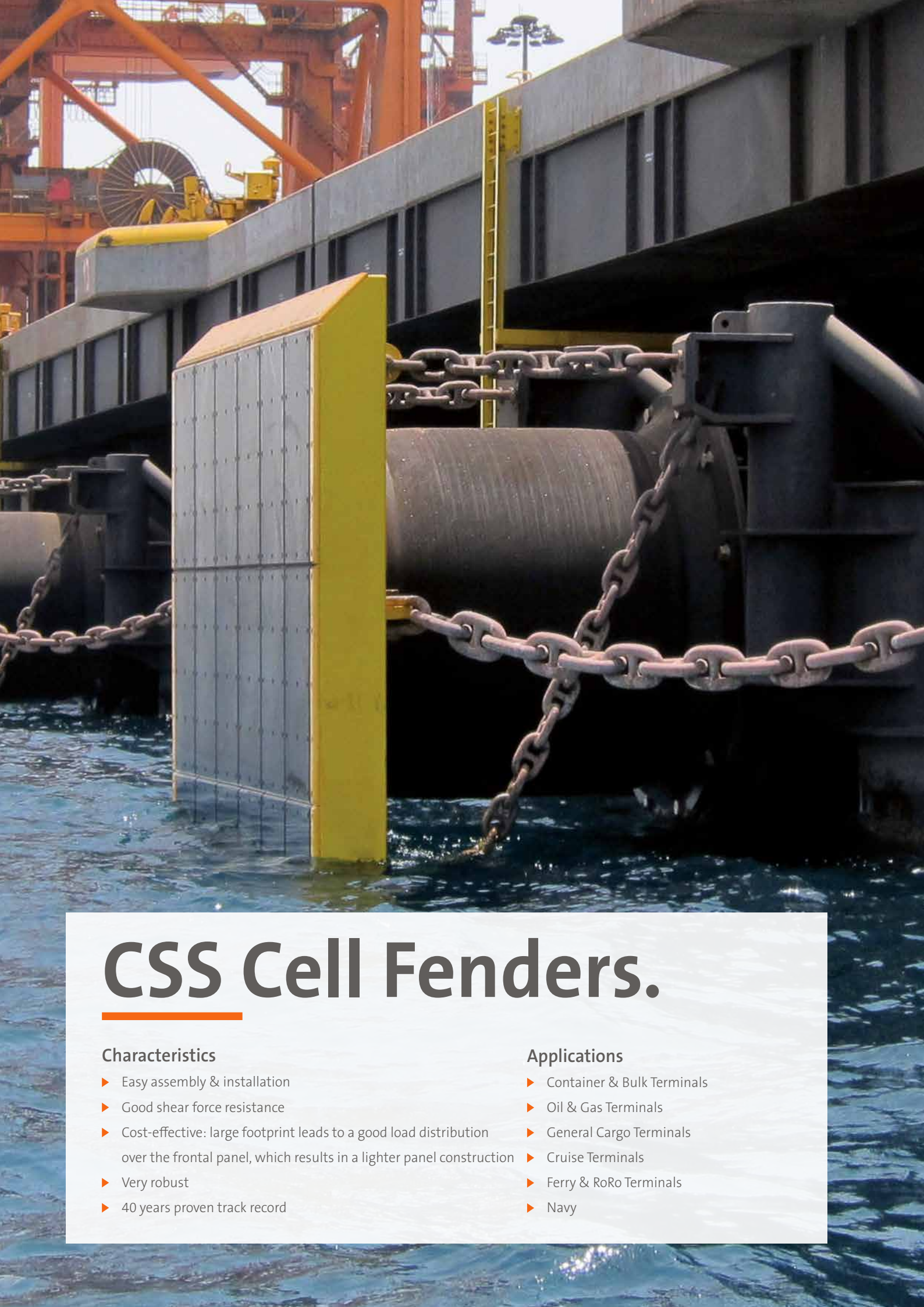


CSS Cell Fenders.

Characteristics

- Easy assembly & installation
- Good shear force resistance
- Cost-effective: large footprint leads to a good load distribution over the frontal panel, which results in a lighter panel construction
- Very robust
- 40 years proven track record

Applications

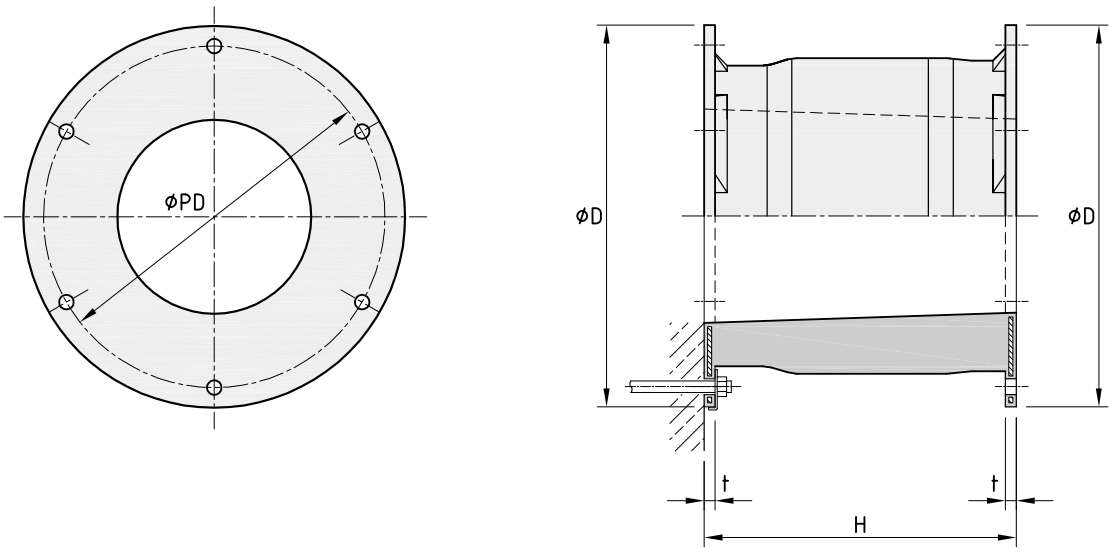
- Container & Bulk Terminals
- Oil & Gas Terminals
- General Cargo Terminals
- Cruise Terminals
- Ferry & RoRo Terminals
- Navy

CSS FENDER DIMENSIONS

Fender Size	H [mm]	Ø D [mm]	t [mm]	Ø PD [mm]	Anchors / Bolts	Weight [kg]
CSS 400	400	650	25	550	4 x M24	78
CSS 500	500	650	25	550	4 x M24	112
CSS 600	600	780	25	660	4 x M30	185
CSS 800	800	1,050	30	900	6 x M30	443
CSS 1000	1,000	1,230	32	1,100	6 x M36	742
CSS 1150	1,150	1,440	37	1,300	6 x M42	1,119
CSS 1250	1,250	1,600	40	1,450	6 x M42	1,499
CSS 1450	1,450	1,820	42	1,650	6 x M48	2,267
CSS 1600	1,600	1,960	45	1,800	8 x M48	2,951
CSS 1700	1,700	2,100	50	1,900	8 x M56	3,400
CSS 2000	2,000	2,200	60	2,000	8 x M64	4,500
CSS 2250	2,250	2,550	65	2,300	10 x M64	7,300
CSS 2500	2,500	2,950	70	2,700	10 x M64	10,760
CSS 3000	3,000	3,350	100	3,150	12 x M76	18,600

Intermediate or larger sizes available upon request

CSS FENDER DRAWING

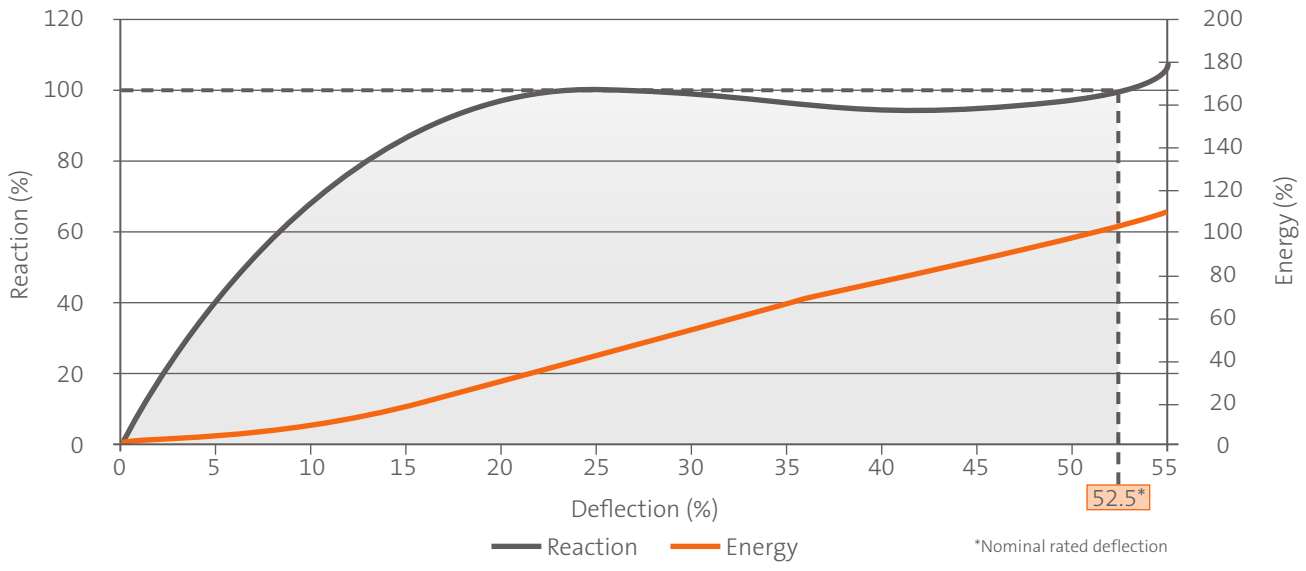


PERFORMANCE TABLE CSS FENDERS (RPD = RATED PERFORMANCE DATA IN ACC. WITH PIANC)

Fender Size		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
CSS 400	E_A	0.17	9	**10**	10	11	12	12	13	13	14	15
	R_F		50	**56**	59	63	67	70	74	77	81	84
CSS 500	E_A	0.22	18	**19**	20	21	22	23	24	25	27	28
	R_F		83	**87**	91	96	100	105	109	115	122	128
CSS 600	E_A	0.30	31	**33**	35	36	38	40	41	44	46	49
	R_F		119	**126**	132	138	144	151	157	166	176	185
CSS 800	E_A	0.35	75	**79**	82	86	90	94	98	104	110	116
	R_F		211	**223**	234	245	256	267	279	295	312	329
CSS 1000	E_A	0.44	145	**153**	161	168	176	184	191	203	214	226
	R_F		331	**348**	366	383	401	418	435	462	488	514
CSS 1150	E_A	0.51	222	**233**	245	257	268	280	291	309	326	344
	R_F		438	**461**	484	507	530	553	576	610	645	679
CSS 1250	E_A	0.55	284	**299**	314	329	343	359	374	396	419	441
	R_F		517	**544**	571	598	626	653	680	720	761	802
CSS 1450	E_A	0.64	444	**467**	490	514	537	560	584	619	654	689
	R_F		694	**732**	768	805	842	878	915	969	1,024	1,078
CSS 1600	E_A	0.70	596	**628**	659	690	721	753	785	832	879	926
	R_F		846	**891**	937	982	1,027	1,073	1,118	1,185	1,251	1,318
CSS 1700	E_A	0.75	714	**751**	789	827	864	902	940	997	1,054	1,110
	R_F		961	**1,010**	1,059	1,108	1,157	1,206	1,255	1,332	1,404	1,484
CSS 2000	E_A	0.88	1,165	**1,226**	1,287	1,348	1,408	1,469	1,530	1,622	1,714	1,806
	R_F		1,322	**1,393**	1,463	1,534	1,604	1,675	1,746	1,860	1,953	2,057
CSS 2250	E_A	0.99	1,659	**1,746**	1,832	1,918	2,005	2,091	2,177	2,309	2,440	2,571
	R_F		1,676	**1,765**	1,854	1,942	2,030	2,118	2,207	2,338	2,469	2,601
CSS 2500	E_A	1.10	2,544	**2,826**	2,976	3,026	3,275	3,425	3,575	3,724	3,874	4,024
	R_F		2,317	**2,574**	2,711	2,847	2,983	3,120	3,256	3,392	3,528	3,665
CSS 3000	E_A	1.15	3,795	**4,217**	4,452	4,688	4,923	5,158	5,394	5,629	5,865	6,100
	R_F		3,310	**3,678**	3,879	4,080	4,281	4,482	4,683	4,884	5,085	5,286

Performance values for single units | Energy Absorption (E_A) in kNm, Reaction Force (R_F) in kN | Nominal rated deflection is 52.5 %, max. deflection is 55 % | Actual deflection at Rated Performance Data may vary | Properties, tolerances, and testing standards can be found on pages 123 ff.

GENERIC PERFORMANCE CURVE CSS 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	
15 88	**16** **91**	16 94	17 97	17 99	18 102	18 104	19 107	19 110	20 112	20 115	**21** **118**	23 129	CSS 400
30 135	**31** **141**	32 146	33 150	34 154	35 159	36 163	37 167	38 171	39 176	40 180	**41** **184**	42 189	CSS 500
51 195	**54** **204**	55 210	57 217	59 223	60 229	62 235	64 241	65 247	67 253	68 259	**70** **265**	72 271	CSS 600
122 345	**128** **362**	132 373	136 385	140 400	144 407	148 418	151 428	155 439	158 450	162 460	**166** **471**	169 481	CSS 800
238 540	**249** **566**	257 583	264 601	272 618	280 636	287 653	295 670	302 686	309 703	316 719	**324** **736**	331 752	CSS 1000
361 714	**379** **748**	390 765	402 794	413 817	425 840	436 863	448 885	459 907	470 920	481 942	**492** **973**	504 995	CSS 1150
464 843	**486** **884**	501 911	516 938	531 965	546 993	561 1,020	575 1,045	590 1,071	604 1,096	618 1,122	**633** **1,147**	647 1,173	CSS 1250
724 1,132	**759** **1,187**	782 1,224	806 1,261	829 1,298	852 1,336	876 1,373	899 1,408	922 1,444	945 1,479	968 1,514	**991** **1,550**	1,020 1,584	CSS 1450
973 1,385	**1,020** **1,451**	1,051 1,495	1,083 1,538	1,114 1,580	1,145 1,624	1,177 1,667	1,206 1,710	1,236 1,753	1,265 1,797	1,295 1,840	**1,324** **1,883**	1,353 1,926	CSS 1600
1,169 1,561	**1,226** **1,638**	1,263 1,687	1,300 1,736	1,338 1,784	1,375 1,834	1,412 1,883	1,448 1,932	1,482 1,980	1,518 2,030	1,553 2,079	**1,589** **2,128**	1,624 2,177	CSS 1700
1,898 2,161	**1,991** **2,265**	2,052 2,334	2,112 2,403	2,173 2,471	2,234 2,540	2,295 2,609	2,354 2,675	2,413 2,742	2,471 2,809	2,530 2,875	**2,589** **2,942**	2,648 3,009	CSS 2000
2,703 2,732	**2,834** **2,864**	2,922 2,952	3,011 3,040	3,099 3,128	3,187 3,275	3,275 3,305	3,358 3,389	3,440 3,474	3,523 3,558	3,604 3,642	**3,687** **3,727**	3,770 3,808	CSS 2250
4,173 3,801	**4,323** **3,937**	4,452 4,056	4,582 4,174	4,712 4,292	4,841 4,410	4,971 4,528	5,101 4,647	5,230 4,765	5,360 4,883	5,490 5,001	**5,619** **5,119**	6,181 5,631	CSS 2500
6,335 5,487	**6,571** **5,688**	6,761 5,856	6,952 6,023	7,143 6,191	7,334 6,358	7,525 6,526	7,716 6,693	7,906 6,860	8,097 7,028	8,288 7,195	**8,479** **7,363**	9,327 8,099	CSS 3000

LNG Terminal | Yamal | Russia

Chemical Product Jetty | Stenungsund | Sweden

CORRECTION FACTORS

FENDER PERFORMANCE AT INTERMEDIATE DEFLECTION

Deflection of original fender height [%]	0	5	10	15	20	25	30	35	40	45	50	52.5	55
Energy Absorption of original value [%]	0	2	8	17	28	39	50	62	72	83	94	100	106
Reaction Force of original value [%]	0	39	70	88	96	100	99	97	96	95	97	100	107

TEMPERATURE FACTOR

Temperature [°C]	-60	-50	-40	-30	-20	-10	0	10	23	30	40	50	60
Correction Factor	Contact your local SFT office for special compound consultation			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	1.050	1.020	1.012	1.005	1.000	1.000	1.000	1.000	1.000

ANGLE FACTOR

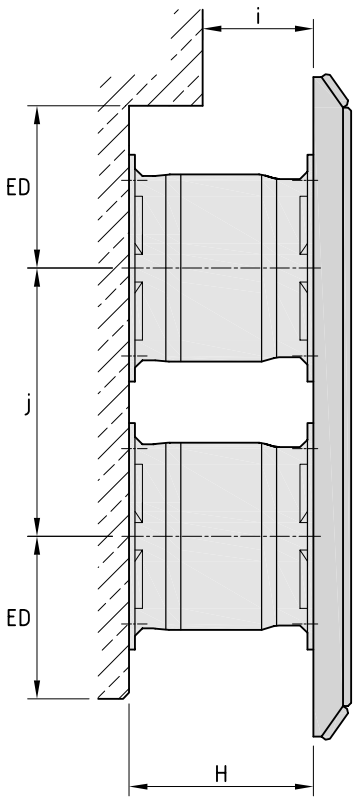
Compression Angle [°]	0	3	5	8	10	15	20
Energy Absorption of original value [%]	100	98.7	97.8	96.8	95.0	87.6	85.5
Reaction Force of original value [%]	100	100	100	100	100	100	100

INSTALLATION CLEARANCES

Fender Size	H [mm]	i [mm]	j [mm]	ED [mm]
CSS 400	400	240	600	480
CSS 500	500	300	750	510
CSS 600	600	360	900	570
CSS 800	800	480	1,200	700
CSS 1000	1,000	600	1,500	850
CSS 1150	1,150	690	1,725	990
CSS 1250	1,250	750	1,875	1,060
CSS 1450	1,450	870	2,175	1,200
CSS 1600	1,600	960	2,400	1,270
CSS 1700	1,700	1,020	2,550	1,470
CSS 2000	2,000	1,200	3,000	1,560
CSS 2250	2,250	1,350	3,375	1,710
CSS 2500	2,500	1,500	3,750	1,910
CSS 3000	3,000	1,800	4,500	2,240

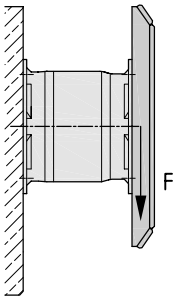
The fender system design should allow for:

- increased diameter of CSS Fenders during compression [j]
- sufficient clearance of front panel [i]
- minimum edge distance for anchoring and to other protrusions [ED]
- angular compression



WEIGHT SUPPORT CAPACITY

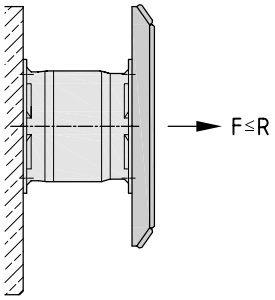
The CSS Fender can support a significant static load. As a rule of thumb, we recommend to add weight support chains if the panel weight exceeds the weight of the rubber body.*



Barbours Cut Container Terminal | Houston, TX | USA

TENSION

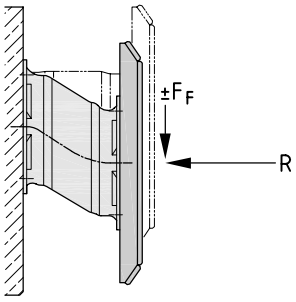
Tension chains are recommended, especially when tensile loads might exceed the rated reaction force of the rubber fender.*



Khalifa Port | Abu Dhabi | U.A.E.

SHEAR

CSS Fenders are stable against horizontal and vertical shear forces. However, depending on the application and layout of the system shear, chains might become necessary. *



Lumut Port | Vale Lumut | Malaysia

* 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