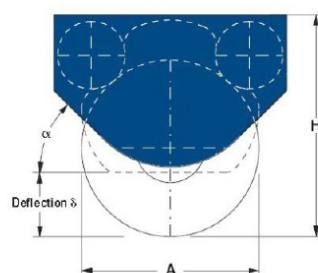
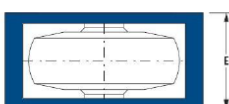
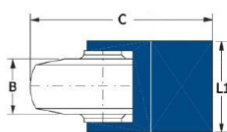
Roller Fenders are also used on berth corners and lock entrances where lower energy capacity is required. The wheel is mounted on a fixed axle supported by a special frame. Performance can be modified where required by adjusting the initial pressure. The heavy duty steel supporting frame is designed to allow easy access to all moving parts. Corrosion traps are eliminated, contributing to a low maintenance service life.

Size	A	B	C	D	L1	H	Weight(kg)
-A600x200	600	200	695	320	420	620	128
-A750x250	750	250	870	400	510	775	248
-A900x300	900	300	1040	480	610	930	466
A1200x400	1200	400	1380	640	820	1240	1046
A1500x500	1500	500	1740	800	1010	1550	2011
A1800x600	1800	600	2080	960	1210	1860	3443
A2100x700	2100	700	2440	1155	1410	2205	5612
A2400x800	2400	800	2770	1280	1610	2480	8116
-A2700x900	2700	900	3130	1440	1810	2790	11595
A3000x1000	3000	1000	3480	1600	2010	3100	16011



### B Wheel Fender

Fenders help vessels manoeuvre into berths and narrow channels. Different configurations are used for a variety of locations such as locks and dry dock entrances and exposed corners. The wheel has a sliding axle in front of two idler rollers to absorb the greatest possible energy during compression of the wheel into the casing. Performance can be modified where required by adjusting the initial pressure.



Size	A	B
B1200x400	1200	400
B1500x500	1500	500
B1800x600	1800	600
B2100x700	2100	700
B2400x800	2400	800
B2700x900	2700	900
B3000x1000	3000	1000

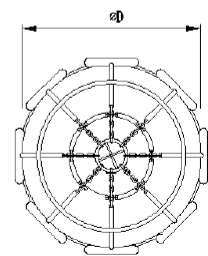
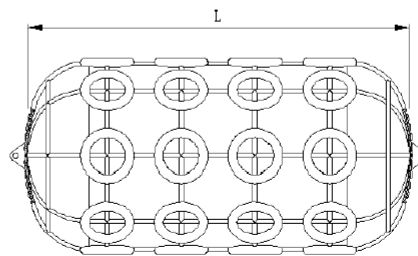


## Pneumatic Rubber Fenders

Pneumatic Rubber Fenders have been in use for around 50 years.

The development of the Pneumatic Fender has progressed through the years in conjunction with the changing shapes, designs and size of ships and ship technology

It is the leading anti-collision device for marine application in the world. This compressed air filled rubber fender is used as a protective medium for ship-to-ship contact (STS), ship to quay (STQ) and ship-to-berthing (STB)



### Specification/ Performance Table

Nominal size Diameter × length	Initial internal pressure	At 60% deflection		Hull pressure (internal pressure)
		Energy absorption	Reaction force	
mm	kPa	kJ	kN	kPa
Φ200x300	50	2	25	/
Φ300x500	50	3	32	/
Φ500x1000	50	6	64	132
Φ600x1000	50	8	74	126
Φ700x1500	50	17	137	135
Φ1000x1500	50	32	182	122
Φ1000x2000	50	45	257	132
Φ1200x2000	50	63	297	126
Φ1350x2500	50	102	427	130
Φ1500x3000	50	153	579	132
Φ1700x3000	50	191	639	128
Φ2000x3500	50	308	875	128
Φ2500x4000	50	663	1381	137
Φ2500x5500	50	943	2019	148
Φ3300x4500	50	1175	1884	130
Φ3300x6500	50	1814	3015	146
Φ3300x10600	50	3067	5257	158
Φ4500x9000	50	4752	5747	146
Φ4500x12000	50	6473	7984	154

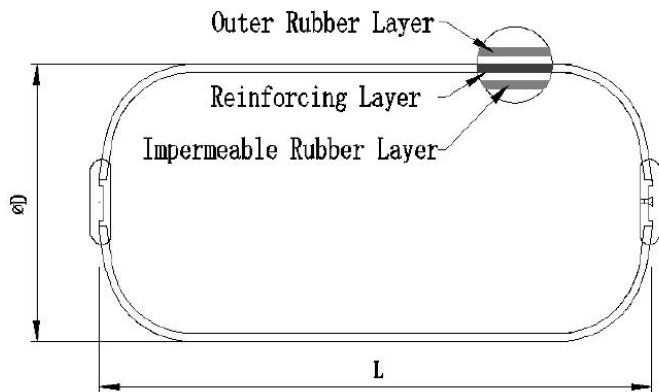


Pneumatic Rubber fenders comply with all the requirements of ISO 17357:2002, ensuring high performance and high quality floating pneumatic fenders for safe berthing operations.



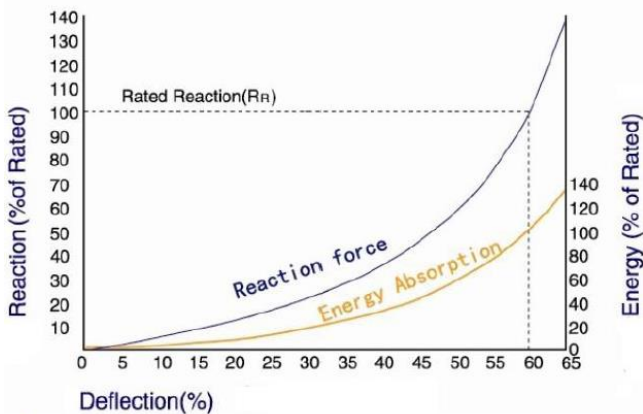
### Construction

The pneumatic rubber fender is made of synthetic-cord-reinforced rubber sheet with compressed air inside to enable it to float on the water and work as a shock absorber between two ships, or between ships and berthing structure when they come alongside each other on the water.



### Performance

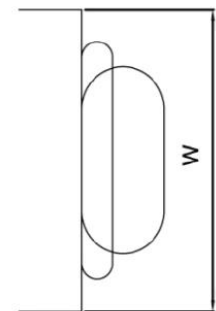
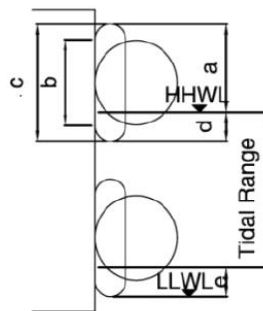
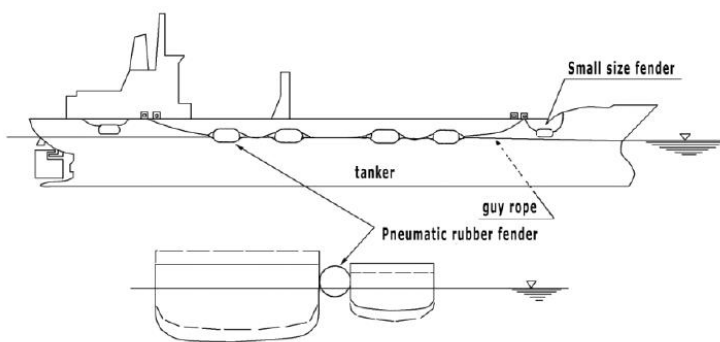
#### Curve



#### Core Attribution

- ◆ Easy and fast to deploy
- ◆ Very low reaction and hull pressure
- ◆ Performance adjustable by varying initial pressure
- ◆ Suitable for areas with large or small tides
- ◆ Maintains large clearances between hull and structure
- ◆ Optional chain-tyre nets for heavy duty applications

### Installation





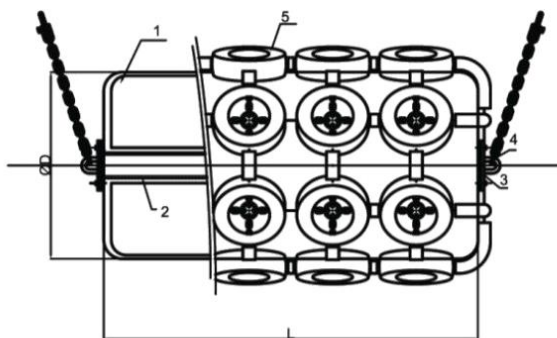
## Foam Filled Fenders

Foam Filled Fenders are versatile, robust and suitable for almost all applications. The manufacturing process allows for virtually any size of fender to be constructed and selecting the appropriate grade of foam core and elastomeric skin means the performance of a fender can be precisely gauged to meet specific specification requirements.

Characteristically Foam Filled Fenders have a high energy absorption compared to their reactive



load meaning they are ideal for existing structures and certain hull types such as catamarans and cruise ships.



1. Fender Body    2. Steel Bar    3. Flange  
4. Towing Ring    5. CTN (Chain-Tyre-Net)

### Specification/ Performance Table

#### (1) Foam Core

The closed cell EVA foam core used inside offers un-sink ability during operation.

#### (2) Outer Rubber + Nylon Cord Fabrics

The outer rubber + nylon cord fabrics is specifically designed to seal EVA foam inside and to prevent any leakage.

#### (3) Polyurea Spraying Coating

Polyurea coating is permanent spray on coatings that protect the surface of fender body. It is more durable than rubber and flexible in all weather conditions; no softening in heat or becoming brittle in cold.

Nominal size Diameter × length	Initial internal pressure	At 60% deflection		Fender body weight (±3%)
		Energy absorption	Reaction force	
mm	kPa	kJ	kN	kgs
300 × 500	50	43	5	7
400 × 800	50	54	7	17
500 × 1000	50	89	32	23
700 × 1500	50	129	24	85
1000 × 1500	50	190	62	175
1000 × 2000	50	298	80	240
1200 × 2000	50	335	110	350
1350 × 2500	50	460	173	550
1500 × 3000	50	615	263	770
1700 × 3000	50	678	330	1075
2000 × 3500	50	940	535	1530
2000 × 4000	50	1095	630	1980
2000 × 4500	50	1250	690	2500
2300 × 4000	50	1380	735	2885
2300 × 5500	50	1860	1133	3480
2500 × 4000	50	1455	980	3390
2500 × 5500	50	1960	1230	3985
3000 × 5000	50	2180	1755	5350
3000 × 6000	50	2455	1960	6680
3300 × 4500	50	1960	1760	5750
3300 × 6500	50	3075	2830	8400
3500 × 7000	50	3975	3162	10100



## UHMW-PE PAD

UHMW-PE, Ultra High Molecular Weight Polyethylene, has become the material of choice for facing steel fender panels and where the combination of very high impact and abrasion resistance with low-friction properties is needed. UHMW-PE is the strongest and toughest of all polyethylene grades for marine applications – even outlasting steel as a facing material, and many times better than timber facings. UHMW-PE does not decay or rot, and is unaffected by marine borers. It is grain-free so will not splinter or crush, and can be cut, drilled and machined with ease. Most UHMW-PE is supplied as Black – not just because this is the most economic choice, but also because black is manufactured using a double sintering process which work hardens the UHMW-PE to further increase its abrasion resistance.



Physical Properties	UHMW Polyethylene
Specific gravity	0.95
Tensile strength (kg/cm <sup>2</sup> )	250
Elongation (%)	20
Compression strength (kg/cm <sup>2</sup> )	200
Bending strength (kg/cm <sup>2</sup> )	140-210
Young modulus (kg/cm <sup>2</sup> )	5600-10500
Resistance to shock (kg-cm)	70
Friction coefficient (toward iron)	0.2
Ratio of wearing	0.5

Contact us for more specifications in details of UHMW-PE Pad.

## Accessories-Chains, Shackles, U anchors, Bolts, Nuts, Washers

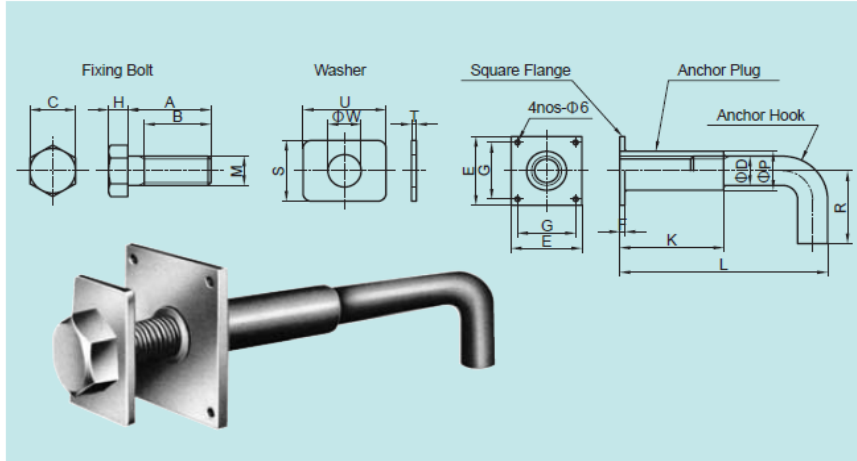






# ANCHOR BOLTS

## Anchor Bolt (for cast in)



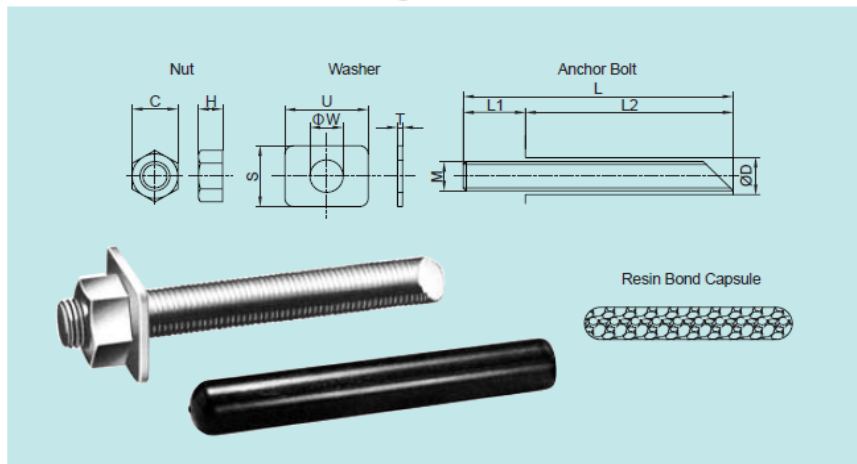
No	Part	Material	Remarks
1	Fixing Bolt	Rolled steel	Galvanized
2	Washer	Rolled steel	Galvanized
3	Square Flange	Rolled steel	Galvanized
4	Anchor Plug	Stainless steel	—
5	Anchor Hook	Rolled steel	—

Stainless steel (JIS G4303 G4305 G4315)  
 Rolled steel (JIS G3101)  
 Other composition of material can be available depend on design conditions.

	M [mm]	A [mm]	B [mm]	C [mm]	H [mm]	S [mm]	U [mm]	T [mm]	ΦW [mm]	ΦD [mm]	E [mm]	F [mm]	G [mm]	K [mm]	L [mm]	ΦP [mm]	R [mm]	Weight [kgf]
18	18	50	45	27	12	40	60	4.5	21	18	50	6	35	75	160	25	45	0.7
22	22	60	50	32	14	50	75	4.5	25	22	55	6	40	85	175	28	50	1.1
24	24	70	60	36	15	55	75	6	28	24	65	6	50	90	185	32	60	1.5
30	30	85	70	46	19	65	85	6	34	30	80	6	65	110	220	40	70	2.7
36	36	100	80	55	23	75	100	6	40	36	85	6	70	125	250	48	90	4.3
42	42	120	95	65	26	90	150	9	47	42	110	6	85	145	340	55	100	7.7
48	48	140	110	75	30	100	150	9	54	48	115	6	90	175	390	65	110	11
64	64	150	120	95	40	140	175	9	70	64	130	6	105	215	420	85	150	21

※The data are subject to change without notice.

## Anchor Bolt (For existing concrete)



No	Part	Material	Remarks
1	Anchor Bolt	Stainless steel	—
2	Washer	Rolled steel	Galvanized
3	Nut	Rolled steel	Galvanized
4	Resin bond capsule	—	—

Stainless steel (JIS G4303 & G4305)  
 Rolled steel (JIS G3101)  
 Other composition of material can be available depend on design conditions.

	M [mm]	L [mm]	L1 [mm]	L2 [mm]	ΦD [mm]	C [mm]	H [mm]	S [mm]	U [mm]	T [mm]	ΦW [mm]	Resin Bond Capsule [cc]	Weight [kgf]
18	18	165	35	130	22	27	15	40	60	4.5	21	22min	0.4
22	22	195	45	150	28	32	18	50	75	4.5	25	47min	0.7
24	24	210	50	160	30	36	19	55	75	6	28	55min	0.9
30	30	270	60	210	38	53.1	24	65	85	6	34	120min	1.6
36	36	325	75	250	46	63.5	29	75	100	6	40	215min	2.8
42	42	380	90	290	55	75	34	90	150	9	47	379min	5.3
48	48	435	105	330	60	86.5	38	100	150	9	54	455min	7
64	64	600	150	450	75	110	51	140	175	9	70	772min	18

※The data are subject to change without notice.



## Accessories for Fender Systems including Steel Frames

■ Steel Frames ■ Plastic Pads ■ Pad Fixing Bolts ■ Frame Fixing Bolts ■ Chain Systems

The following is a list of accessories for the fender system.



## PLASTIC PADS & FIXING

Various polyethylene materials are available depending on the level of quality required, as shown in the table of common polyethylene types below. However, in most cases, Rubber Industries employ recycled UHMW (ultra-high molecular weight) or recycled HMW (high molecular weight) polyethylene. By making an effort to use recycled materials, we hope to contribute to environmental conservation.

### Mechanical Property of Plastic Pad

Characteristics & Test Code	Coloured Virgin UHMW	Regenerated UHMW Multicol Black	Coloured Virgin HMW	Regenerated HMW Multicol Black
Density in ISO1183-1	≥0.93g/cm <sup>3</sup>	≥0.94g/cm <sup>3</sup>	≥0.96g/cm <sup>3</sup>	≥0.96g/cm <sup>3</sup>
Notched Impact Strength(charpy) in ISO11542-2	≥180kJ/m <sup>2</sup>	≥70kJ/m <sup>2</sup>	≥15kJ/m <sup>2</sup>	≥10kJ/m <sup>2</sup>
Abrasion in ISO15527	100%	130-150%	400±25%	350-450%
Tensile Strength at Yield in ISO527-2,50mm/min	≥17N/mm <sup>2</sup>	≥17N/mm <sup>2</sup>	≥20N/mm <sup>2</sup>	≥17N/mm <sup>2</sup>
Breaking Elongation in ISO527-2,50mm/min	>50%	>50%	>50%	>50%
Friction PE-Metal	0.2	0.2	0.2	0.2
Hardness in ISO868/DIN53505 Shore-D, 3-s-value 6mm plate	63	63-66	65	65-67

※The data are subject to change without notice.

### Steel Frame material

Tensile Strength (N/mm <sup>2</sup> )	JIS	BS 4360	EN 10025	ASTM
400	G3101 SS400 G3106 SM400			A36
410			S275	A572-290 A529 A633
430		Gr43		
490	G3101 SS490 G3106 SM490	Gr50	S355	

### Paint coating system for steel frame

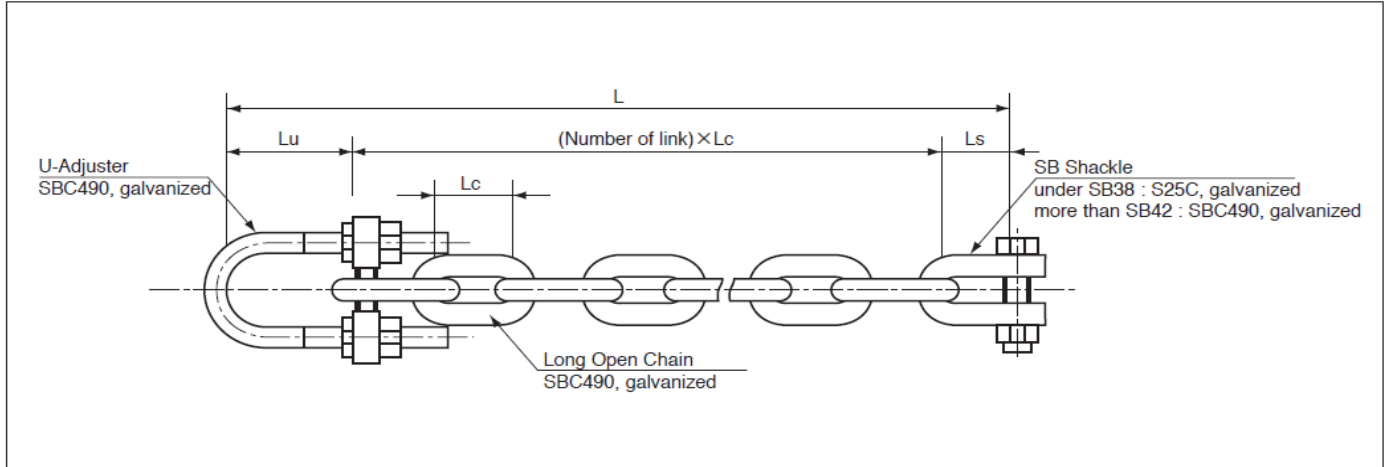
It is normally designed to comply with category C5-M which is specified in ISO 12944 (Paints&Varnishes-Corrosion Protection of Steel Structures by protective paint). Following coating system is our typical specification.

Surface preparation	Shotbrast SIS Sa 2.5	Shotbrast SIS Sa 2.5
Primer coat	Zincrich primer 40µm	Zincrich primer 100µm
Top coat	2-pack Epoxy 280µm	Coal Tar Epoxy 200µm
NDFT	320µm	300µm



# CHAIN SYSTEM

## Chain Strings including Adjustable Link

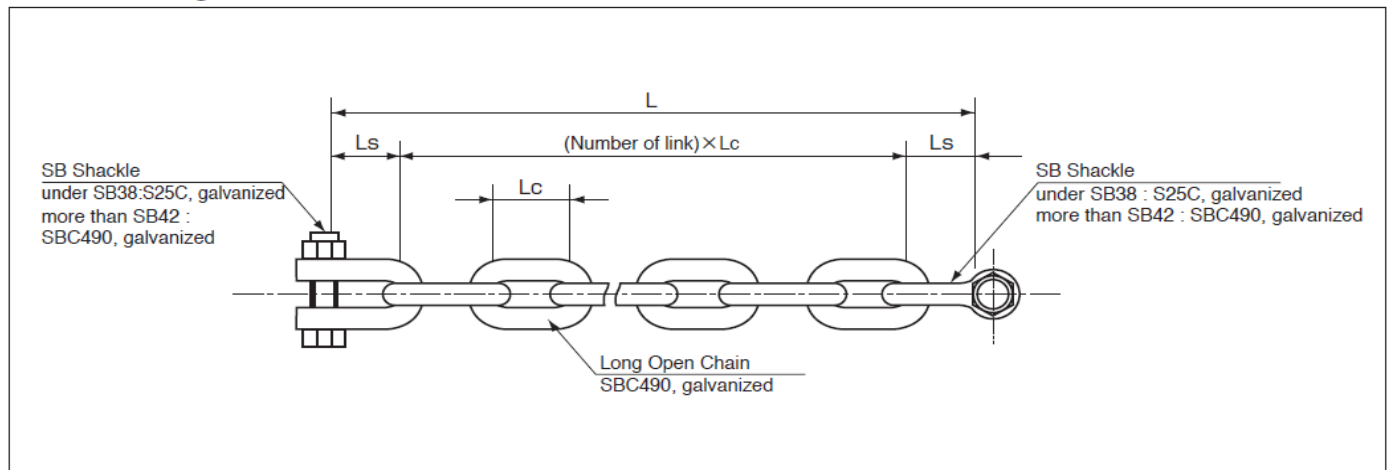


● Table chain-1

Nominal dia [mm]	Lc [mm]	Lu [mm]	Ls [mm]	Breaking Test Load [kN]
25	100	100	88	322.6
30	120	120	102	465.0
34	136	136	116	596.4
38	152	152	129	745.6
42	168	168	142	910.4
46	184	184	156	1092.8
50	200	200	170	1291.0
52	208	208	187	1396.9
54	216	216	187	1504.9

Note) Adjustable range is ±50mm from the standard length.  
 ※The data are subject to change without notice.

## Chain Strings with Both End Shackle



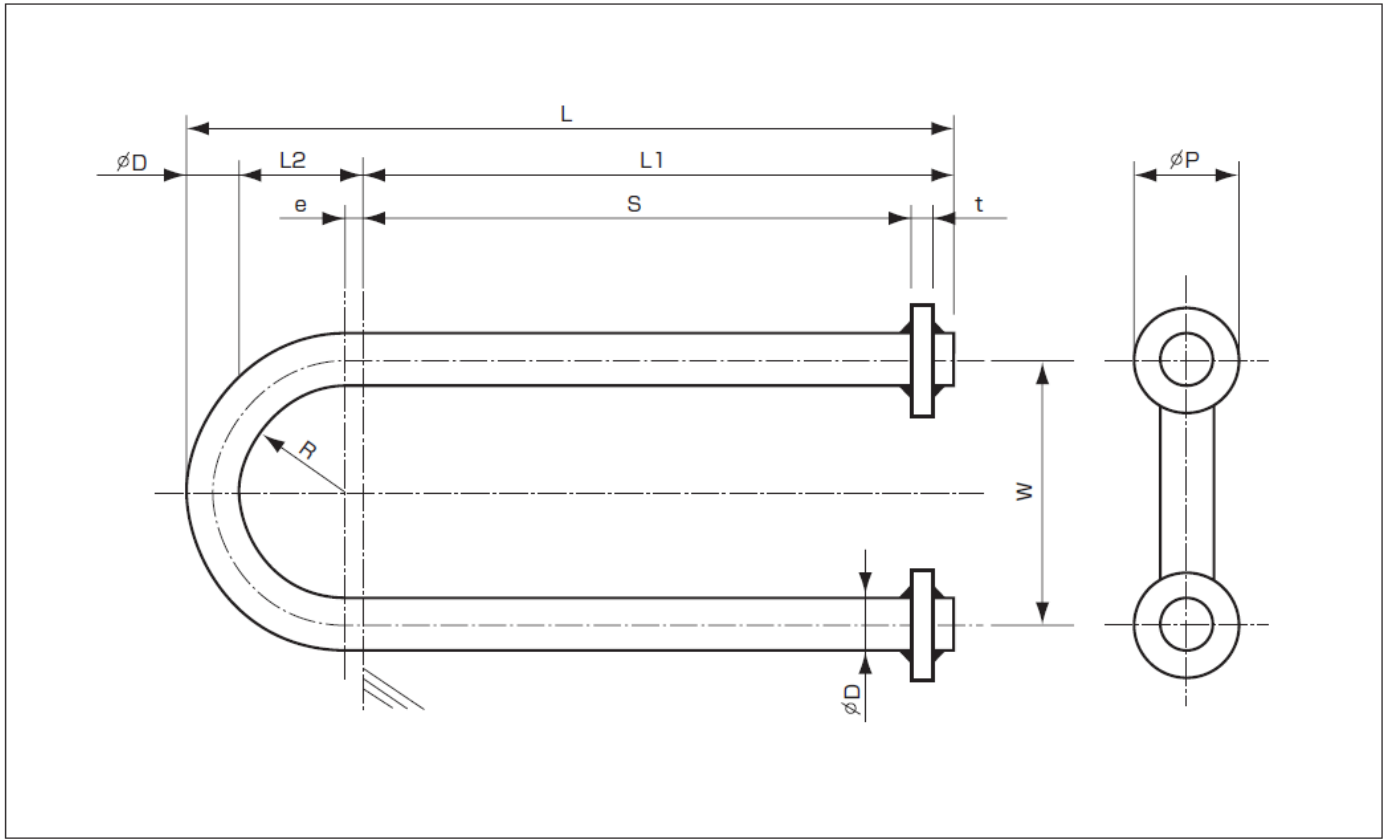
● Table chain-2

Nominal dia [mm]	Lc [mm]	Ls [mm]	Breaking Test Load [kN]
25	100	88	322.6
30	120	102	465.0
34	136	116	596.4
38	152	129	745.6
42	168	142	910.4
46	184	156	1092.8
50	200	170	1291.0
52	208	187	1396.9
54	216	187	1504.9

※The data are subject to change without notice.



U-ANCHOR



●Material: Industrial Standard (JIS G3101) SS400, HOT DIP GALVANIZED  
Other material is available as condition demands.

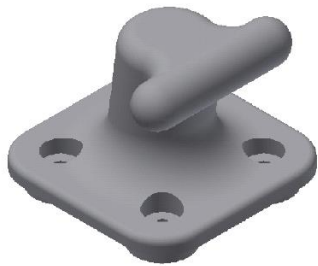
Metric:mm

Diameter of Chain [mm]	L [mm]	L1 [mm]	L2 [mm]	$\Phi D$ [mm]	e [mm]	S [mm]	t [mm]	R [mm]	W [mm]	$\Phi P$ [mm]
25	520	390	94	36	24	360	16	70	176	70
30	640	485	113	42	28	445	19	85	212	80
34	720	550	122	48	27	510	22	95	238	100
38	820	630	135	55	25	585	25	110	275	110
42	870	670	140	60	20	620	28	120	300	120
46	940	720	155	65	25	670	28	130	325	130
50	1000	760	170	70	30	700	32	140	170	140
52	1090	820	195	75	45	760	32	150	187	150
54	1150	870	200	80	40	800	36	160	400	160

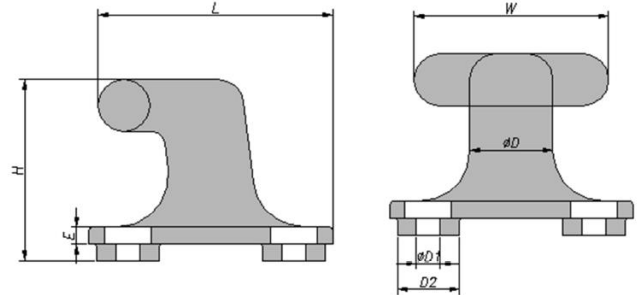
※The data are subject to change without notice.



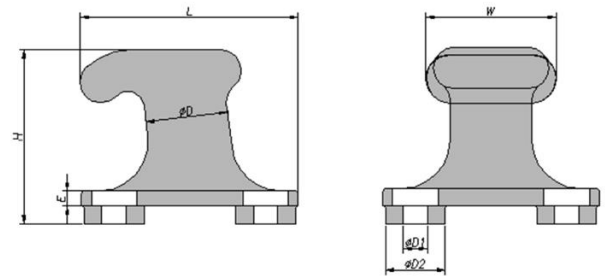
# BOLLARDS



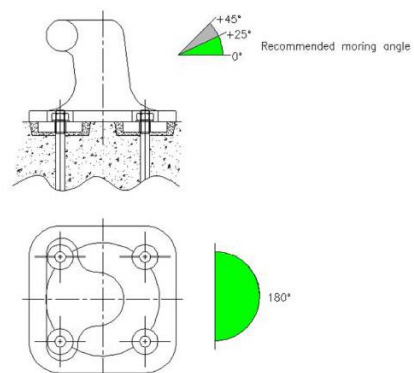
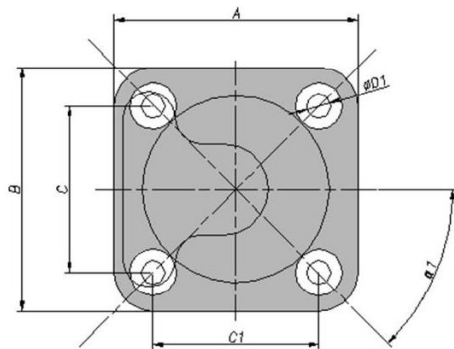
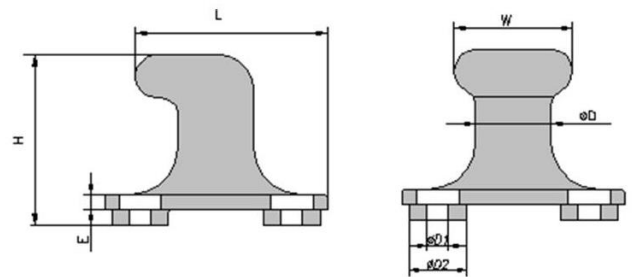
- High quality casting material
- Strong and durable design
- Low maintenance
- Large mooring range angle



- High quality casting material
- Strong and durable design
- Low maintenance
- Large mooring range angle



- High quality casting material
- Strong and durable design
- Low maintenance
- Large mooring range angle





# RUBBER PROPERTIES

The rubber compound is superior, especially in resistance to aging, seawater, weathering and friction.

Being reinforced with carbon black, it shows the excellent physical properties as enumerated below.

## Rubber Properties

PROPERTY	Test standard and condition		Criterion	Equivalent International standard		
				ASTM	BS ISO	DIN
Tensile Strength	JIS K6251 No.3 Dumbbell	Before ageing After ageing 70°Cx96hrs	16 MPa Min. More than 80% to original	D412	BS ISO 37 BS 903 A2 *1	DIN 53504
Elongation		Before ageing After ageing 70°Cx96hrs	350% Min. More than 80% to original			
Hardness	JIS K6253 Durometer A	Before ageing After ageing 70°Cx96hrs	82 max. Less than +8 to original	D2240	BS ISO 48 BS 903 A26 *1	DIN 53505
Ageing	JIS K6253	70°Cx96hrs		D573	BS ISO 188 BS 903 A19 *1	DIN 53508
Compression set	JIS K6252	70x24hrs	30% Max.	D395	BS ISO 815-1 BS 903 A6 *1	DIN 53517
Tear Resistance	JIS K6252	Crescent type	70N/mm Min.	D624	BS ISO 34-1 BS 903 A3 *1	DIN 53507
Abrasive Wear	JIS K6264	Akron Method	1.5cc Max.	D5963-04	BS ISO 4649 BS 903 A9	DIN 53516
Bond Strength	JIS K6256-2	90 degree	7N/mm Min.	D429	BS 903 A21.1	
Oil Resistance	JIS K6258	Heavy oil 23°Cx24hrs	Volume change 20% Max. Volume change 60% Max	D471	BS ISO 1817 BS 903 A16 *1	
Seawater Resistance	JIS K6258	3% NaCl solution 23°Cx24hrs	Volume change +10%/-5% Max. Hardness change ±10 Max.	D471	BS ISO 1817 BS 903 A16 *1	
Ozone Resistance	JIS K6259	50pphm 20% elon. 40°Cx100hrs	No crack	D1149	BS ISO 1431-1 BS 903 A43 *1	DIN 53509
Density	JIS K6268		1.10 g/cc to 1.30 g/cc	D1817	BS ISO 2781 BS 903 A1 *1	

\*1 Previous BS standards are superseded

※The data are subject to change without notice.





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