



FE Element Fenders.

Characteristics

- ▶ Good energy absorption to reaction force ratio (E/R)
- ▶ High energy absorption per fender weight
- ▶ Modular and compact design with small footprint
- ▶ Vertical and horizontal mounting, typically in pairs
- ▶ Pile Fender design may use single units
- ▶ Easy maintenance & replacement

Applications

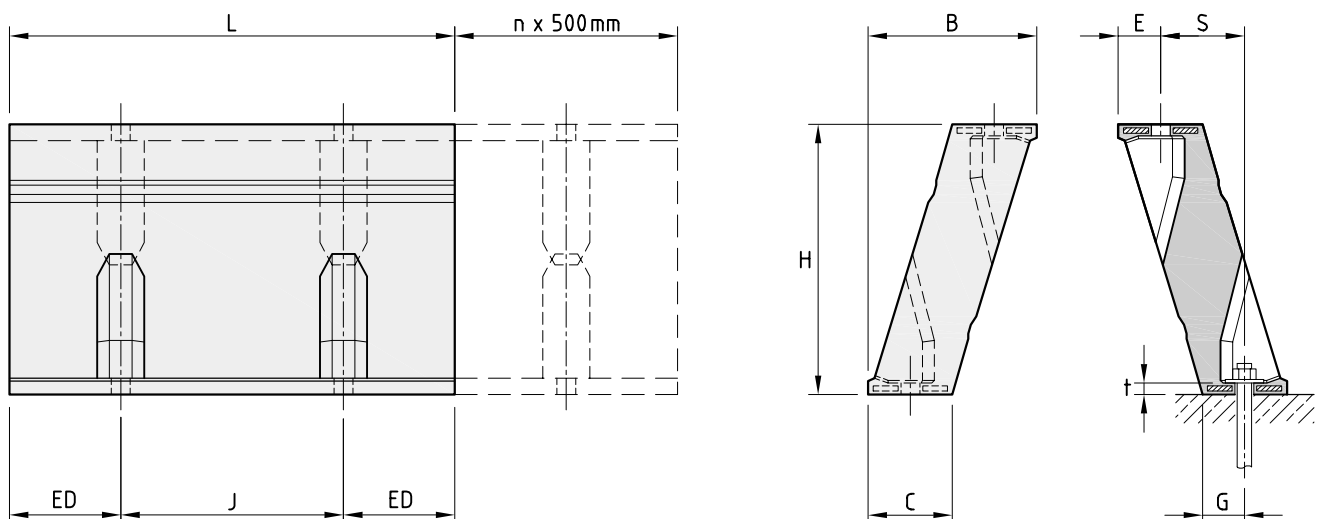
- ▶ Container & Bulk Terminals
- ▶ General Cargo Terminals
- ▶ RoRo Terminals
- ▶ Navy
- ▶ Barge

FE FENDER DIMENSIONS

Fender Size	L [mm]	H [mm]	B [mm]	C [mm]	S [mm]	E [mm]	t [mm]	G [mm]	ED [mm]	J [mm]	Anchors/ Bolts	Weight [kg/m]
FE 250	1,000	250	158	80	78	40	17	40	50	300	M20	30
FE 300	1,000	300	187	94	93	47	17	47	100	400	M20	46
FE 400	1,000	400	250	125	124	63	17	62	250	500	M24	66
FE 500	1,000	500	316	158	142	87	20	71	250	500	M30	111
FE 550	1,000	550	344	172	170	87	20	85	250	500	M30	132
FE 600	1,000	600	373	188	199	87	20	101	250	500	M30	153
FE 700	1,000	700	443	225	217	113	26	112	250	500	M36	222
FE 750	1,000	750	466	235	230	118	26	117	250	500	M36	239
FE 800	1,000	800	498	250	240	129	26	121	250	500	M36	268
FE 900	1,000	900	569	289	279	145	31	144	250	500	M42	367
FE 1000	1,000	1,000	634	322	310	162	31	160	250	500	M42	454
FE 1200	1,000	1,200	762	390	372	195	36	195	250	500	M48	625
FE 1250	1,000	1,250	792	401	388	202	36	199	250	500	M48	639
FE 1400	1,000	1,400	870	440	430	220	41	220	250	500	M48	846
FE 1450	1,000	1,450	901	454	445	228	41	226	250	500	M48	873
FE 1600	1,000	1,600	1,002	507	480	261	50	246	250	500	M56	1,114
FE 2000*	1,000	2,000	1,318	585	733	–	52	–	–	–	M42	1,840

Also available in different bolt-layouts and with different geometries to replace Element Fenders of other manufacturers
 * Shape differs from standard fender drawing

FE FENDER DRAWING

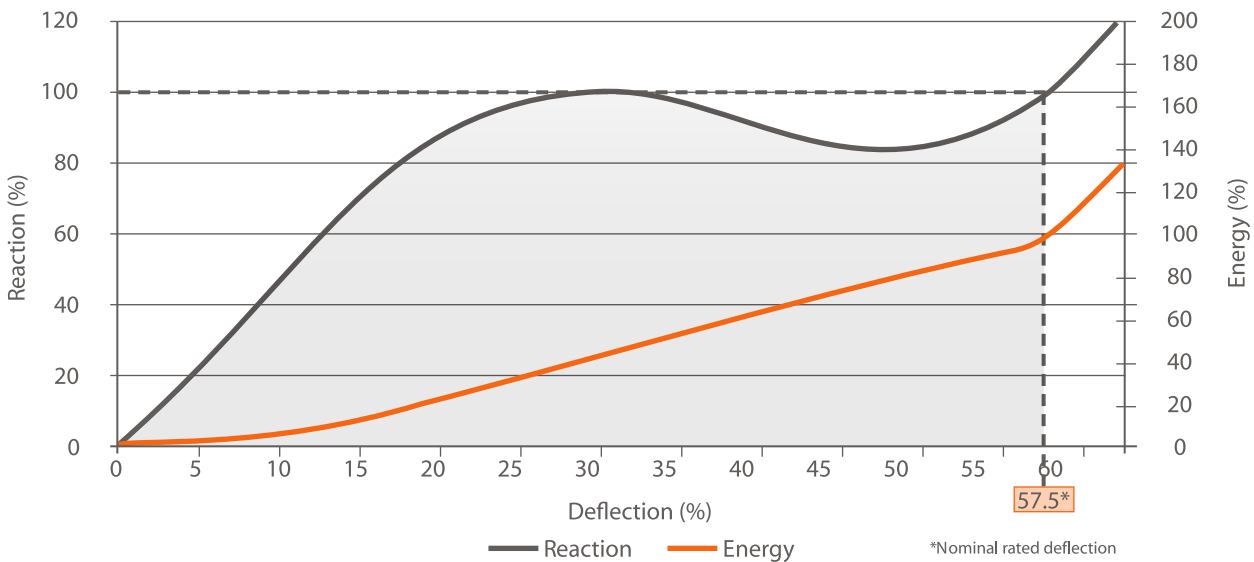


PERFORMANCE TABLE FE FENDERS (RPD = RATED PERFORMANCE DATA IN ACC. WITH PIANC)

Fender Size	E _A R _F	E/R	Rubber Grades									
			G 0.9	G 1.0	G 1.1	G 1.2	G 1.3	G 1.4	G 1.5	G 1.6	G 1.7	G 1.8
FE 250	E _A R _F	0.10	8.7 79	9.0 82	9.3 86	9.6 89	9.9 93	10 96	11 100	11 103	11 107	11 110
FE 300	E _A R _F	0.12	13 102	13 106	13 109	14 112	14 115	15 119	15 122	15 125	16 129	16 132
FE 400	E _A R _F	0.18	22 122	23 126	24 131	25 135	25 140	26 144	27 148	28 153	29 157	29 162
FE 500	E _A R _F	0.23	32 139	36 157	37 162	39 168	40 173	41 179	43 185	44 190	45 196	46 202
FE 550	E _A R _F	0.25	40 160	44 173	46 179	47 185	49 192	50 198	52 204	53 210	55 216	56 222
FE 600	E _A R _F	0.28	47 168	52 188	54 195	56 202	58 209	59 215	61 222	63 229	65 235	67 242
FE 700	E _A R _F	0.32	63 212	70 219	73 227	75 235	78 243	80 251	83 259	85 266	88 274	90 282
FE 750	E _A R _F	0.34	73 215	81 238	84 246	87 254	89 262	92 270	95 279	98 287	101 295	103 303
FE 800	E _A R _F	0.37	84 227	93 251	96 259	99 268	103 278	106 286	109 295	112 303	115 311	119 322
FE 900	E _A R _F	0.41	106 259	118 285	122 295	126 305	130 314	134 324	138 334	142 344	146 354	150 363
FE 1000	E _A R _F	0.46	131 285	146 317	151 328	156 338	161 349	166 360	171 371	176 382	181 393	186 403
FE 1200	E _A R _F	0.54	186 344	207 378	213 389	220 401	226 412	232 424	239 435	245 446	251 458	257 469
FE 1250	E _A R _F	0.57	194 340	216 378	222 389	229 402	235 413	242 426	249 437	255 448	261 460	268 471
FE 1400	E _A R _F	0.64	257 402	286 447	294 455	303 469	311 482	320 495	328 509	336 530	345 539	353 548
FE 1450	E _A R _F	0.67	336 501	343 511	351 523	359 535	367 547	374 558	382 570	390 582	398 594	406 605
FE 1600	E _A R _F	0.74	363 491	374 505	385 520	396 535	408 551	419 566	430 581	441 596	452 611	464 627
FE 2000	E _A R _F	1.00	565 565	581 581	598 598	614 614	630 630	647 647	663 663	680 680	696 696	712 712

Performance values for single units of 1,000 mm length | Energy Absorption (E_a) in kNm, Reaction Force (R_p) in kN | Nominal rated deflection is 57.5 %, max. deflection is 62.5 % | Actual deflection at Rated Performance Data may vary | Properties, tolerances, and testing standards can be found on pages 123 ff.

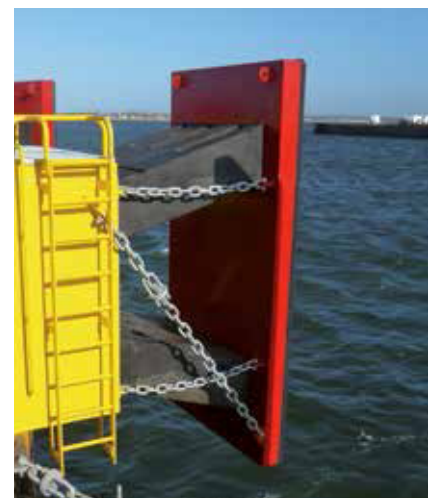
GENERIC PERFORMANCE CURVE FE FENDERS



Rubber Grades													Fender Size
G 1.9	G 2.0	G 2.1	G 2.2	G 2.3	G 2.4	G 2.5	G 2.6	G 2.7	G 2.8	G 2.9	G 3.0	G 3.1	
12 113	12 117	12 120	13 124	13 127	13 131	14 134	15 138	15 141	15 145	15 148	15 148	17 163	FE 250
17 135	17 138	17 142	18 145	18 148	19 151	19 155	19 158	20 161	21 172	22 176	22 179	24 196	FE 300
30 166	31 170	32 175	33 179	33 184	34 188	35 192	36 197	37 201	37 205	38 210	39 214	43 235	FE 400
48 207	49 213	50 219	52 224	53 230	54 236	56 241	57 247	58 253	59 258	61 264	62 270	68 294	FE 500
58 228	60 234	61 240	63 246	64 253	66 259	67 265	69 271	70 277	72 283	73 289	75 295	83 323	FE 550
69 249	71 255	72 262	74 269	76 276	78 282	80 289	82 296	83 302	85 309	87 316	89 322	98 352	FE 600
93 290	95 298	98 306	100 313	103 321	105 329	108 337	110 345	113 353	115 361	118 368	120 376	132 413	FE 700
106 311	109 320	112 328	115 336	117 344	120 352	123 361	126 369	129 377	131 385	134 394	137 402	151 443	FE 750
122 329	125 337	128 345	131 354	135 365	138 372	141 381	144 389	147 397	151 408	154 416	157 424	173 470	FE 800
154 373	159 383	163 393	167 402	171 412	175 422	179 432	183 442	187 451	191 461	195 471	199 481	219 529	FE 900
191 414	196 425	201 436	206 447	211 458	216 469	221 479	226 490	231 501	236 512	241 523	246 534	271 587	FE 1000
264 481	270 492	278 507	286 522	294 537	302 552	311 567	319 582	327 597	335 612	343 627	351 642	386 706	FE 1200
273 473	281 487	289 502	298 517	306 531	315 546	323 560	331 575	340 589	348 604	356 618	365 633	402 710	FE 1250
362 562	370 575	381 592	392 610	404 627	415 644	426 662	437 679	448 696	460 713	471 731	482 748	530 823	FE 1400
413 620	421 631	429 643	437 654	444 666	452 678	460 689	468 701	475 713	483 724	491 736	499 748	549 825	FE 1450
475 641	486 657	497 671	508 686	520 702	531 718	542 732	553 747	564 762	576 778	587 793	598 808	609 823	FE 1600
729 729	745 745	761 761	778 778	794 794	810 810	827 827	843 843	859 859	876 876	892 892	909 909	925 925	FE 2000



Bridge Protection Guidewall | Stockholm | Sweden



Ferry & RoRo Terminal | Rostock | Germany

CORRECTION FACTORS

FENDER PERFORMANCE AT INTERMEDIATE DEFLECTION

Deflection of original fender height [%]	0	5	10	15	20	25	30	35	40	45	50	55	57.5	62.5
Energy Absorption of original value [%]	0	2	7	14	24	32	41	56	66	76	85	95	100	113
Reaction Force of original value [%]	0	31	58	78	92	97	100	96	90	85	84	92	100	130

TEMPERATURE FACTOR

Temperature [° C]	-30	-20	-10	0	10	23	30	40	50	60
Correction Factor	1.559	1.375	1.182	1.083	1.034	1.000	0.976	0.945	0.918	0.917

VELOCITY FACTOR

Compression Time [s]	1	2	3	4	5	6	7	8	10
Correction Factor	1.020	1.010	1.010	1.000	1.000	1.000	1.000	1.000	1.000

ANGLE FACTOR

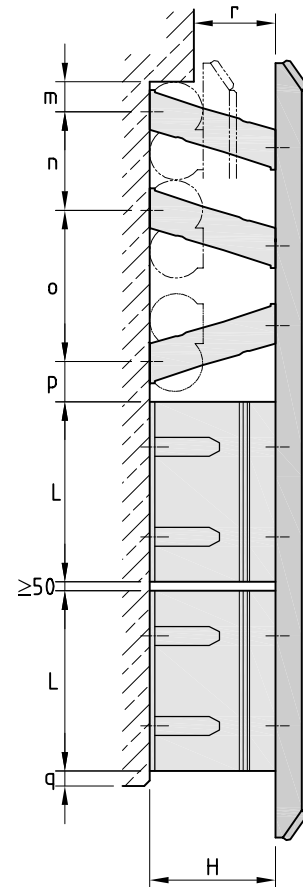
Compression Angle [°]	0	2	4	6	8	10	12	14	16	18	20
Energy Absorption of original value [%]	100	96	94	92	90	88	86	84	82	80	78
Reaction Force of original value [%]	100	96	94	92	90	88	86	84	82	80	78

INSTALLATION CLEARANCES

Fender Size	L [mm]	H [mm]	m [mm]	n [mm]	o [mm]	p [mm]	q [mm]	r [mm]
FE 250	1,000	250	60	195	300	80	30	163
FE 300	1,000	300	72	234	360	96	36	195
FE 400	1,000	400	96	312	480	128	48	260
FE 500	1,000	500	120	390	600	160	60	325
FE 550	1,000	550	132	429	660	176	66	358
FE 600	1,000	600	144	468	720	192	72	390
FE 700	1,000	700	168	546	840	224	84	455
FE 750	1,000	750	180	585	900	240	90	488
FE 800	1,000	800	192	624	960	256	96	520
FE 900	1,000	900	216	702	1,080	288	108	585
FE 1000	1,000	1,000	240	780	1,200	320	120	650
FE 1200	1,000	1,200	288	936	1,440	384	144	780
FE 1250	1,000	1,250	300	975	1,500	400	150	813
FE 1400	1,000	1,400	336	1,092	1,680	448	168	910
FE 1450	1,000	1,450	348	1,131	1,740	464	174	943
FE 1600	1,000	1,600	384	1,248	1,920	512	192	1,040
FE 2000	1,000	2,000	425	1,500	2,100	575	250	1,200

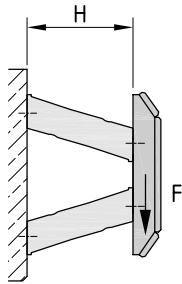
The fender system design should allow for:

- ▶ increased dimension of F E Fender during compression [n, o, p]
- ▶ sufficient clearance of front panel [r]
- ▶ minimum edge distance for anchoring and to other protrusions [m, q]
- ▶ angular compression

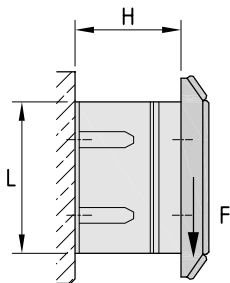


WEIGHT SUPPORT CAPACITY AND SHEAR RESISTANCE

The weight support capacity and shear resistance of the FE Fender is depending on the orientation of the elements versus the static load respectively the shear load. When the fenders are mounted horizontally, they can only support a limited amount of weight, respectively resist a limited vertical shear force. We typically allow for a maximum of 50% of the weight of the rubber units and recommend chain suspension if shear loads are expected to act contrary to the orientation of the fender.

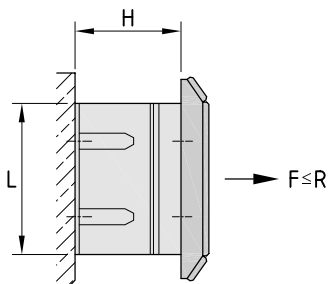


When the fenders are mounted vertically, the weight support capacity is far higher, i.e. at least twice the weight of the rubber units. However, the resistance against horizontal shear forces is limited.



TENSION

Tension chains are recommended, especially when tensile loads might exceed the rated reaction force of the rubber fender.*



Ethanol Jetty | Stenungsund | Sweden



Ferry Terminal | Hirtshals | Denmark



Pier 1 | North Kingstown, RI | U SA

* For detailed advice, please contact your local SFT office. SFT generally recommends the use of properly designed suspension chain systems to support the fender's performance and reduce the risk of damages