



For Customer, For Technology, For Together

DONGYANG RUBBER FENDER



DONGYANG RUBBER FENDER

MARINE FENDERING SYSTEM

System Fenders
Floating Fenders
Arch Fenders
Other Fenders
Fender Accessories

EXPANSION JOINT & INDUSTRIAL HOSE

Expansion Joint
& Marine Hose
Oil hose
AIR & Water Hose
Material Hose

DONGYANG RUBBER FENDER

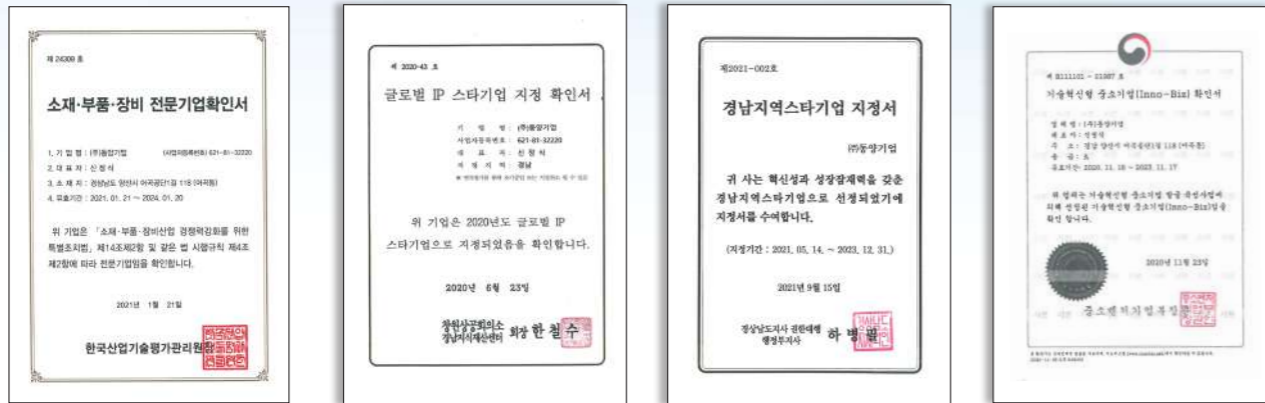


ADD | 118, Eogokgongdan 1-gil, Yangsan-si, Gyeongsangnam-do, Korea
TEL | +82-55-367-2311 FAX | +82-55-367-2316 E-mail | dycok@dyfender.com



DONGYANG ENTERPRISE Co., Ltd.

Certificate (Company, Quality, Management)



Certificate of Company Specializing in Material Parts Equipment

Certificate of Global IP Star Company

Certificate of Star Company Designation

Certificate of Inno-Biz



ISO CERTIFICATE

KS CERTIFICATE

Certificate of Intellectual Property Management

Safety and Health Management

KHNP Equipment Repair Company

Patent (Domestic / FENDER)



Floating fender with excellent buffering effect

Reversing air fender

Spool-type

Floating fender with excellent buffering effect

Patent (foreign / HOSE)



Prevention of damage to outer rubber

Rubber sleeve

Dredge line buoyancy

Reinforced winding

Utility Model



Pneumatic fender

Burst-proof fender

Cement Hose

Rubber Pad

Certificate	Corporate Certificate	Quality Certificate	Management Certificate
	Certificate of Company Specializing in Material Parts Equipment	ISO 9001 (ISO)	Certificate of Intellectual Property Management
	Certificate of Global IP Star Company	KS M6709 (KS)	Safety and Health Management System
Patent	Certificate of Star Company Designation	Quality Management System Certificate (QMS-2739)	KHNP Equipment Repair Company
	Certificate of Inno-Biz	Quality Management System Certificate (HSS-0203)	
Utility Model	Domestic / FENDER	Foreign / FENDER	Domestic / HOSE
	Floating fender with excellent buffering effect	Floating fender with excellent buffering effect	Cement hose with a protector to prevent damage to outer rubber
	Reversing air fender and manufacturing method thereof		Rubber sleeve
	Method for manufacturing spool-type fender and device therefor		Air-filled loader and manufacturing method of the loader to maintain the buoyancy of dredging line
			A method for manufacturing a dredging hose by winding a reinforcing yarn and a dredging hose manufactured by the method
	FENDER	HOSE	PAD
	Manufacturing device of pneumatic fender	Cement hose with a protector to prevent damage to outer rubber	Rubber pad used for fender
	Burst-proof fender		



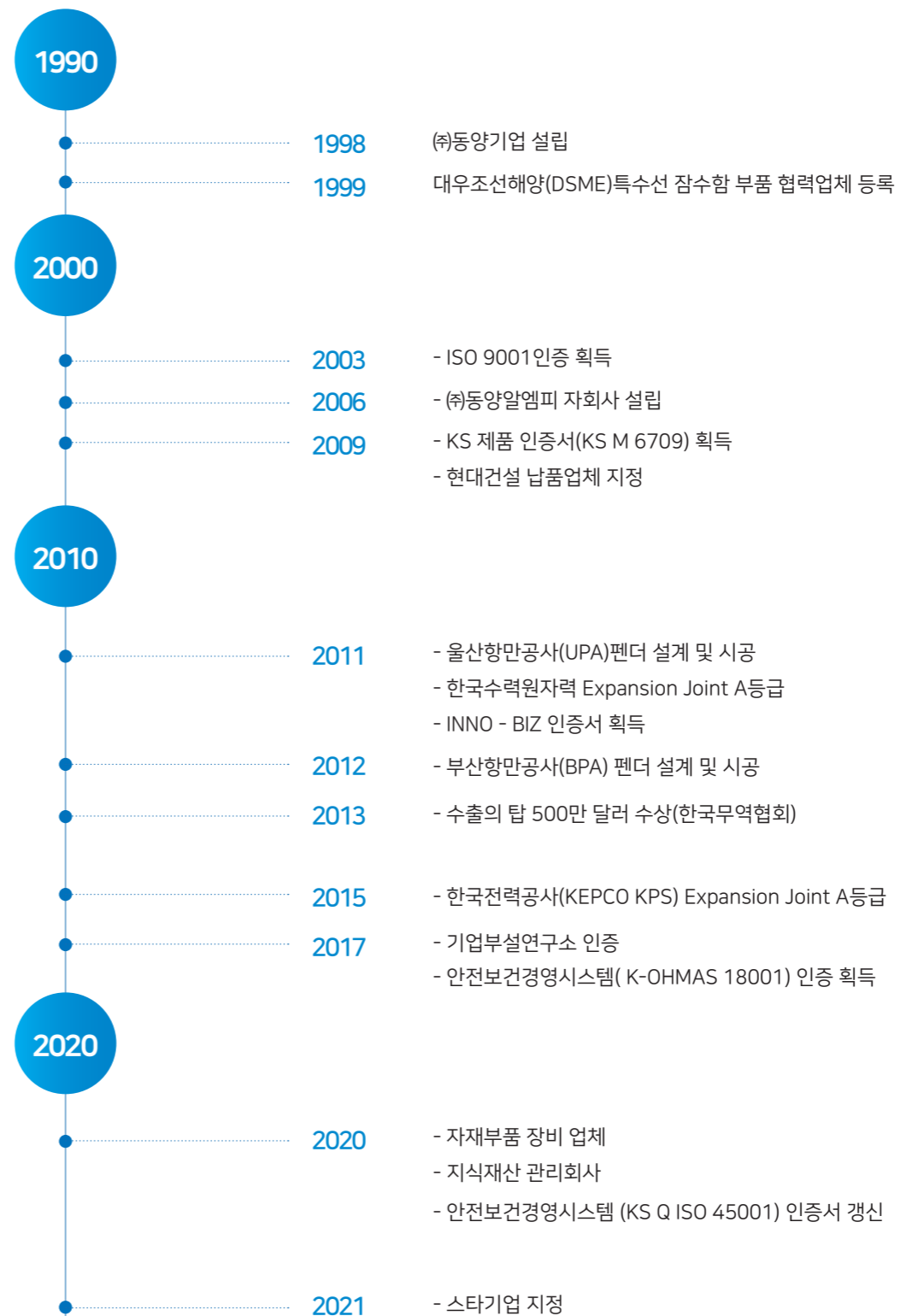
INTRODUCTION

(주)동양기업은 세계에서 가장 큰 고무제품 제조회사로서, 1998년부터 고품질의 해양 펜더 및 산업용 호스를 개발하고 생산하고 있습니다. 전 세계에 우수한 펜더를 공급하기 위해 최적화된 설계와 고성능 제품 제작을 지속적으로 진행하고 발전시켜 왔습니다.

압축 시 three-dimensional extension을 적용해 반력을 낮게 유지하면서 에너지 흡착력을 효과적으로 확보하기 위해 개발되었으며, 1998년 첫 공급 이후 여러 국가의 항만시설에 납품되고 있습니다. (주)동양기업에 의해 설계 및 제조된 펜더는 수명이 길고 고장이 없으며 보장된 기간동안 성능 또는 특성이 저하되지 않습니다. (주)동양기업의 Marine Systems은 해양 구조물에 이상적인 펜더, 환경에 가장 적합한 재료 및 긴 사용 수명과 낮은 유지보수가 가능하도록 최상의 설계를 할 수 있도록 도와줍니다.

우리는 모든 고객들에게 우수한 품질과 서비스를 갖춘 세계 최고의 펜더 제조업체로 평가받도록 노력하고 있습니다.

HISTORY



CONTENTS

DONGYANG RUBBER FENDER

Marine Fendering System

01 System Fenders

Spool Fender 8
 Cone Fender 10
 Super TR Fender 12
 TR Fender 14
 TRS Fender 16
 Panel / Pad 18

02 Floating Fenders

Pneumatic Fender 19

03 Arch Fenders

NV Fender 22
 AOV Fender 24
 ACV Fender 26

04 Other Fenders

Cylindrical Fender 28
 BC Fender 30
 SBP Fender 32
 BP Fender 33
 RC, RD, DC, DD Fender 34
 MC Fender 35
 WO Fender
 Roller Fender 36
 Composite Fender 37
 Other Fenders 38
 Seals
 Rubber Properties 39

Fender Accessories

05 Resin Anchor Bolt 40
 I-Type Anchor Bolt 41
 J-Type Anchor Bolt
 Stud-Type Anchor Bolt 42
 Chemical Anchor Bolt
 Washer 43
 Chain & U-Anchor
 Template
 Rubber Ladder 44
 Bollard 45

Expansion Joint & Industrial Hose

06 Expansion Joint & Marine Hose

Rubber Expansion Joint 46
 Sleeve Hose 49

07 Oil Hose

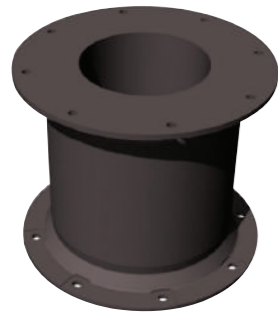
Oil Suc. & Dis. Hose (S10, S15 Type) 50

08 AIR & Water Hose

Air Suction Hose 52
 Water Suc. & Dis. Hose 53

09 Material Hose

Ceramic Discharge Hose 54
 Ceramic Suction Hose
 Mud Suc. & Dis. Hose 55



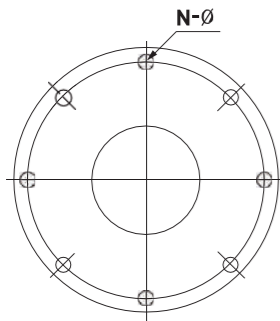
According to KSD 64 10 10.
If other specifications are requested, special orders are possible.

Spool Fender

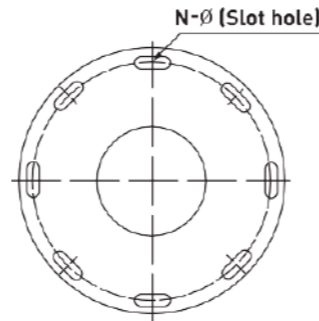
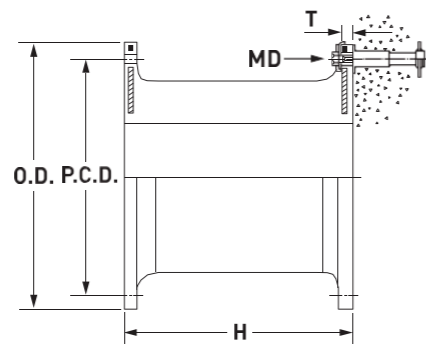
스풀 펜더(spool fender)는 유닛별로 설치 가능한 시스템 펜더의 한 종류이며, 선박 접안시 접안 충격을 효율적으로 줄여준다.

넓은 응력 분산으로 압축 성능을 45%에서 52.5%로 증가시킨 펜더이며, 뛰어난 성능과 내구성을 가진다.

당사의 특허된 공법으로 제작되는 스푼펜더는 높은 내구성과 반발력, 에너지 흡수율을 가지며 다양한 크기로 제작 가능하다.(최대 3000H)



Panel Side

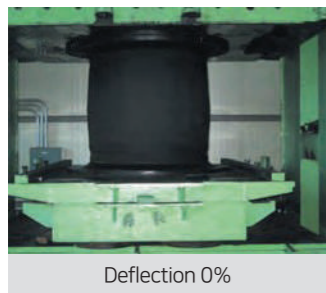


Wharf Side(Slot)

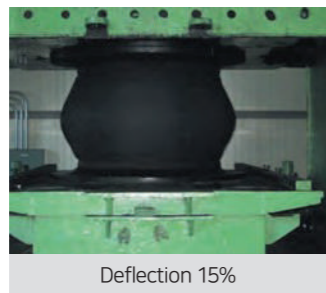
[Unit:mm]

Dimension	MD	O.D.	P.C.D.	N-ø	N-ø (Slot Hole)	T
Height						
300H	M20 (3/4)	400	340	4-25	4-25x35	15
500H	M24 (1)	650	550	4-32	4-32x40	25
630H	M27 (1 1/8)	840	700	4-39	4-39x49	25
650H	M27 (1 1/8)	870	730	4-39	4-39x49	25
800H	M30 (1 1/4)	1050	900	6-40	6-40x50	30
1000H	M36 (1 1/2)	1300	1100	6-47	6-47x58	35
1150H	M42 (1 3/4)	1500	1300	6-50	6-50x65	37
1200H	M42 (1 3/4)	1550	1350	6-53	6-53x65	38
1250H	M42 (1 3/4)	1650	1450	6-53	6-53x65	35
1400H	M48 (2)	1800	1600	6-60	6-60x75	37
1450H	M48 (2)	1850	1650	6-60	6-60x75	37
1600H	M48 (2)	2000	1800	8-60	8-60x75	45
1700H	M56 (2 1/4)	2100	1900	8-66	8-66x80	40
2000H	M64 (2 1/2)	2200	2000	8-74	8-74x95	50
2250H	M64 (2 1/2)	2550	2300	10-74	10-74x95	52
2500H	M64 (2 1/2)	2950	2700	10-74	10-74x95	70
3000H	M64 (2 1/2)	3350	3150	12-74	12-74x95	100

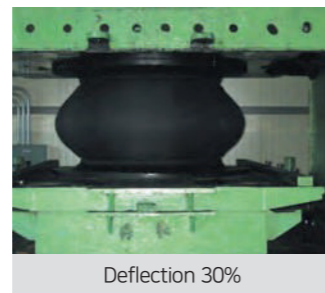
Compression Test



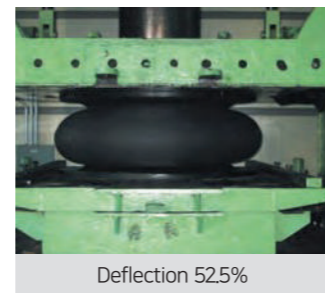
Deflection 0%



Deflection 15%

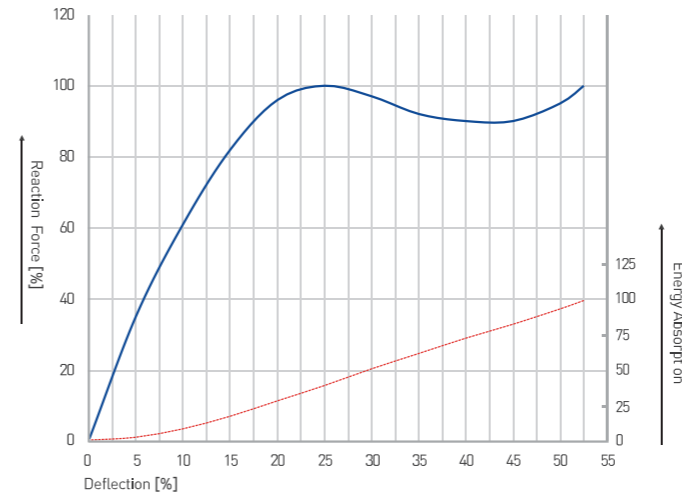


Deflection 30%



Deflection 52.5%

Performance Curve



Performance of Intermediate Deflection

Deflection[%]	R·F[%]	E·A[%]
0	0	0
5	35	2
10	61	8
15	82	17
20	96	28
25	100	39
30	97	51
35	92	62
40	90	73
45	90	83
50	95	94
52.5	100	100

Performance Table

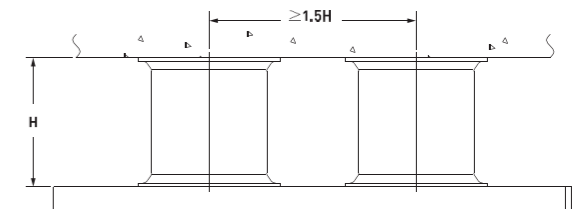
GRADE	300H		500H		630H		650H		800H		1000H		1150H		1200H	
	R.F	E.A	R.F	E.A	R.F	E.A	R.F	E.A	R.F	E.A	R.F	E.A	R.F	E.A	R.F	E.A
	kN	kJ	kN	kJ	kN	kJ	kN	kJ	kN	kJ	kN	kJ	kN	kJ	kN	kJ
GS	89.5	8.8	248.2	40.6	394.7	81.4	419.8	89.3	636	166	994	325	1,313	495	1,431	562
G1	74.6	7.3	206.8	33.8	328.9	67.8	349.8	74.4	530	139	828	271	1,095	412	1,192	468
G2	65.8	6.3	182.6	29.5	290.4	59.0	308.0	64.8	468	121	730	236	966	359	1,052	408
G3	57.0	5.4	158.4	25.1	251.9	50.3	267.3	55.2	406	103	634	201	837	306	911	347
G4	48.3	4.4	134.2	20.8	213.4	41.5	226.6	45.6	342	85	536	167	708	253	771	287
G5	39.4	3.8	110.0	17.5	174.9	35.0	184.8	38.4	281	72	439	140	579	212	631	242

GRADE	1250H		1400H		1450H		1600H		1700H		2000H		2250H		2500H		3000H	
	R.F	E.A	R.F	E.A	R.F	E.A	R.F	E.A	R.F	E.A	R.F	E.A	R.F	E.A	R.F	E.A	R.F	E.A
	kN	kJ	kN	kJ	kN	kJ	kN	kJ	kN	kJ	kN	kJ	kN	kJ	kN	kJ	kN	kJ
GS	1,551	635	1,947	892	2,088	991	2,542	1,332	2,870	1,597	3,973	2,602	5,028	3,703	6,207	5,080	8,944	8,777
G1	1,293	529	1,623	743	1,740	826	2,119	1,110	2,391	1,331	3,311	2,168	4,190	3,086	5,172	4,234	7,454	7,314
G2	1,141	461	1,431	648	1,536	719	1,870	967	2,111	1,159	2,921	1,888	3,697	2,688	4,564	3,687	6,577	6,934
G3	989	392	1,241	552	1,330	613	1,620	824	1,828	987	2,531	1,608	3,204	2,290	3,956	3,141	5,700	5,419
G4	837	324	1,049	455	1,126	507	1,371	680	1,548	816	2,143	1,328	2,712	1,892	3,347	2,595	4,824	4,496
G5	684	274	859	383	921	427	1,122	573	1,268	687	1,752	1,119	2,219	1,593	2,739	2,185	3,946	3,767

- Note**
1. R.F (Reaction Force) kN, E.A (Energy Absorption) kJ, Tolerance ±10%, Rated Deflection : 52.5%
 2. Additionally, if other performance grades / tolerance are required for fender, we can manufacture various grades / tolerance to meet your requirement. Please inquire to DRF.
 3. The above data can be changed due to the quality improvement of the manufacturer.



3D Model ▲



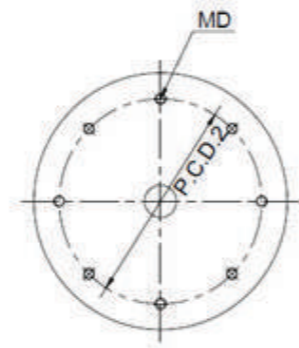
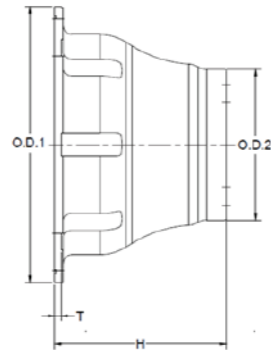
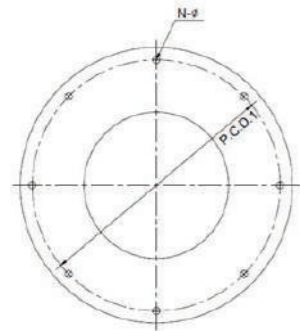
Clearances ▲



According to KSD 64 10 10. If other specifications are requested, special orders are possible.

Cone Fender

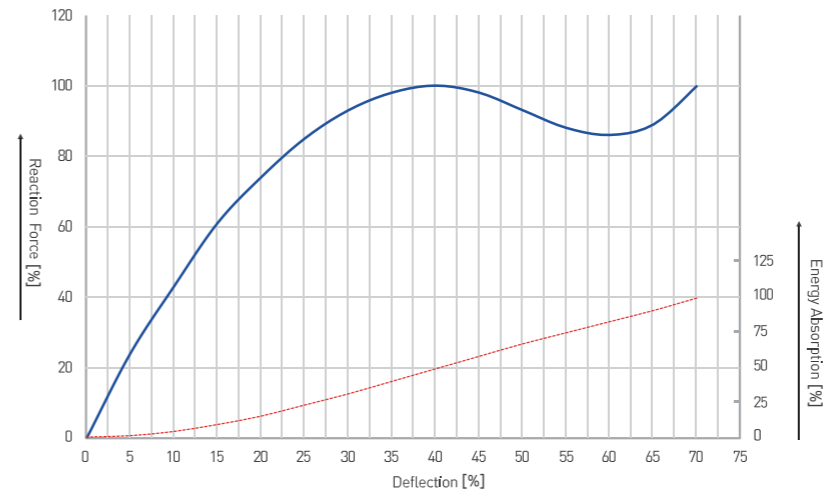
콘 펜더(cone fender)는 스폴펜더와 동일하게 시스템 펜더로 분류되며, 설치 공간이 협소하거나 충격 흡수의 범위가 넓은 경우 사용한다. 압축 및 복원력이 우수하며 내구성이 뛰어난 고성능 선박용 펜더이다.



[Unit:mm]

Dimension	MD	O.D.1	P.C.D.1	O.D.2	P.C.D.2	T	N-ø
Height							
300H	M20 (3/4)	500	440	262	210	18	4-26
350H	M20 (3/4)	575	510	306	245	20	4-26
400H	M20 (3/4)	650	585	350	280	20	4-26
500H	M24 (1)	820	730	436	350	22	4-30
600H	M24 (1)	900	810	525	420	23	4-30
700H	M30 (1 1/4)	1120	1020	615	490	26	4-38
800H	M30 (1 1/4)	1280	1165	700	560	31	6-38
900H	M36 (1 1/2)	1450	1313	785	630	36	6-44
1000H	M42 (1 3/4)	1600	1460	875	700	38	6-50
1100H	M42 (1 3/4)	1760	1605	963	770	40	6-50
1150H	M42 (1 3/4)	1850	1550	1000	805	41	6-50
1200H	M42 (1 3/4)	1920	1750	1050	840	46	8-50
1300H	M42 (1 3/4)	2080	1900	1140	910	53	8-50
1400H	M42 (1 3/4)	2240	2040	1225	980	54	8-50
1600H	M48 (2)	2560	2330	1400	1120	64	8-60
1800H	M56 (2 1/4)	2880	2620	1575	1260	90	10-70
2000H	M56 (2 1/4)	3200	2920	1700	1400	100	10-70

Performance Curve



Performance of Intermediate Deflection

Deflection[%]	R·F[%]	E·A[%]
0	0	0
5	24	1
10	43	4
15	61	9
20	74	15
25	85	23
30	93	31
35	98	40
40	100	49
45	98	58
50	93	67
55	88	75
60	86	83
65	89	91
70	100	100

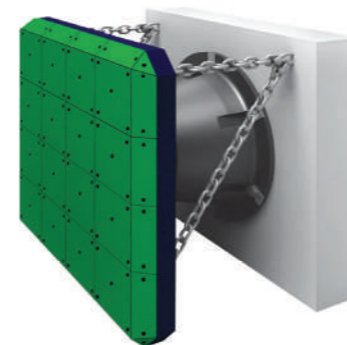
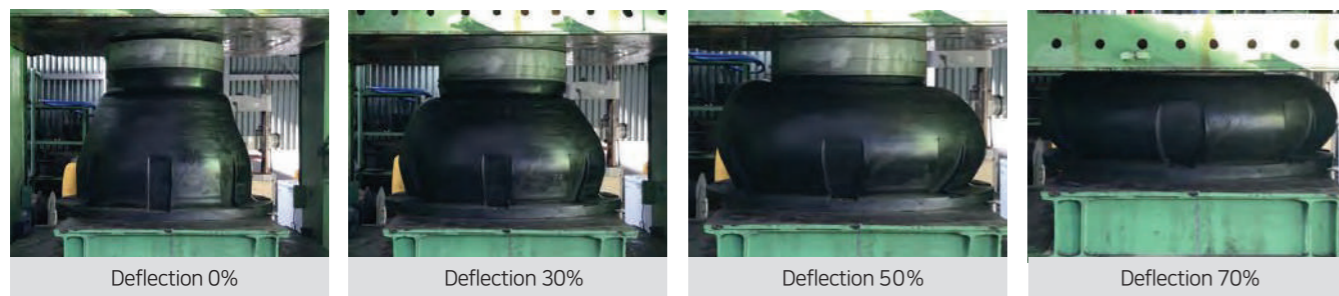
Performance Table

GRADE	300H		350H		400H		500H		600H		700H		800H		900H	
	R.F	E.A	R.F	E.A	R.F	E.A	R.F	E.A	R.F	E.A	R.F	E.A	R.F	E.A	R.F	E.A
GS	147.8	17.9	202.0	28.4	264.0	43.0	414.5	86.0	594.0	146.9	810.5	243.4	1,057	350	1,339	497
G1	123.2	14.9	168.3	23.7	220.0	35.8	345.4	71.7	495.0	122.4	675.4	195.3	881	292	1,115	414
G2	111.1	13.2	151.8	21.1	198.0	32.0	310.2	64.0	445.5	109.8	607.2	174.6	794	260	1,004	370
G3	98.7	11.6	135.3	18.5	176.0	28.2	276.1	56.3	397.1	96.3	540.1	153.9	706	230	893	326
G4	86.4	10.1	117.7	16.0	154.0	24.3	240.9	48.7	346.5	83.1	473.0	132.3	617	198	781	281
G5	74.0	8.5	101.2	13.5	133.1	20.5	206.8	41.0	297.0	69.9	405.9	111.6	529	167	670	237

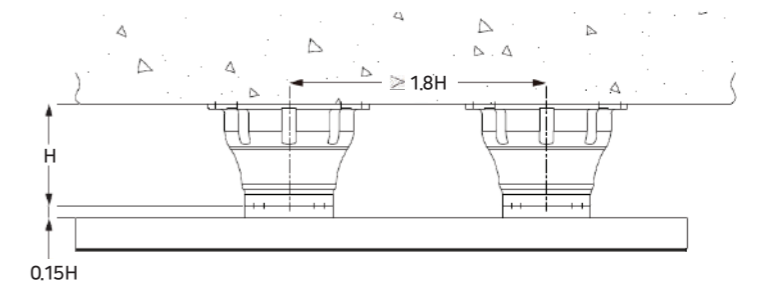
GRADE	1000H		1150H		1200H		1300H		1400H		1600H		1800H		2000H	
	R.F	E.A	R.F	E.A	R.F	E.A	R.F	E.A	R.F	E.A	R.F	E.A	R.F	E.A	R.F	E.A
GS	1,653	908	2,185	1,038	2,380	1,179	2,793	1,500	3,238	1,874	4,231	2,795	5,354	3,980	6,611	5,458
G1	1,377	757	1,821	865	1,983	983	2,328	1,250	2,698	1,562	3,526	2,329	4,462	3,317	5,509	4,549
G2	1,240	676	1,638	772	1,784	878	2,094	1,116	2,429	1,393	3,174	2,079	4,015	2,961	4,958	4,062
G3	1,101	594	1,458	680	1,586	772	1,861	982	2,159	1,226	2,822	1,830	3,570	2,606	4,408	3,574
G4	965	514	1,275	587	1,388	667	1,629	848	1,890	1,058	2,468	1,580	3,123	2,250	3,856	3,087
G5	826	432	1,092	494	1,190	562	1,397	714	1,619	891	2,115	1,331	2,677	1,895	3,306	2,599

- Note**
1. R.F (Reaction Force) kN, E.A (Energy Absorption) kJ, Tolerance ±10%, Rated Deflection : 70.0%
 2. Additionally, if other performance grades / tolerance are required for fender, we can manufacture various grades / tolerance to meet your requirement. Please inquire to DRF.
 3. The above data can be changed due to the quality improvement of the manufacturer.

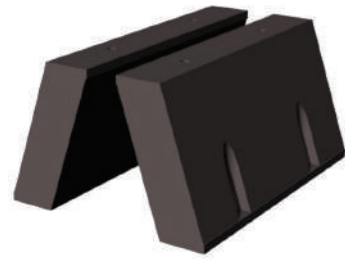
Compression Test



3D Model ▲



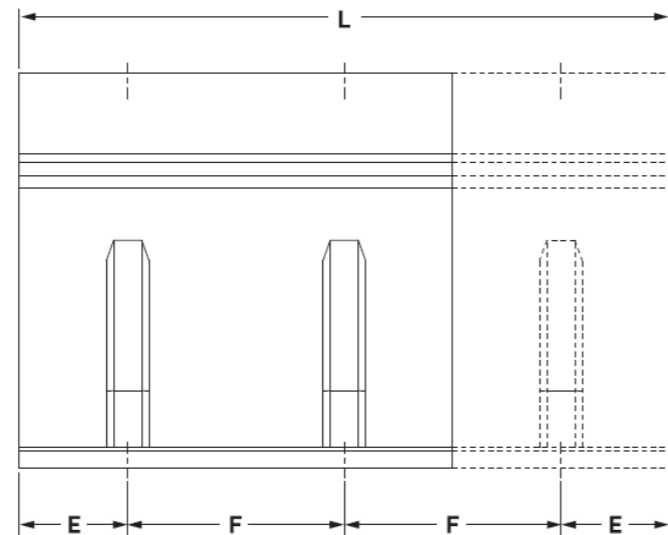
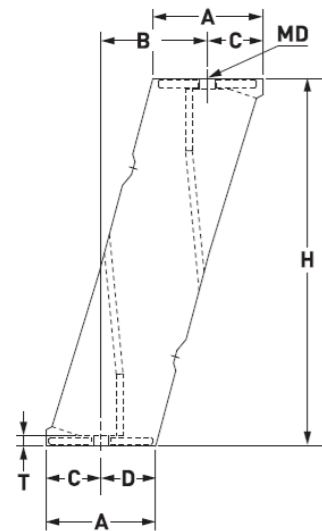
Clearances ▲



According to KSD 64 10 10.
If other specifications are requested, special orders are possible.

Super TR Fender

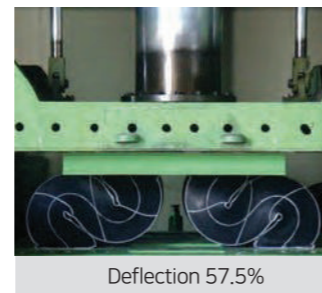
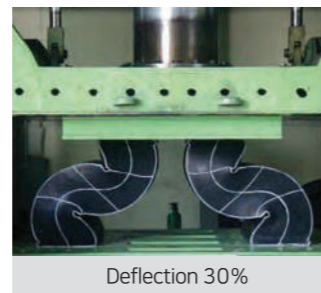
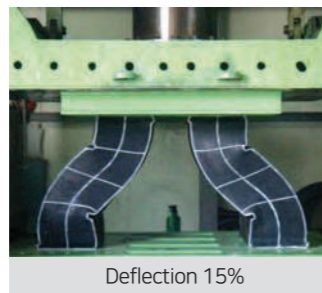
Super TR펜더는 TR펜더를 개선한 모델이다. 고효율 펜더 개발의 필요로 당사가 개발한 제품이며, 설치 공간이 부족한 경우 사용가능하다.



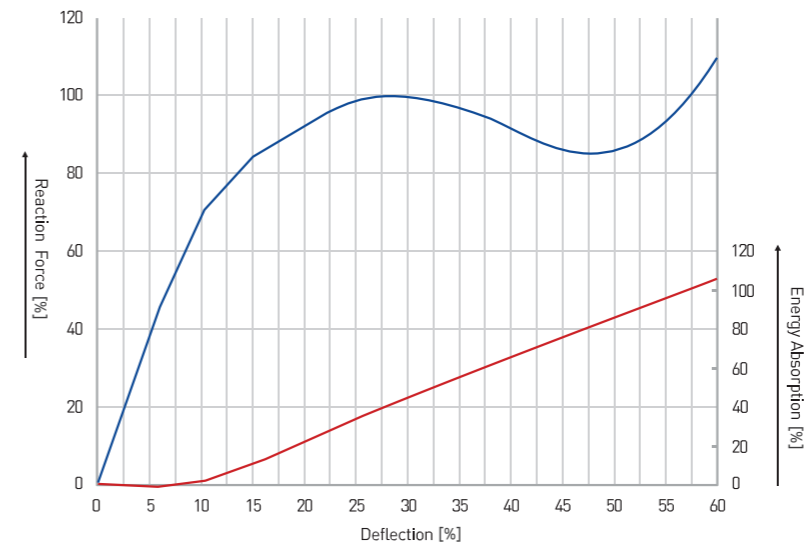
[Unit:mm]

Dimension	MD	T	A	B	C	D	E	F
Height								
250H	M20(3/4)	17	80	78	40	40	150	300
300H	M20(3/4)	17	94	93	47	47	150	300
400H	M24(1)	17	125	124	63	62	250	500
500H	M30(1 1/4)	20	158	142	87	71	250	500
600H	M30(1 1/4)	20	188	199	87	101	250	500
750H	M36(1 1/2)	26	235	230	118	117	250	500
800H	M36(1 1/2)	26	250	240	129	121	250	500
1000H	M42(1 3/4)	31	322	310	162	160	250	500
1250H	M48(2)	36	401	388	202	199	250	500
1450H	M48(2)	41	454	445	228	226	250	500
1600H	M56(2 1/4)	50	507	480	261	246	250	500

Compression Test



Performance Curve



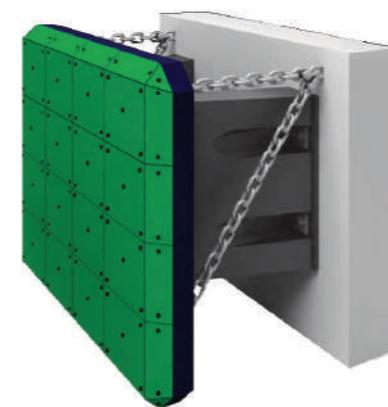
Performance of Intermediate Deflection

Deflection[%]	R·F[%]	E·A[%]
0	0	0
5	32	2
10	60	7
15	79	14
20	92	24
25	99	34
30	100	45
35	97	56
40	92	66
45	86	76
50	85	86
55	94	95
57.5	100	100
60	110	106

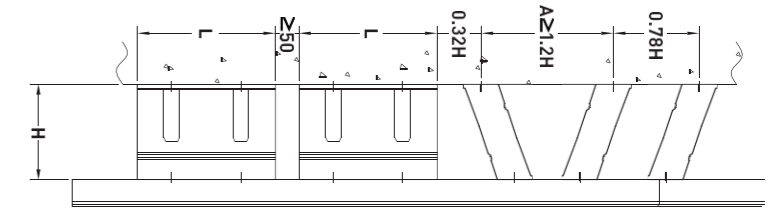
Performance Table

GRADE	250H		300H		400H		500H		600H		750H		800H		1000H		1250H		1450H		1600H	
	R.F	E.A	R.F	E.A	R.F	E.A	R.F	E.A	R.F	E.A	R.F	E.A	R.F	E.A	R.F	E.A	R.F	E.A	R.F	E.A	R.F	E.A
	kN	KJ	kN	KJ	kN	KJ	kN	KJ	kN	KJ	kN	KJ	kN	KJ	kN	KJ	kN	KJ	kN	KJ	kN	KJ
G1	324.5	28.7	388.3	41.0	518.1	72.5	647.9	115.2	776.6	164.7	970.2	257.4	1,036.2	292.5	1,295	457	1,618	715	1,877	960	2,071	1,170
G2	294.8	25.0	353.1	35.7	470.8	63.2	589.6	99.9	706.2	143.1	882.2	224.1	941.6	254.7	1,177	398	1,472	622	1,706	837	1,882	1,019
G3	255.2	21.3	305.8	30.4	408.6	53.8	510.4	85.3	611.6	121.5	764.5	190.8	816.2	216.9	1,020	339	1,275	530	1,478	713	1,631	869
G4	215.6	17.6	258.5	25.2	345.4	44.5	432.3	70.5	518.1	100.8	646.8	157.5	690.8	179.1	864	280	1,079	438	1,251	589	1,381	713
G5	177.1	14.9	212.3	21.2	282.7	37.4	353.1	59.3	423.5	84.8	529.1	133.2	565.4	151.2	706	236	883	369	1,024	496	1,130	604

- Note**
1. R.F (Reacion Force) kN, E.A (Energy Absorption) kJ, Tolerance : R.F below+10%, E.A over -10%, Rated Deflection : 57.5%
 2. Additionally, If other performance grades / tolerance are required for fender, we can manufacture various grades / tolerance to meet your requirement. Please inquire to DRF.
 3. The above data can be changed due to the quality improvement of the manufacturer.



3D Model ▲



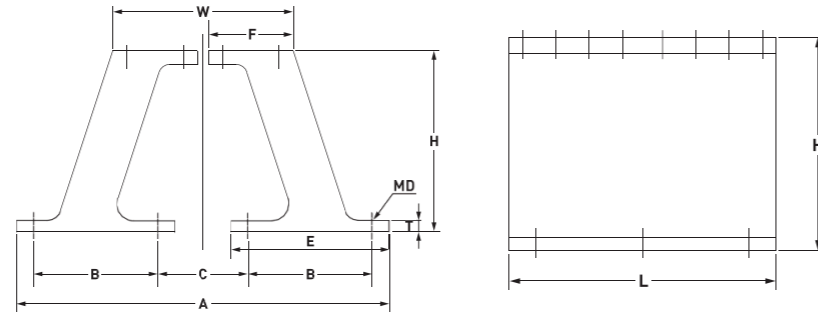
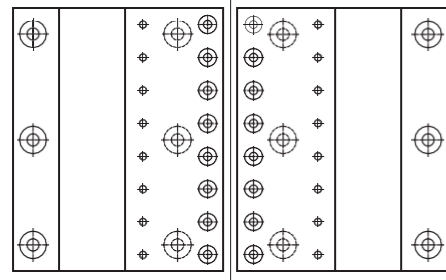
Clearances ▲



According to KSD 64 10 10.
If other specifications are requested, special orders are possible.

TR Fender

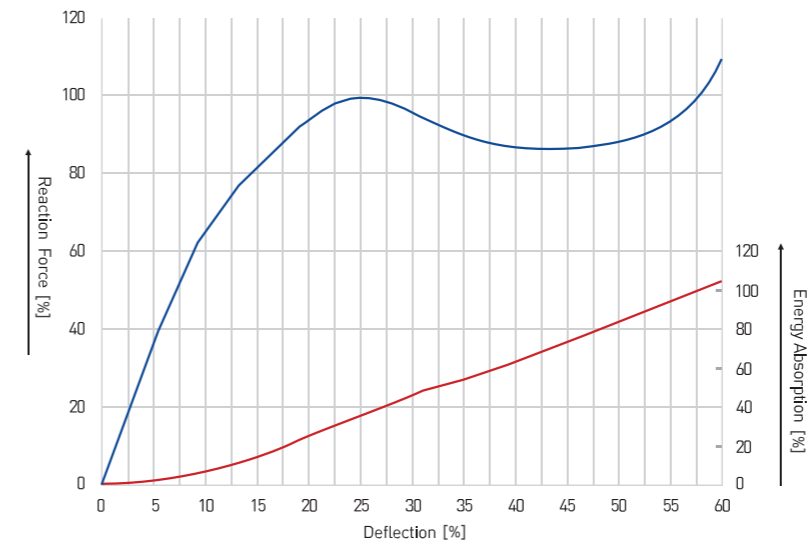
TR펜더는 고품질 플라스틱 재질의 사각 패드로 보호되는 강철 프레임 보드에 두개의 독립적인 고무 패드를 볼트로 고정시켜 놓은 형태이다.



[Unit:mm]

Dimension	MD	A	B	C	E	F	T	W	L
Height									
600H	M48(2)	1435	450	375	592.5	180	50	965	
800H	M64(2 1/2)	1850	585	480	765	240	60	800	
1000H	M64(2 1/2)	2180	685	610	890	300	65	1000	
1150H	M64(2 1/2)	2500	800	650	1005	345	65	1150	
1300H	M76(3)	2740	880	750	1115	395	65	1300	1000
1450H	M76(3)	3100	1000	800	1300	675	100	1450	~
1600H	M76(3)	3300	1100	800	1400	750	100	1600	3000
1800H	M76(3)	3670	1200	970	1500	830	110	1800	
2000H	M76(3)	4050	1300	1150	1600	880	120	2000	
2250H	M76(3)	4400	1400	1300	1700	945	130	2250	
2500H	M76(3)	4860	1500	1560	1800	1000	140	2500	

Performance Curve



Performance of Intermediate Deflection

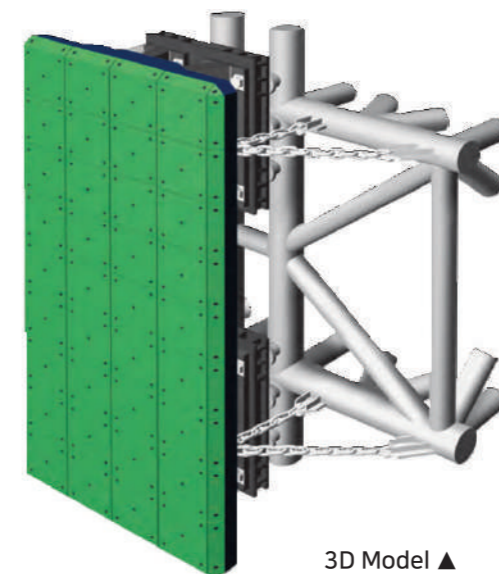
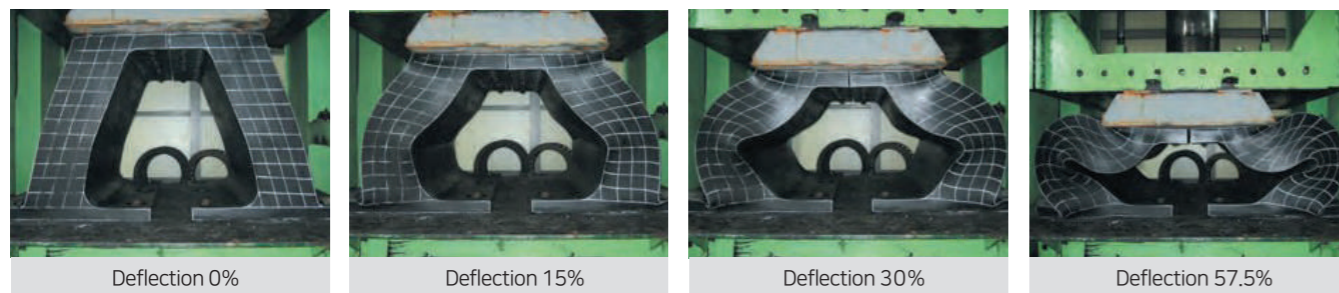
Deflection[%]	R·F[%]	E·A[%]
0	0	0
5	33	2
10	58	7
15	80	14
20	94	24
25	100	34
30	96	45
35	90	56
40	87	65
45	86	75
50	89	85
55	94	95
57.5	100	100
60	110	106

Performance Table

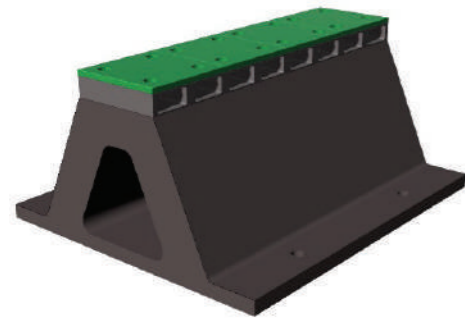
GRADE	600H		800H		1000H		1150H		1300H		1450H		1600H		1800H		2000H		2250H		2500H		
	R.F	E.A	R.F	E.A	R.F	E.A	R.F	E.A	R.F	E.A	R.F	E.A	R.F	E.A	R.F	E.A	R.F	E.A	R.F	E.A	R.F	E.A	
	kN	kJ	kN	kJ	kN	kJ	kN	kJ	kN	kJ	kN	kJ	kN	kJ	kN	kJ	kN	kJ	kN	kJ	kN	kJ	kN
GS	851.4	176.0	1,133.9	313.2	1,418	489	1,632	647	1,844	827	2,057	1,029	2,269	1,254	2,553	1,585	2,835	1,958	3,192	2,479	3,546	3,060	
G1	709.5	146.7	944.9	261.0	1,181	408	1,360	539	1,537	689	1,714	858	1,891	1,045	2,127	1,321	2,363	1,632	2,660	2,066	2,955	2,550	
G2	638.0	131.4	850.3	233.1	1,064	365	1,224	482	1,383	616	1,543	766	1,702	932	1,914	1,180	2,127	1,457	2,394	1,844	2,659	2,277	
G3	567.6	110.7	756.8	195.3	945	306	1,088	404	1,229	518	1,372	644	1,513	783	1,702	991	1,891	1,224	2,127	1,549	2,363	1,913	
G4	473.0	89.3	630.3	158.4	788	248	906	328	1,024	419	1,143	521	1,261	635	1,418	802	1,575	991	1,773	1,254	1,969	1,548	
G5	378.4	73.5	503.8	130.5	630	204	725	269	820	345	914	429	1,009	522	1,134	661	1,261	815	1,418	1,033	1,575	1,275	

- Note**
1. R.F (Reaction Force) kN, E.A (Energy Absorption) kJ, Tolerance : R.F below +10%, E.A over -10%, Rated Deflection : 57.5%
 2. Additionally, if other performance grades / tolerance are required for fender, we can manufacture various grades / tolerance to meet your requirement. Please inquire to DRF.
 3. The above data can be changed due to the quality improvement of the manufacturer.

Compression Test



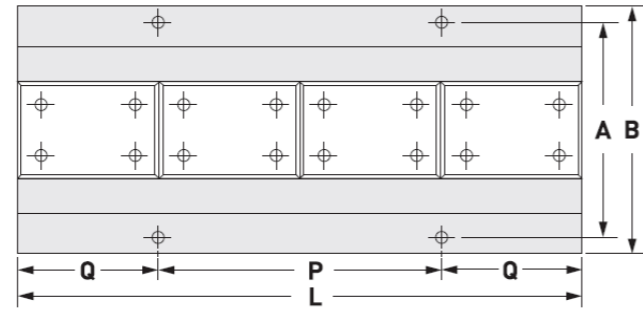
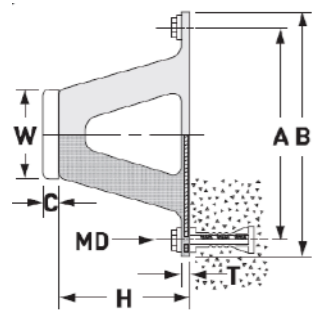
3D Model ▲



TRS Fender

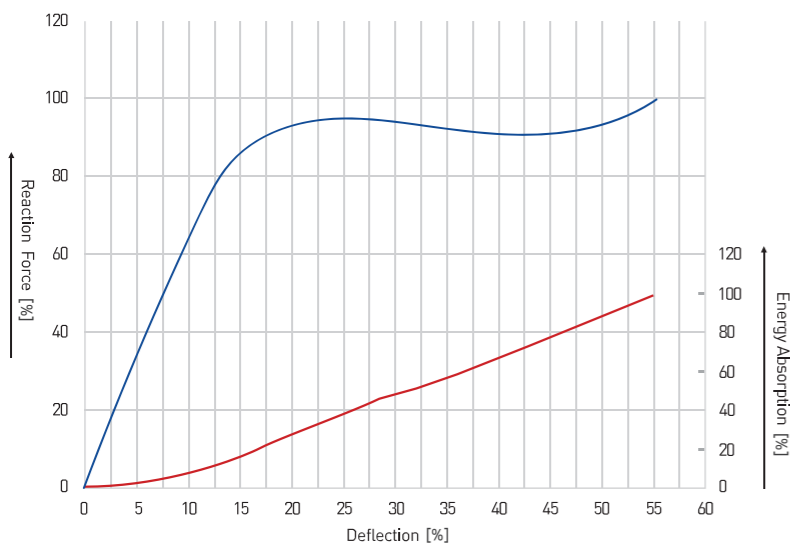
TRS 펜더는 V형 펜더를 개선한 에너지 흡수율이 높은 펜더이다. 반력/에너지 비율은 다른 펜더보다 작다. 펜더 상단뿐 아니라 하단 전체에도 강판으로 보강되어 있으며, 합성수지 보드를 부착해 고무로된 몸체를 보호하고 마찰력을 줄여 성능을 향상시킨다.

- TRS-A Type : 상부에 합성수지판이 설치되어 있는 타입
- TRS-B Type : 일체형이 아닌 필요한 만큼 분할하여 합성수지판을 상부에 설치하는 타입
- TRS-C Type : 이미 설치되어있는 철로 된 조인트 위에 합성수지판이 설치되어 있는 타입



Dimension	MD	A	B	P	Q	T	W
Height							
150	M18 (3/4)	260	320	500	250	20	100
200	M24 (1)	310	380	500	250	25	130
250	M24 (1)	400	500	500	250	30	160
300	M30 (1 1/4)	530	645	500	250	35	190
400	M36 (1 1/2)	710	840	500	250	40	250
500	M42 (1 3/4)	860	1000	500	250	45	320
600	M48 (2)	1050	1210	500	250	50	380
800	M64 (2 1/2)	1350	1550	500	250	60	500
1000	M64 (2 1/2)	1600	1800	500	250	70	640

Performance Curve



Performance of Intermediate Deflection

Deflection[%]	R·F[%]	E·A[%]
0	0	0
5	36	2
10	65	8
15	84	16
20	93	26
25	95	37
30	93	48
35	92	58
40	90	68
45	91	79
50	93	89
55	100	100

Performance Table

GRADE	150H		200H		250H		300H		400H		500H		600H		800H		1000H	
	R.F	E.A	R.F	E.A	R.F	E.A	R.F	E.A	R.F	E.A	R.F	E.A	R.F	E.A	R.F	E.A	R.F	E.A
GS	167.7	10.1	223.6	19.1	279.5	30.6	647.9	115.2	776.6	164.7	970.2	257.4	1,036.2	292.5	1,295	457	1,618	715
G1	141.9	7.0	189.2	13.2	236.5	21.2	589.6	99.9	706.2	143.1	882.2	224.1	941.6	254.7	1,177	398	1,472	622
G2	118.8	6.2	157.3	11.4	196.9	17.6	510.4	85.3	611.6	121.5	764.5	190.8	816.2	216.9	1,020	339	1,275	530
G3	97.0	4.4	125.4	8.8	157.3	14.1	432.3	70.5	518.1	100.8	646.8	157.5	690.8	179.1	864	280	1,079	438
G4	61.7	3.4	79.8	6.9	100.1	11.0	353.1	59.3	423.5	84.8	529.1	133.2	565.4	151.2	706	236	883	369

- Note
1. R.F (Reaction Force) kN, E.A (Energy Absorption) kJ, Tolerance ±10%, Rated Deflection : 55.0%
 2. Additionally, if other performance grades / tolerance are required for fender, we can manufacture various grades / tolerance to meet your requirement. Please inquire to DRF.
 3. The above data can be changed due to the quality improvement of the manufacturer.

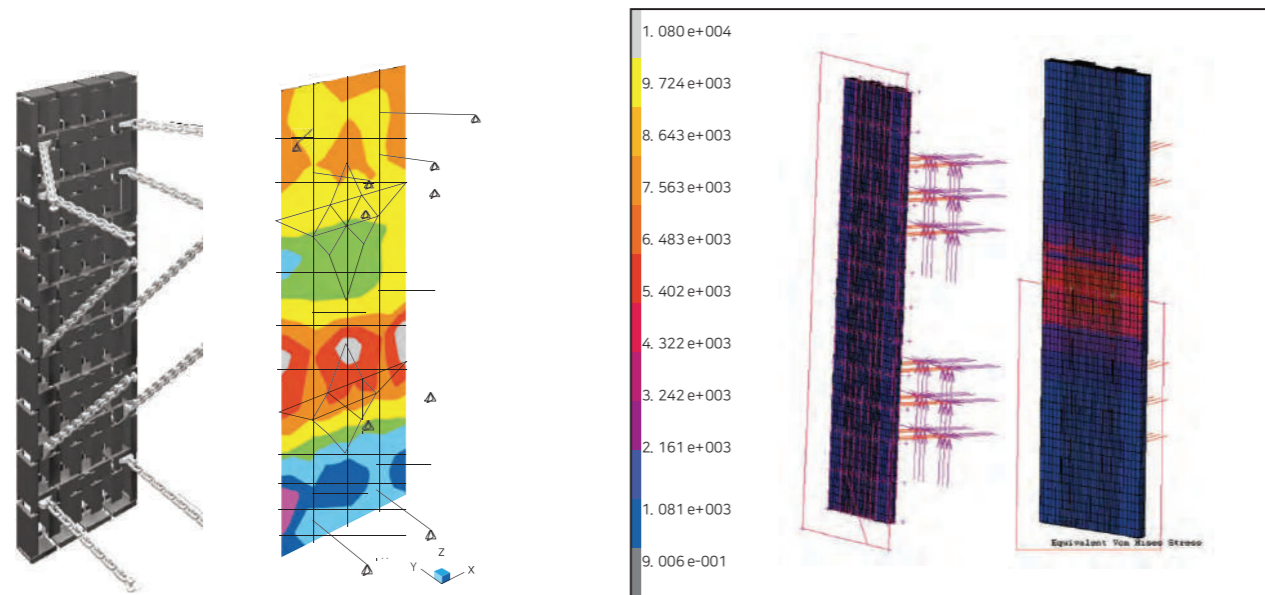
Panel

당사의 시스템 펜더들은 전면에 판넬을 부착할수 있어, 선박과의 넓은 접촉면적을 확보할 수 있으므로 선체에 대한 압력을 필요한 만큼 줄일 수 있다. 또한, 당사는 자체적인 구조 분석 능력을 가지고 있기 때문에 선박과 적합한 유형의 펜더 설계가 가능하다.



One Unit Two Unit (vertical) Two Unit (horizontal) Three Unit Four Unit

Example of Structure Analysis



Pad

일부 유형의 펜더에는 강철 프레임에 패드가 부착되어 있다. 패드는 펜더에 부착되어 선박과 펜더 사이의 마찰로 인한 선박 선체의 굽힘을 최소화한다.



Applicable color
Colors above may be differed from actual products

● Resin Pad (HDPE)

Physical Properties	Testing Standard	Requirement
Density	ASTM D 1505, JIS K 7112	0.92~1.05 g/cm ³
Tensile Strength	ASTM D 638, JIS K 7113	Min. 20MPa
Elongation		Min. 500%
Compression Strength	ASTM D 695a, JIS K 7181	Min. 30MPa
Friction Coefficient	ASTM D 1894	Max. 0.2

● Resin Pad (UHMW-PE)

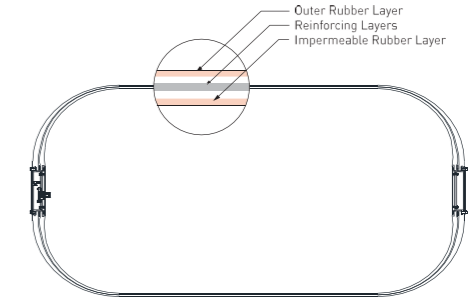
Physical Properties	Testing Standard	Requirement
Density	ISO 1183	0.922~0.942 g/cm ³
Wear resistance	DIN 58836	100 ± 10%
Yield stress	ISO 527	Min. 17 Mpa
Tensile strain	ISO 527	Min. 8%
Modulus of elasticity	ISO 527	Min. 700 Mpa
Impact strength	ISO 179 (double-notched)	Min. 170 kJ/m ²
	ISO 179 (single-notched)	No fracture

Pneumatic Fender

Pneumatic Fender는 다루기 쉽고 가벼우며 재배치가 가능하여 장기간 사용하기에 적합하다. 당사는 우수한 품질을 바탕으로 조선소, 군함, 선박 등에 사용되는 다양한 형태의 제품을 제조 공급하고 있다



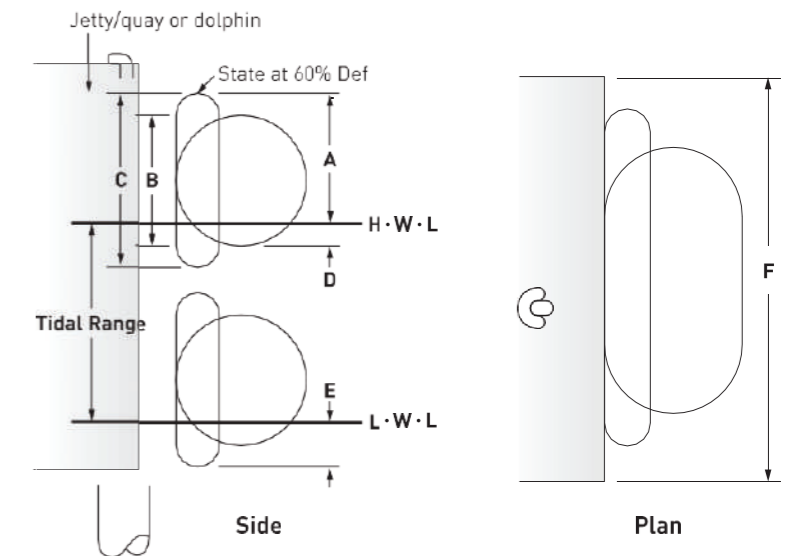
According to KSD 64 10 10.
If other specifications are requested, special orders are possible.



[Unit : mm,kg]

Dimension	300	500	600	700	800	1000	1200	1350	1500	1700	2000	2500	3000	3300	4500
Length	500:600	800:1000	1000:1500	1500:2000	2000:2500	2500:3000	3000:3500	3500:4000	4000:4500	4500:5000	5000:6000	6000:7000	7000:8000	8000:9000	9000:11150
Fender Body	10:15	25:35	45:80	25:35	140:170	180:200	270:300	350:500	550:650	950:1100	1350:1700	1800:2250	3000:3700	4100:4950	
Chain Net	-	-	-	-	-	170:200	210:220	260:400	440:510	880:920	1220:1510	1620:2620	2360:3120	4700:5800	5100:6200
Total	10:15	25:35	45:80	25:35	310:370	390:420	530:700	790:1010	1430:1570	2170:2610	2970:4320	4160:5370	7700:9500	9200:11150	

Dimension of Jetty at Installation

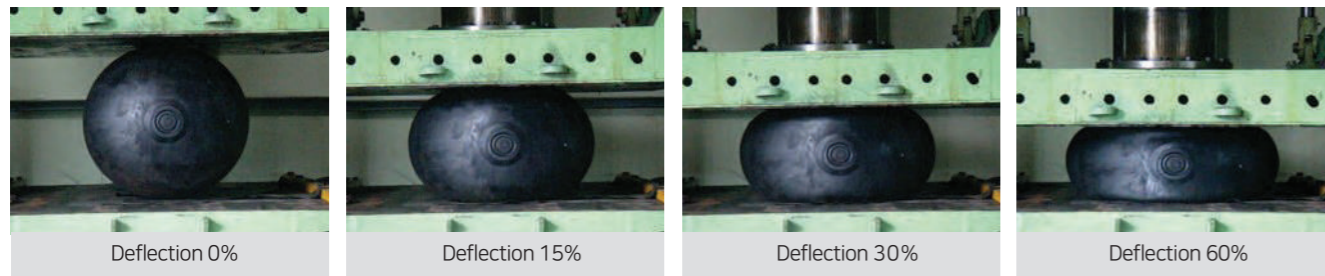


Installation Dimension

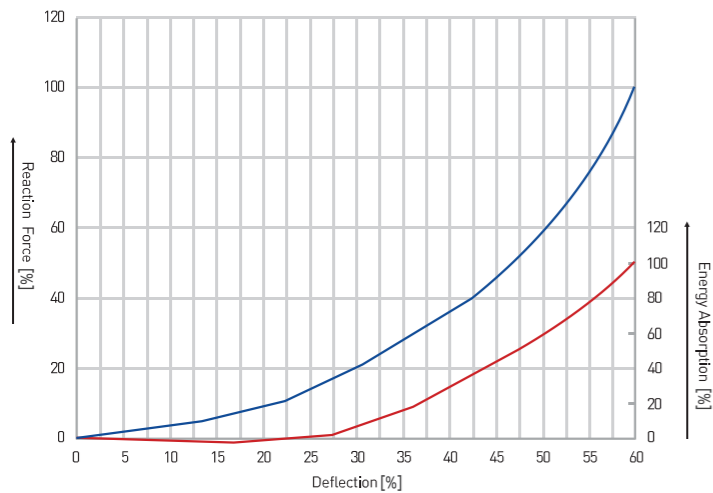
[Unit:mm]

Size	A	B	C	D	E	(F)
1000Ø × 1500L	975	950	1350	200	375	2000
1200Ø × 2000L	1200	1140	1620	220	430	2600
1500Ø × 2500L	1525	1420	2050	250	525	3250
2000Ø × 3500L	2050	1900	2700	300	650	4500
2500Ø × 4000L	2490	2380	3380	450	890	5200
3300Ø × 6500L	3380	3140	4460	500	1080	8500
4500Ø × 9000L	4710	4270	6180	800	1470	12000

Compression Test



Performance Curve



Performance of Intermediate Deflection

Deflection[%]	R·F[%]	E·A[%]
0	0	0
5	3	0
10	6	1
15	9	4
20	13	7
25	18	11
30	23	16
35	29	24
40	36	32
45	45	44
50	58	58
55	75	76
60	100	100

Performance Table

Diameter	300	500	600	700	800	1000	1200	1350	1500	1700	2000	2500	3000	3300	4500
Length(mm)	500 600	800 1000	1000 1500	1200 1500	1500 2000	1800 2000	2500 2500	3000 3000	3000 3500	6000 4000	5500 5000	4500 4500	6500 6500	10600 13000	7000 9000
Initial Inner Pressure of 30 kPa															
R·F(kN)	19.6 23.5	52.9 66.6	79.9 146	127 167	196 265	294 323	441 500	588 664	798 931	1596 1274	1752 1960	2038 2038	2940 4753	5627 4106	5292 4655
E·A(kJ)	1.0 1.2	4.1 5.1	7.7 14.1	15.7 19.6	31.4 41.2	53.9 58.8	99.0 118	137 181	235 274	470 490	674 980	1019 1019	1470 2372	3397 2960	3802 4949
Initial Inner Pressure of 50 kPa															
R·F(kN)	22.5 26.5	58.8 73.5	88.2 163	141 186	222 295	320 354	496 554	658 755	882 1029	1764 1480	2035 2205	2195 2195	3165 5165	6331 4655	5998 4949
E·A(kJ)	1.3 1.5	5.7 7.2	8.5 15.8	21.6 27.4	40.2 53.9	69.6 77.4	125 152	182 233	323 377	647 674	927 1225	1323 1323	1911 3116	3822 2960	4949 6350
Initial Inner Pressure of 80 kPa															
R·F(kN)	29.4 35.3	78.4 98.0	118 206	187 235	280 373	404 449	631 697	836 953	1121 1313	2244 1862	2558 2783	2764 2764	3989 6497	7977 5860	7536 6350
E·A(kJ)	1.7 2.0	7.4 9.1	11.4 19.9	27.4 34.3	51.9 69.6	90.2 101	160 196	235 304	421 491	842 871	1196 1568	1705 1705	2470 4028	4938 2960	6350 8350

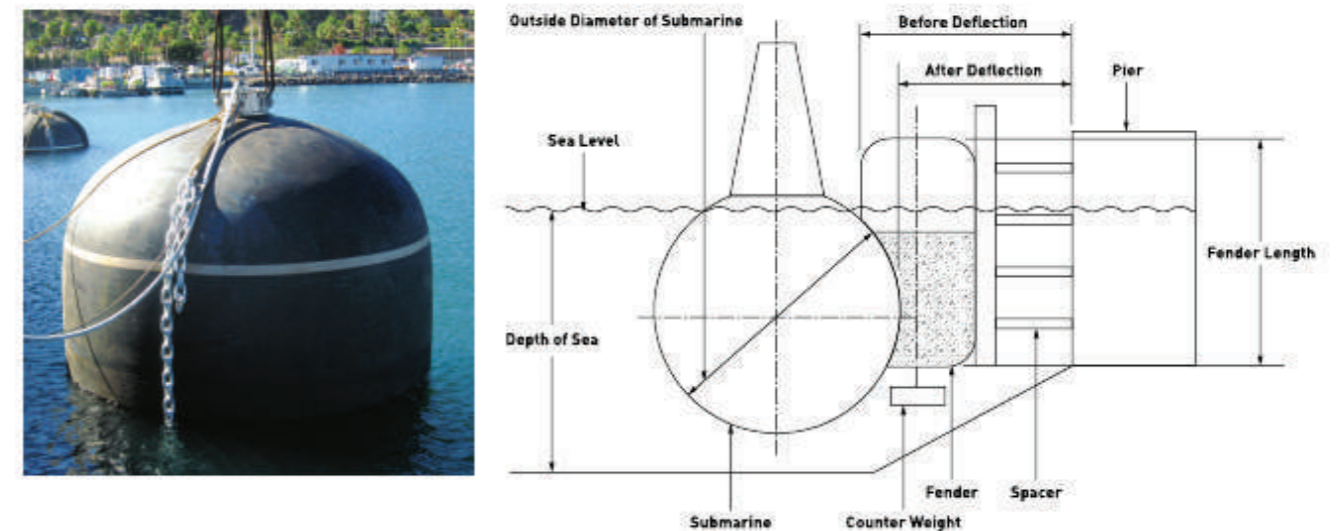
- Note**
1. R·F: Reaction Force(kN) - E·A: Energy Absorption(kJ) - Tolerance: ±10% - Deflection: 60%
 2. Additionally, if other performance grades / tolerance are required for fender, we can manufacture various grades / tolerance to meet your requirement. Please inquire to DRF.
 3. The above data can be changed due to the quality improvement of the manufacturer.

Weight

[Unit : mm, kg]

Diameter	300	500	600	700	800	1000	1200	1350	1500	1700	2000	2500	3000	3300	4500	
Length	500 600	800 1000	1000 1500	1200 1500	1500 2000	1800 2000	2500 2500	3000 3000	3000 3500	6000 4000	5500 5000	4500 4500	6500 6500	10600 13000	7000 9000	
Fender Body	10 15	25 35	45 80	75 95	140 170	180 200	270 300	350 500	550 650	950 1,100	1,350 1,700	1,800 2,250	3,000 3,700	4,100 4,950	5,100 6,200	
Chain Net	-	-	-	-	100 110	170 200	210 220	260 400	440 510	880 920	1,220 1,510	1,620 2,620	2,360 3,120	4,700 5,800	5,100 6,200	
Total	10 15	25 35	45 80	75 95	140 170	180 200	270 300	350 500	550 650	950 1,100	1,430 1,570	2,170 2,610	2,970 4,320	4,160 5,370	7,700 9,500	9,200 11,150

Typical Fender Arrangement for Submarine



Submarine Type Fender Performance Table (Initial Pressure : 50kPa)

(Unit:mm)

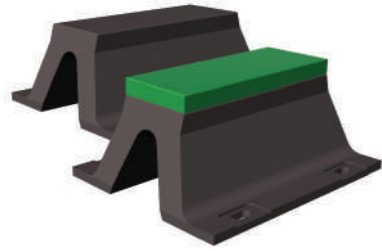
Size	Ø1700 × 7200L		Ø2000 × 6000L		Ø2500 × 5500L		Ø3300 × 6500L		Ø3300 × 10600L		Ø4500 × 9000L	
DEF (%)	60	45	60	45	60	45	60	45	60	45	60	45
Water Ratio (%)	0.0	65.0	0.0	65.0	0.0	65.0	0.0	60.0	0.0	54.5	0.0	65.0
R·F (kN)	1811	611	1764	599	2035	686	3165	1246	5165	1275	5998	2191
E·A (kJ)	561	134	647	155	927	223	1911	615	3116	589	4949	865

- Note**
1. R·F (Reaction Force) kN, E·A (Energy Absorption) kJ, Tolerance : ±5% or ±10% Rated Deflection : 60%(±5%)
 2. Additionally, if other performance grades / tolerance are required for fender, we can manufacture various grades / tolerance to meet your requirement. Please inquire to DRF.
 3. The above data can be changed due to the quality improvement of the manufacturer.

Color Fender

The DRF Pneumatic Fender can be manufactured to the customer's requirement in color for the application of yacht or military usage etc. with dark-red, grey, blue and yellow colors.



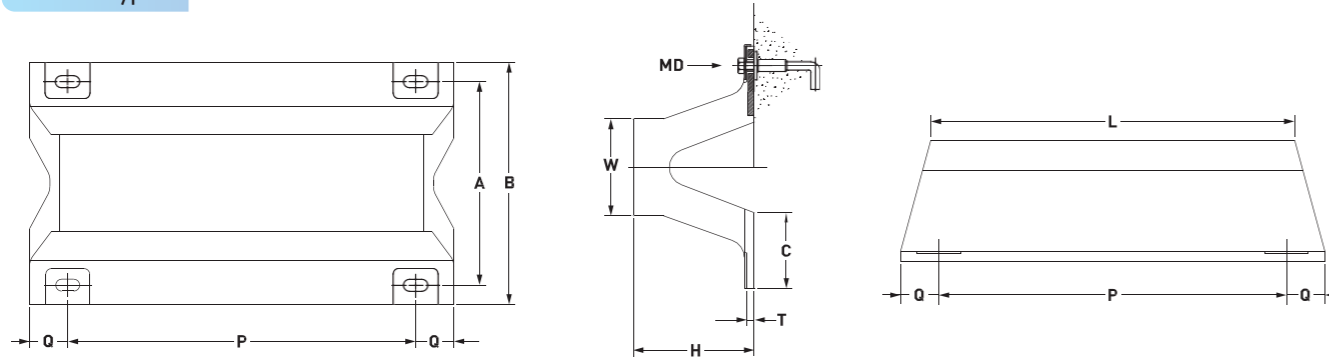


According to KSD 64 10 10. If other specifications are requested, special orders are possible.

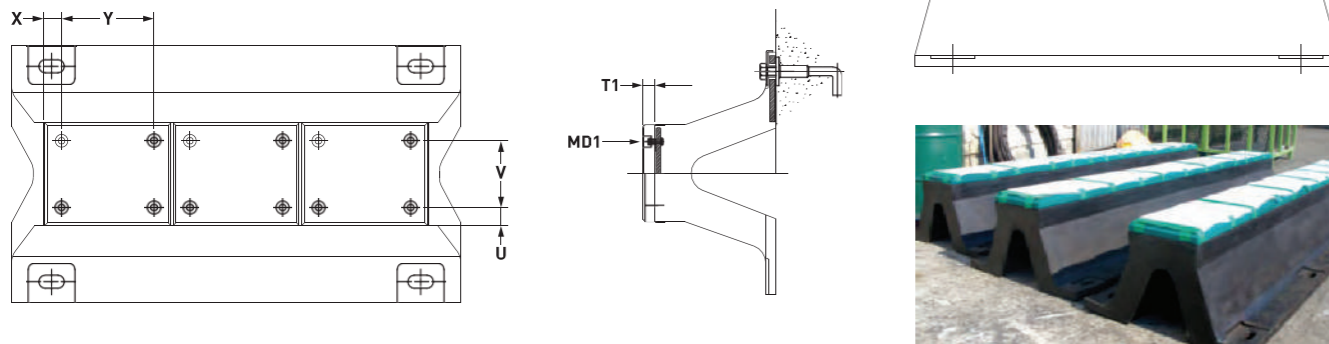
NV Fender

NV펜더는 동일한 크기, 동일한 고무 등급을 가진 다른 유형의 펜더에 비해 에너지 흡수 능력이 15% 증가하도록 새롭게 설계되었다. 최적의 구조와 형상 설계로 압축 능력을 45%에서 52.5%로 증가시켰다. 구조가 간단하고 AOV와 동일한 볼트 홀을 가지고 있어 설치 및 교체가 용이하다. 동일한 에너지 흡수능력을 가진 기존 아치형 펜더와 비교해 반력은 17% 감소, 표면 반력은 32% 감소 한다.

NV-A Type



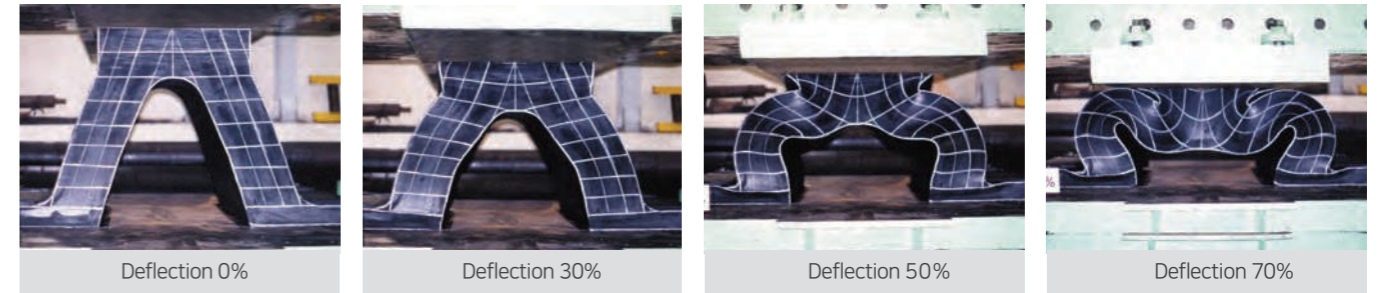
NV-B Type



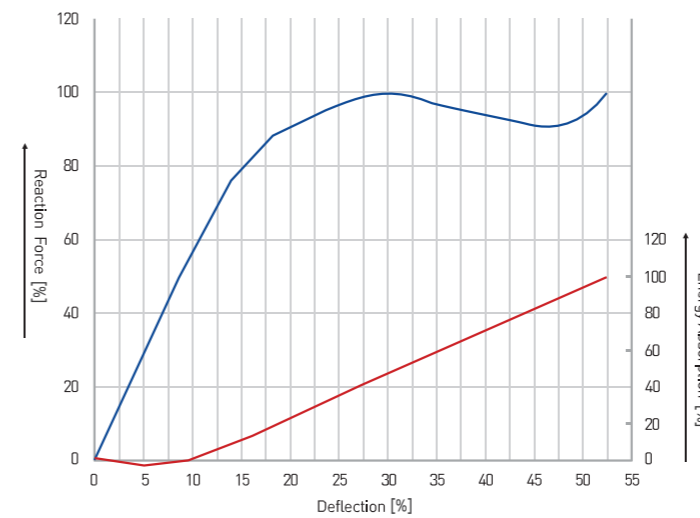
(Unit:mm)

Dimension Height	MD	A	B	C	T	W	NV-B Type					1000L		1500L		2000L		2500L		3000L		
							MD1	X	Y	U	V	T1	P	Q	P	Q	P	Q	P	Q	P	Q
150H	M22 (7/8)	240	300	93.5	17	120	M16	60~70	330~410	60	0	30	855	110	675×2	112.5	620×3	107.5	785×3	110	715×4	107.5
200H	M24 (1)	320	400	125	17	160	M16	60~70	330~410	80	0	30	860	120	680×2	120	620×3	120	785×3	122.5	715×4	120
250H	M27 (1 1/8)	410	500	156	22	200	M16	70~85	330~410	45	110	30	865	130	680×2	132.5	620×3	132.5	790×3	127.5	715×4	132.5
300H	M30 (1 1/4)	490	600	187.5	23	240	M16	70~85	330~410	50	140	40	870	140	685×2	140	625×3	137.5	790×3	140	715×4	145
400H	M36 (1 1/2)	670	800	250	28	320	M16	70~85	330~410	60	200	40	900	150	700×2	150	635×3	147.5	800×3	150	725×4	150
500H	M42 (1 3/4)	840	1000	312.5	32	370	M20	70~85	330~410	65	340	50	930	160	715×2	160	645×3	157.5	810×3	160	730×4	165
600H	M48 (2)	1010	1200	375	40	480	M20	70~85	330~410	65	350	50	960	170	730×2	170	655×3	167.5	820×3	170	740×4	170
800H	M64 (2 1/2)	1340	1600	500	45	640	M24	70~85	330~410	100	440	60	1040	180	770×2	180	680×3	180	845×3	182.5	760×4	180
1000H	M64 (2 1/2)	1680	2000	625	49	800	M24	70~85	330~410	100	600	60	1100	200	800×2	200	700×3	200	865×3	202.5	775×4	200

Compression Test



Performance Curve



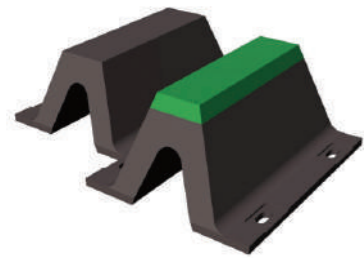
Performance of Intermediate Deflection

Deflection[%]	R·F[%]	E·A[%]
0	0	0
5	26	2
10	52	6
15	73	14
20	88	24
25	97	35
30	100	47
35	97	60
40	94	71
45	91	83
50	93	94
52.5	100	100

Performance Table

GRADE	150H		200H		250H		300H		400H		500H		600H		800H		1000H	
	R.F kN	E.A kJ	R.F kN	E.A kJ	R.F kN	E.A kJ	R.F kN	E.A kJ	R.F kN	E.A kJ	R.F kN	E.A kJ	R.F kN	E.A kJ	R.F kN	E.A kJ	R.F kN	E.A kJ
GS	213.5	9.5	271.7	18.0	349.3	28.7	426.8	41.3	562.7	73.0	698.5	114.2	834.4	165.1	1,125.5	293.3	1,397.0	460.4
G1	177.9	7.9	226.4	15.0	291.1	23.9	355.7	34.4	468.9	60.8	582.1	95.2	695.3	137.6	937.9	244.4	1,164.2	383.7
G2	129.4	6.2	183.3	11.4	226.4	18.5	269.5	26.5	355.7	46.7	452.8	73.2	539.0	105.8	711.5	188.7	894.7	294.6
G3	118.6	5.3	150.9	9.7	194.0	15.8	237.2	23.0	312.6	40.6	388.1	63.5	463.5	91.7	625.2	163.2	776.2	255.8
G4	97.0	4.4	129.4	7.9	161.7	12.3	183.3	18.5	247.9	32.9	312.6	51.1	377.3	73.2	495.9	130.5	625.4	203.8

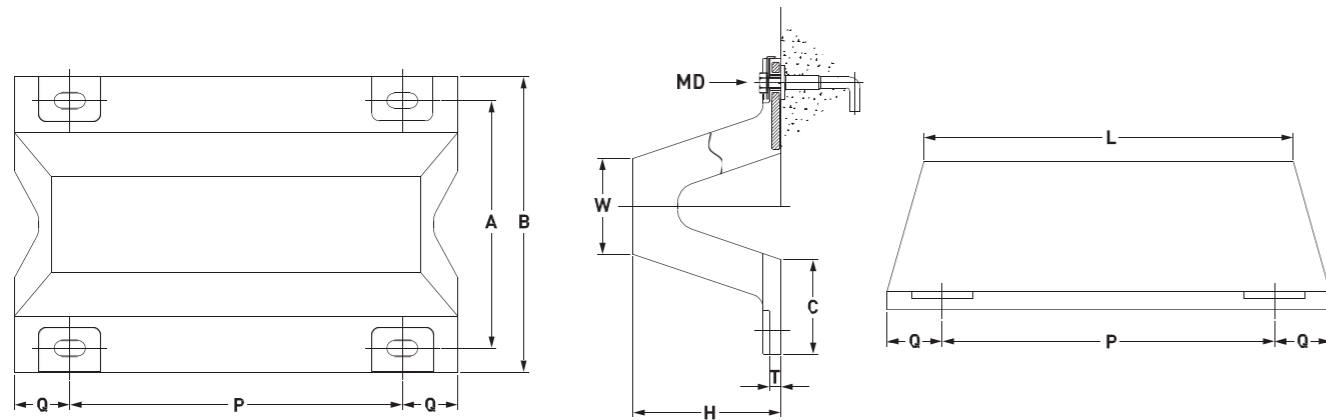
- Note**
1. R.F (Reacion Force) kN, E.A (Energy Absorption) kJ, Tolerance ±10% , Rated Deflection : 52.5%
 2. Additionally, If other performance grades / tolerance are required for fender, we can manufacture various grades / tolerance to meet your requirement. Please inquire to DRF.
 3. The above data can be changed due to the quality improvement of the manufacturer.



According to KSD 64 10 10 .
If other specifications are requested, special orders are possible.

AOV Fender

AOV펜더는 높은 에너지 흡수율과 낮은 반응력이 특징이다. 아치형 모양은 펜더가 압축될때 응력 집중을 줄여주는 역할을 한다. 4가지 등급의 고무로 높은 품질을 가진다. 다양한 크기와 에너지 용량을 가지고 있으며, 펜더 바닥이 철판으로 되어 있다. 또한, 펜더 바닥이 오픈형으로 되어 있어 어떤 정박 시설에서도 펜더를 쉽게 설치할 수 있다.

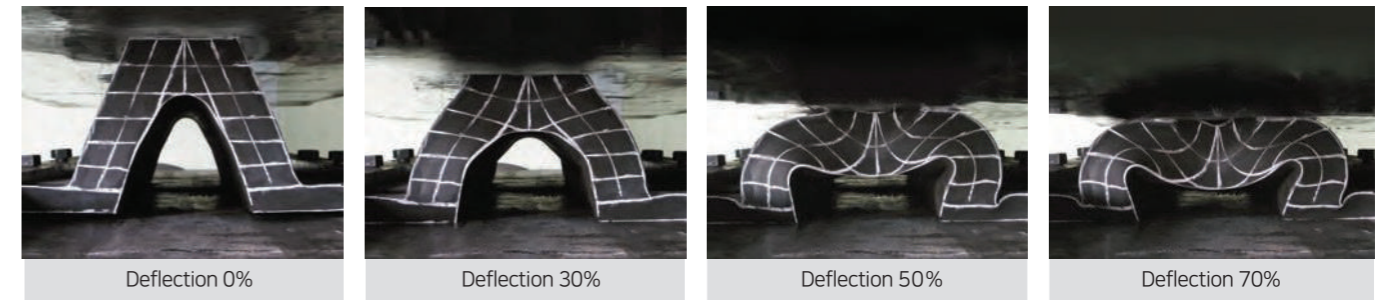


(Unit:mm)

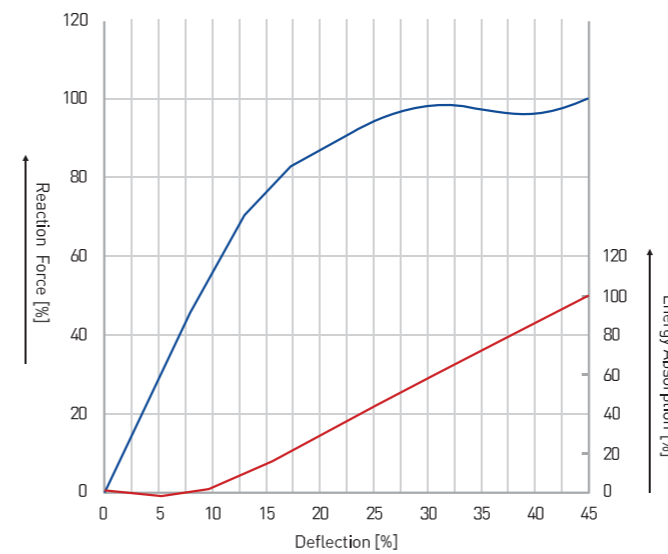
Dimension	MD	A	B	C	T	W	1000L		1500L		2000L		2500L		3000L		3500L	
							P	Q	P	Q	P	Q	P	Q	P	Q	P	Q
150H	M22 (7/8)	240	300	96	17	97.5	855	110	675×2	112.5	620×3	107.5	785×3	110	715×4	107.5	671×5	110
200H	M24 (1)	320	400	128	17	130	860	120	680×2	120	620×3	120	785×3	122.5	715×4	120	672×5	120
250H	M27 (1 1/8)	410	500	160	22	162.5	865	130	680×2	132.5	620×3	132.5	790×3	127.5	715×4	132.5	673×5	130
300H	M30 (1 1/4)	490	600	192	23	195	870	140	685×2	140	625×3	137.5	790×3	140	715×4	145	674×5	140
400H	M36 (1 1/2)	670	800	256	31	260	900	150	700×2	150	635×3	147.5	800×3	150	725×4	150	680×5	150
500H	M42 (1 3/4)	840	1,000	320	34	325	930	160	715×2	160	645×3	157.5	810×3	160	730×4	165	686×5	160
600H	M48 (2)	1,010	1,200	384	40	390	960	170	730×2	170	655×3	167.5	820×3	170	740×4	170	692×5	170
800H	M64 (2 1/2)	1,340	1,600	501	45	525	1,040	180	770×2	180	680×3	180	845×3	182.5	760×4	180	-	-
1000H	M64 (2 1/2)	1,680	2,000	640	49	650	1,100	200	800×2	200	700×3	200	865×3	202.5	775×4	200	-	-



Compression Test



Performance Curve



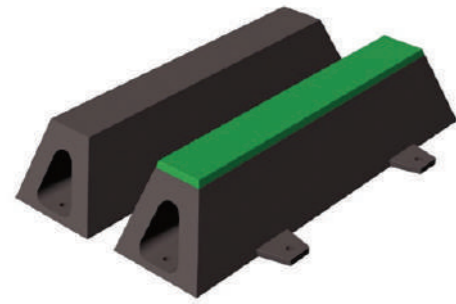
Performance of Intermediate Deflection

Deflection[%]	R·F[%]	E·A[%]
0	0	0
5	26	2
10	50	8
15	69	17
20	85	28
25	96	42
30	100	56
35	97	71
40	96	85
45	100	100

Performance Table

GRADE	150H		200H		250H		300H		400H		500H		600H		800H		1000H	
	R.F	E.A	R.F	E.A	R.F	E.A	R.F	E.A	R.F	E.A	R.F	E.A	R.F	E.A	R.F	E.A	R.F	E.A
GS	168.1	6.4	232.8	12.7	284.6	19.0	336.4	27.6	452.8	48.7	556.2	76.2	672.7	110.0	892.6	194.8	1,112.5	303.8
G1	140.1	5.3	194.0	10.6	237.2	15.8	280.3	23.0	377.3	40.6	463.5	63.5	560.6	91.7	743.8	162.3	927.1	253.2
G2	118.6	4.4	161.7	8.8	204.8	14.1	247.9	20.3	323.4	35.3	409.6	55.5	485.1	79.4	646.8	141.1	808.5	219.6
G3	97.0	3.5	129.4	7.0	150.9	10.6	183.3	15.0	247.9	27.4	312.6	42.3	366.5	59.9	495.9	108.5	614.5	167.6
G4	64.7	2.6	86.2	4.4	107.8	7.0	129.4	10.6	172.5	18.5	204.8	27.4	247.9	40.6	334.2	72.4	409.6	112.1

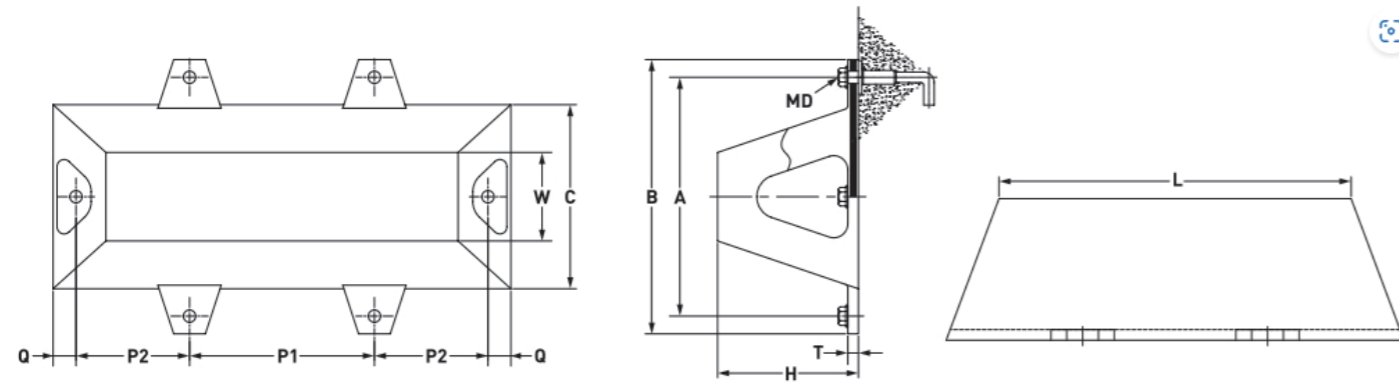
- Note**
1. R.F (Reaction Force) kN, E.A (Energy Absorption) kJ, Tolerance ±10% , Rated Deflection : 45.0%
 2. Additionally, if other performance grades / tolerance are required for fender, we can manufacture various grades / tolerance to meet your requirement. Please inquire to DRF.
 3. The above data can be changed due to the quality improvement of the manufacturer.



According to KSD 64 10 10.
If other specifications are requested, special orders are possible.

ACV Fender

ACV펜더는 바닥 전체에 철판을 매립해 보강한 최초의 펜더이다. 다양한 방향으로 오는 외력에 대해 동적으로 안정적인 펜더이며, 취급 및 유지관리가 쉽다.

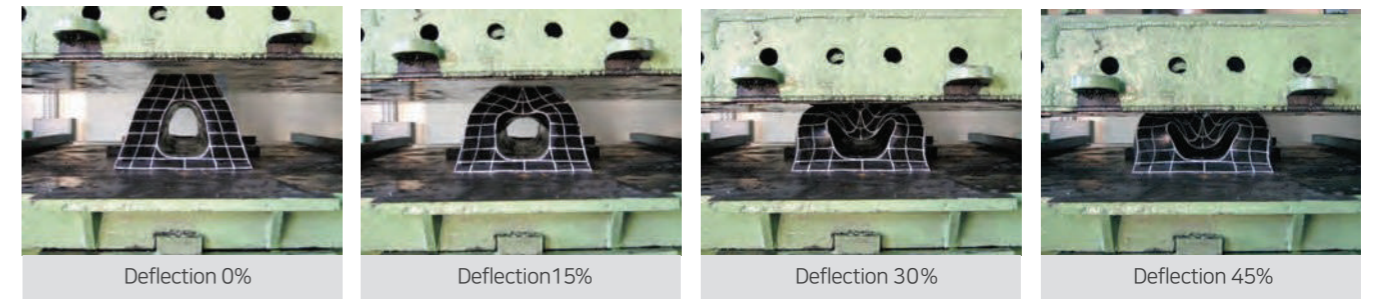


(Unit:mm)

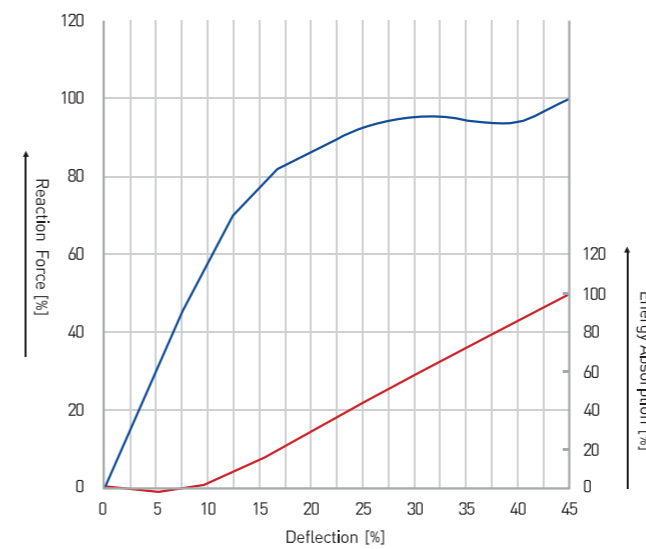
Dimension Height	MD	A	B	C	T	W	1000L		1500L		2000L		2500L			3000L			3500L			
							P2	Q	P2	Q	P1	P2	Q	P1	P2	Q	P1	P2	Q	P1	P2	Q
200 H	M24 (1)	350	445	250	25	125	555	70	805	70	900	605	70	900	855	70	900×2	655	70	900×2	905	70
300 H	M30 (1 1/4)	530	645	375	35	188	600	75	850	75	1000	600	75	1000	850	75	1000×2	600	75	1000×2	850	75
400 H	M36 (1 1/2)	710	840	500	40	250	640	85	890	85	1200	540	85	1200	790	85	1200×2	440	85	1200×2	690	85
500 H	M42 (1 3/4)	860	1000	625	40	315	675	100	925	100	1000	675	100	1000	925	100	1000×2	675	100	1000×2	925	100
600 H	M48 (2)	1050	1210	750	50	375	710	115	960	115	1020	700	115	1020	950	115	1020×2	690	115	1020×2	940	115
700 H	M48 (2)	1180	1380	880	55	450	635	115	885	115	1000	635	115	1000	885	115	1000×2	635	115	-	-	-
800 H	M64 (2 1/2)	1350	1550	1000	60	500	670	130	920	130	1050	645	130	1050	895	130	1050×2	620	130	-	-	-
1000 H	M64 (2 1/2)	1600	1800	1250	65	625	700	150	950	150	1200	600	150	1200	850	150	1200×2	500	150	-	-	-



Compression Test



Performance Curve



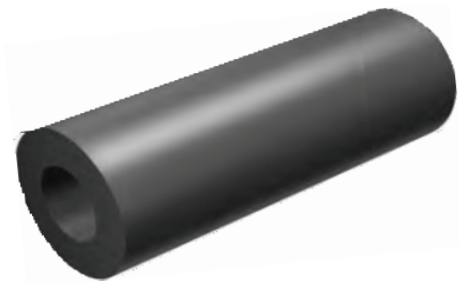
Performance of Intermediate Deflection

Deflection[%]	R·F[%]	E·A[%]
0	0	0
5	27	2
10	51	8
15	72	17
20	86	29
25	96	42
30	100	57
35	95	71
40	94	85
45	100	100

Performance Table

GRADE	200H		300H		400H		500H		600H		800H		1000H	
	R.F kN	E.A kJ	R.F kN	E.A kJ	R.F kN	E.A kJ	R.F kN	E.A kJ	R.F kN	E.A kJ	R.F kN	E.A kJ	R.F kN	E.A kJ
GS	213.9	11.6	327.9	25.6	427.7	46.7	541.7	72.3	641.6	105.0	855.4	186.6	1,069.3	291.6
G1	186.0	10.1	285.1	22.3	371.9	40.6	471.0	62.9	557.9	91.3	743.8	162.3	929.8	253.6
G2	161.7	8.8	247.9	19.4	323.4	35.3	409.6	54.7	485.1	79.4	646.8	141.1	808.5	220.5
G3	129.4	6.2	183.3	14.1	258.7	26.5	323.4	40.6	366.5	57.3	517.4	105.8	646.8	158.8
G4	86.2	4.4	129.4	8.8	172.5	17.6	204.8	26.5	258.7	35.3	345.0	70.6	409.6	105.8

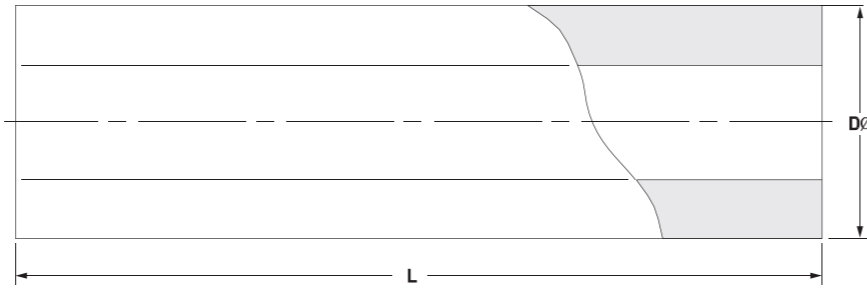
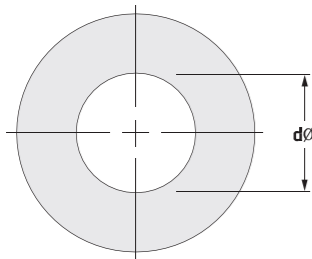
- Note**
1. R.F (Reacion Force) kN, E.A (Energy Absorption) kJ, Tolarence ±10% , Rated Deflection : 45.0%
 2. Additionally, If other performance grades / tolerance are required for fender, we can manufacture various grades / tolerance to meet your requirement. Please inquire to DRF.
 3. The above data can be changed due to the quality improvement of the manufacturer.



According to KSD 64 10 10.
If other specifications are requested, special orders are possible.

Cylindrical Fender

단순한 원통형 구조이며, 낮은 반발 하중으로 큰 압축 변형을 견딜수 있다. 정밀한 anchor bolt 없이도 고정이 자유롭다.

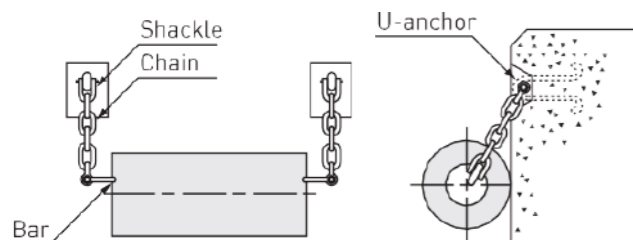


(Unit:mm)

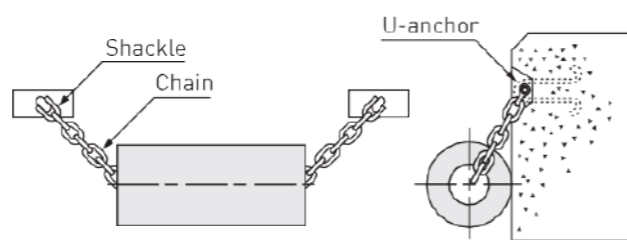
Size	Ø150 ×Ø75	Ø200 ×Ø100	Ø250 ×Ø125	Ø300 ×Ø150	Ø400 ×Ø200	Ø500 ×Ø250	Ø600 ×Ø300	Ø700 ×Ø350	Ø800 ×Ø400	Ø900 ×Ø450	Ø1000 ×Ø500	Ø1100 ×Ø550	Ø1200 ×Ø600	Ø1400 ×Ø700	Ø1500 ×Ø750	Ø1600 ×Ø800	Ø1800 ×Ø900	Ø2000 ×Ø1000
Ø D	150	200	250	300	400	500	600	700	800	900	1000	1100	1200	1400	1500	1600	1800	2000
Ø d	75	100	125	150	200	250	300	350	400	450	500	550	600	700	750	800	900	1000

Installation Example

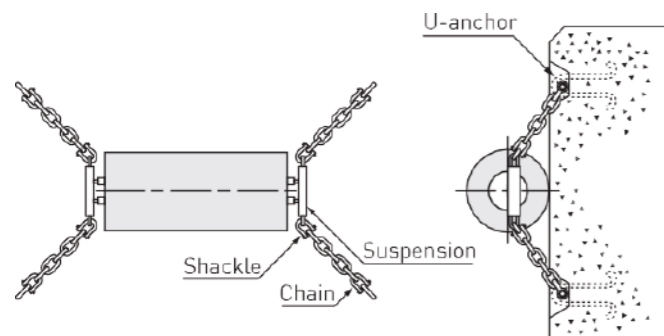
• Fitting chain and bar



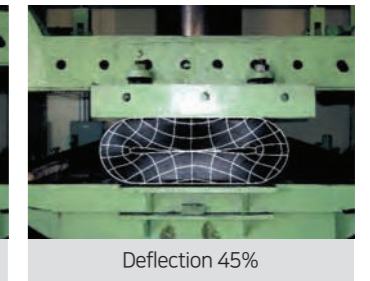
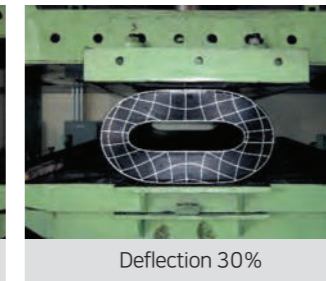
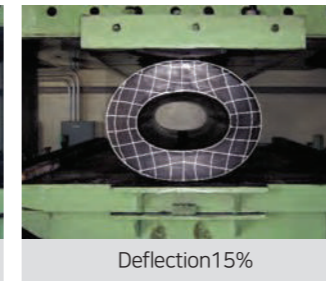
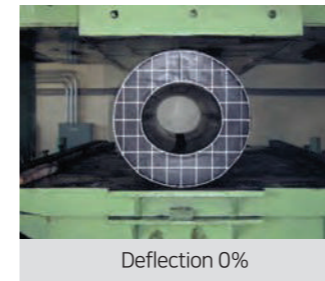
• Fitting chain



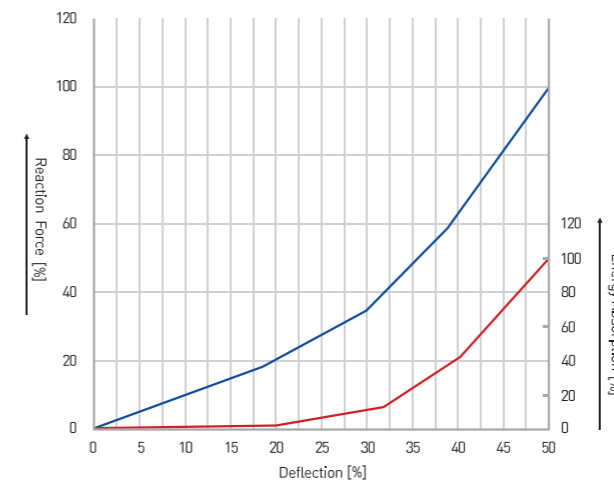
• Ladder



Compression Test



Performance Curve



Performance of Intermediate Deflection

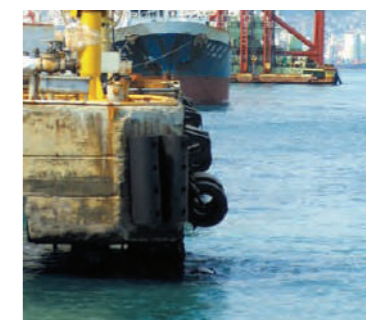
Deflection[%]	R·F[%]	E·A[%]
0	0	0
5	5	1
10	12	3
15	19	7
20	27	12
25	35	20
30	45	30
35	56	42
40	69	58
45	83	77
50	100	100

Performance Table

SIZE (mm)	Φ150 ×Φ75	Φ200 ×Φ100	Φ250 ×Φ125	Φ300 ×Φ150	Φ400 ×Φ200	Φ500 ×Φ250	Φ600 ×Φ300	Φ700 ×Φ350	Φ800 ×Φ400	Φ900 ×Φ450	Φ1000 ×Φ500	Φ1100 ×Φ550	Φ1200 ×Φ600	Φ1400 ×Φ700	Φ1500 ×Φ750	Φ1600 ×Φ800	Φ1800 ×Φ900	Φ2000 ×Φ1000	
GS	R.F(kN)	88.2	113.2	139.7	176.4	235.2	279.3	338.1	411.6	441.0	529.2	558.6	617.4	676.2	793.8	845.3	896.7	1,058.0	1,117.0
	E.A(kJ)	2.6	4.7	7.1	10.7	19.1	29.4	42.6	57.3	76.4	95.6	120.5	135.2	172.0	233.7	254.3	305.8	380.7	446.9
G1	R.F(kN)	73.5	98.0	122.5	147.0	196.0	245.0	294.0	343.0	392.0	441.0	490.0	539.0	588.0	686.0	735.0	784.0	882.0	980.0
	E.A(kJ)	2.2	3.9	6.2	8.8	15.7	24.5	35.3	48.0	62.7	79.5	98.0	118.6	141.1	192.1	220.5	250.9	317.5	392.0
G2	R.F(kN)	58.8	75.5	93.1	117.6	156.8	186.2	225.4	274.4	294.0	352.8	372.4	411.6	450.8	529.2	563.5	597.8	705.6	744.8
	E.A(kJ)	1.8	3.1	4.7	7.2	12.7	19.6	28.4	38.2	51.0	63.7	80.4	90.2	114.7	155.8	169.5	203.3	253.8	297.9
G3	R.F(kN)	40.2	52.9	63.7	78.4	107.8	127.4	156.8	176.4	205.8	235.2	254.8	284.2	313.6	362.6	387.1	411.6	470.4	509.6
	E.A(kJ)	1.2	2.1	3.2	4.7	8.2	12.9	18.6	24.5	33.3	42.1	51.9	62.7	74.5	101.9	116.6	132.3	169.5	203.8

Note

1. R.F (Reaction Force) kN, E.A (Energy Absorption) kJ, Tolerance ±10% , Rated Deflection : 50.0%
2. Additionally, If other performance grades / tolerance are required for fender, we can manufacture various grades / tolerance to meet your requirement. Please inquire to DRF.
3. The above data can be changed due to the quality improvement of the manufacturer.



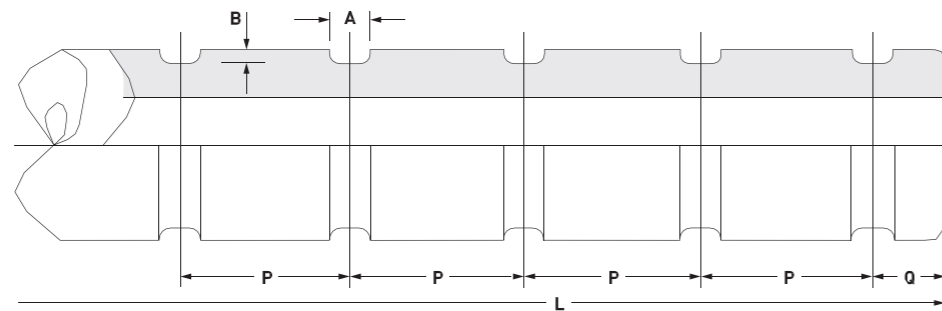
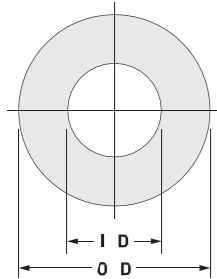


According to KSD 64 10 10.
If other specifications are requested, special orders are possible.

BC Fender

BC펜더는 낮은 면압으로 인해 설치시 선체 뿐 아니라 도장에 손상이 없으며 다양한 형태로 조절이 가능하다. 체인이나 와이어, 로프등을 이용해 본체의 홀과 연결해 설치가 용이하며, 예인선 등에 많이 설치된다.

Straight Type



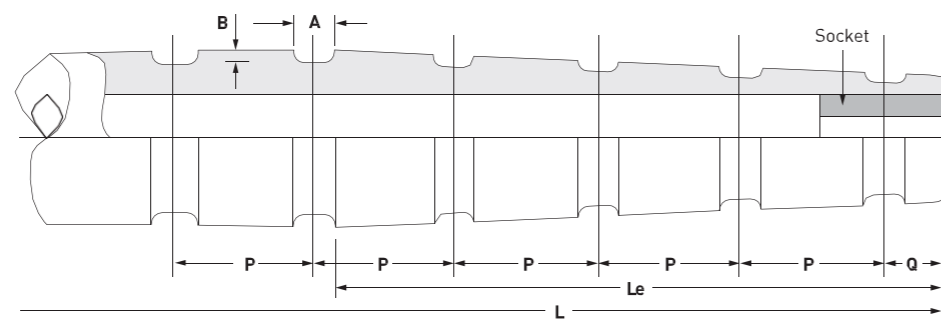
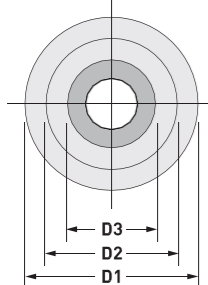
● Dimension (Use:For Side)

Size	Ø100 ×Ø50	Ø150 ×Ø75	Ø200 ×Ø100	Ø250 ×Ø125	Ø300 ×Ø150	Ø350 ×Ø175	Ø400 ×Ø200	Ø500 ×Ø250	Ø600 ×Ø300	Ø700 ×Ø350
O · D	100	150	200	250	300	350	400	500	600	700
I · D	50	75	100	125	150	175	200	250	300	350
A	30	30	50	50	50	70	70	70	85	85
B	10	10	15	15	15	20	20	30	30	40
P	600~900	600~900	600~900	600~900	600~900	600~900	600~900	600~900	600~900	600~900
Q	100	100	150	150	200	200	200	250	250	300

(Unit:mm)

- Maximun length available is 20m.

Taper Type



Le=1/4L

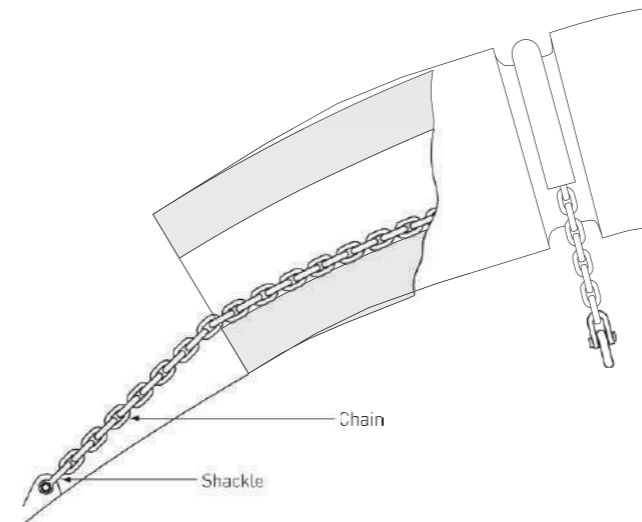
● Dimension (Use:For Bow and Stern)

Size	Ø200 ×Ø100	Ø250 ×Ø125	Ø300 ×Ø150	Ø350 ×Ø175	Ø400 ×Ø200	Ø500 ×Ø250	Ø600 ×Ø300	Ø700 ×Ø350	Ø800 ×Ø400
D1	200	250	300	350	400	500	600	700	800
D2	150	190	225	260	300	375	450	525	600
D3	100	125	150	175	200	250	300	350	400
A	50	50	50	70	70	70	85	85	85
B	15	15	15	20	20	30	30	40	40
P	600~900	600~900	600~900	600~900	600~900	600~900	600~900	600~900	600~900
Q	150	150	200	200	200	250	250	300	300
Socket	O · D	-	-	-	202	252	303	354	404
	I · D	-	-	-	100	100	150	150	150
	Length	-	-	-	300	350	400	400	400

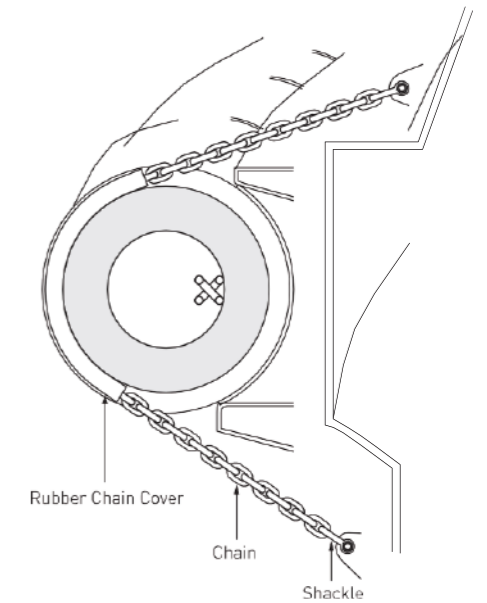
(Unit:mm)

- Maximun length available is 20m.

Method of Installation-Inside



Method of Installation-Groove



● Size of Fitting

Size of Fender	Chain		Shackle	Turnbuckle
	For Inside	For Groove		
Less than Ø600	Ø16	Ø16	SC-16	Ø19
Including and over Ø600	Ø19	Ø19	SC-20	Ø22

SC : Straight shackle with screwed bolt - Fittings are to be galvanized



● Bending Radius(R) should be larger than 4 times of outer diameter

O · D	Ø200	Ø300	Ø400	Ø500	Ø600	Ø800
Permissible Bending Radius(R)	800	1200	1600	2000	2400	3200

(Unit:mm)



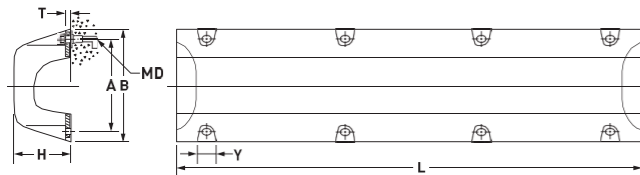


According to KSD 64 10 10. If other specifications are requested, special orders are possible.

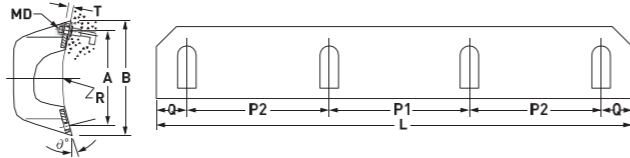
SBP Fender

SBP펜더는 기존 BP펜더를 개선해 교량 및 선체의 충돌에 의한 손상을 최소화하는데 특화되어 있다. 또한 펜더 자체의 압축 변형률이 우수하여 에너지 흡수 능력이 뛰어나며, 교량의 모든 곡면에 설치가 가능하다.

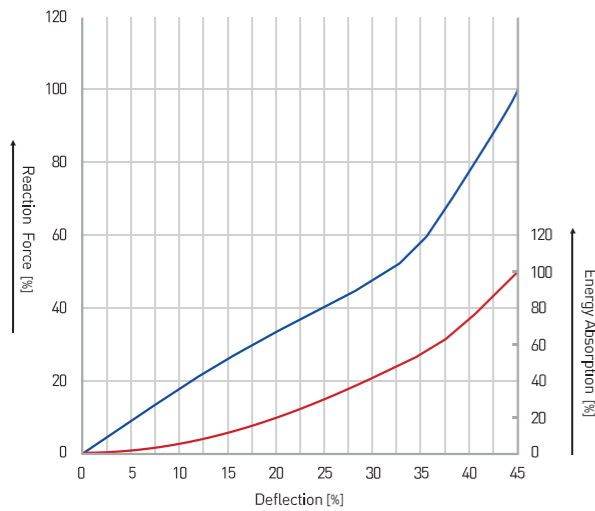
● For plane surface



● For curver surface



Performance Curve



Performance of Intermediate Deflection

Deflection[%]	R·F[%]	E·A[%]
0	0	0
5	9	1
10	17	5
15	25	11
20	33	19
25	41	29
30	49	42
35	61	57
40	77	76
45	100	100

(Unit:mm)

Size Height	MD	A	B	T	Y	R		1000L		1500L		2000L		2500L		3000L		
						4°	8°	P2	Q	P2	Q	P2	Q	P2	Q	P1	P2	Q
250H	M30(1 1/4)	410	500	25	130	over 3m	under 3m	560	220	560×2	190	560×3	160	700×3	200	700×2	560×2	240
300H	M36(1 1/2)	490	600	30	140	over 3m	under 3m	560	220	560×2	190	560×3	160	700×3	200	700×2	560×2	240
400H	M36(1 1/2)	660	800	40	140	over 4m	under 4m	560	220	560×2	190	560×3	160	700×3	200	700×2	560×2	240
500H	M42(1 3/4)	820	1000	50	170	over 4m	under 4m	560	220	560×2	190	560×3	160	700×3	200	700×2	560×2	240
600H	M48(2)	990	1200	60	180	over 5m	under 5m	560	220	560×2	190	560×3	160	700×3	200	700×2	560×2	240

Performance Table

(1mLength)

Size Performance	250	300	400	450	500	600
E·A(kJ)	19.4	27.9	49.7	62.9	77.6	111.8

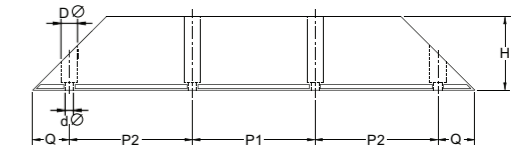
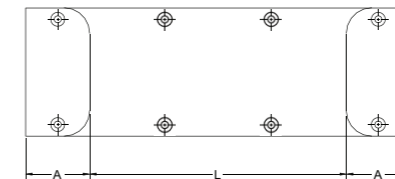
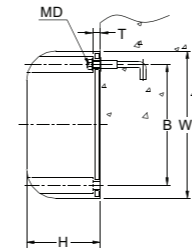
- Note**
1. R·F: Reaction Force(kN) - E·A: Energy Absorption(kJ) - Tolerance: ±10% - Deflection: 45%
 2. Additionally, If other performance grades / tolerance are required for fender, we can manufacture various grades / tolerance to meet your requirement. Please inquire to DRF.
 3. The above data can be changed due to the quality improvement of the manufacturer.



According to KSD 64 10 10. If other specifications are requested, special orders are possible.

BP Fender

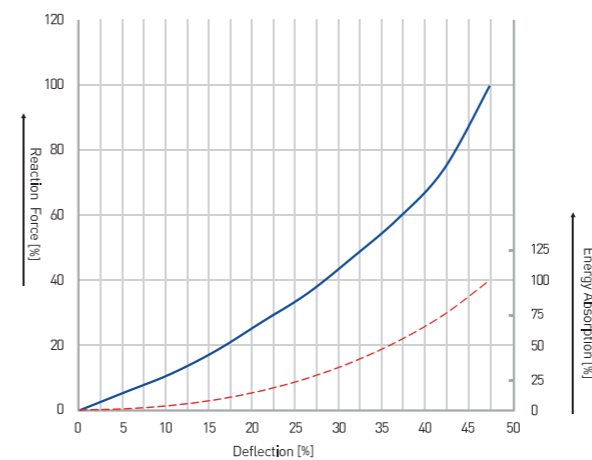
BP펜더는 항구 시설물을 선박 좌현의 횡방향 하중으로부터 보호하는데 적합하다. 잘 부러지지 않는 형상 때문에 펜더 손상을 최소화 하고, 선박 선체와의 접촉 면적이 크다. 중력식 안벽에 적합한 모델이다.



(Unit:mm)

Dimension Height	MD	A	B	DØ	dØ	Q	T	W	1000L		1500L		2000L		2500L		3000L	
									P1	P2	P1	P2	P1	P2	P1	P2	P1	P2
200H	M30(1 1/4)	200	290	75	40	100	30	400	-	600	-	850	730	735	900	900	800X2	800
250H	M30(1 1/4)	250	380	80	40	125	35	500	-	625	-	875	750	750	910	920	815X2	815
300H	M36(1 1/2)	300	470	90	45	150	35	600	-	650	-	900	760	770	930	935	825X2	825
400H	M36(1 1/2)	400	640	90	45	200	40	800	-	700	-	950	800	800	960	970	850X2	850
500H	M42(1 3/4)	500	820	110	55	250	50	1000	-	750	-	1000	830	835	1000	1000	875X2	875
600H	M48(2)	600	920	125	60	300	60	1200	-	800	-	1050	860	870	1030	1035	900X2	900
800H	M64(2 1/2)	800	1240	145	75	400	80	1600	-	900	-	1150	930	935	1100	1100	950X2	950

Performance Curve



● Contact Pressure

Size	200H~800H
Type	
BP-Type	abt. 833kPa
AOV-Type (RH Grade)	abt. 1136kPa

- At the same size, the contact pressure of BP-Type Fender is about 27% lower than AOV-Type Fender. (Contact pressure = Reaction Force / Contact Area(WxL))
The higher contact pressure is more likely to damage the side hull of the berthing vessel.

Performance Table

SIZE	150H		200H		250H		300H		400H		500H		600H		700H		800H		1000H		1200H	
	R.F	E.A	R.F	E.A	R.F	E.A	R.F	E.A	R.F	E.A	R.F	E.A	R.F	E.A	R.F	E.A	R.F	E.A	R.F	E.A	R.F	E.A
	kN	kJ	kN	kJ	kN	kJ	kN	kJ	kN	kJ	kN	kJ	kN	kJ	kN	kJ	kN	kJ	kN	kJ	kN	kJ
	501.6	5.4	666.0	9.4	834.0	14.7	1,000	21.2	1,332	37.7	1666	58.3	2,000	85	2,916	132	3,333	150.8	4,166	188.5	4,998	226.2

- Note**
1. R.F (Reaction Force) kN, E.A (Energy Absorption) kJ, Tolerance ±10%, Rated Deflection: 45.0%
 2. Additionally, If other performance grades / tolerance are required for fender, we can manufacture various grades / tolerance to meet your requirement. Please inquire to DRF.
 3. The above data can be changed due to the quality improvement of the manufacturer.

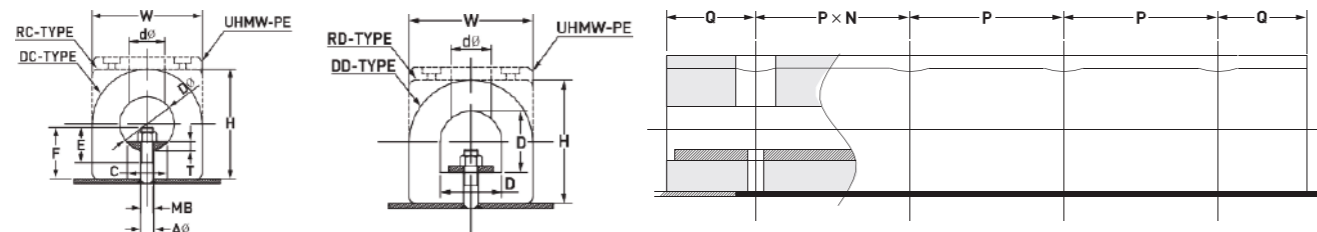


RC, RD, DC, DD Fender

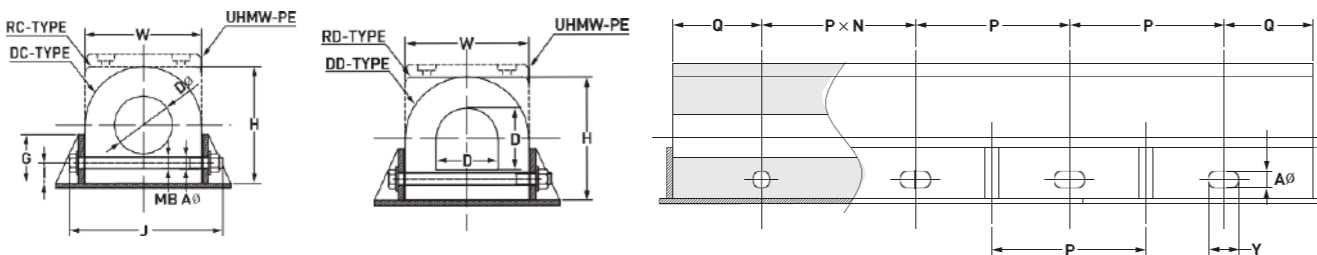
RC, RD, DC, DD펜더의 에너지 흡수량과 반발력은 cylindrical fender 보다 크다. 부착면이 평평하여 cylindrical fender보다 더 견고하게 고정할 수 있다.

According to KSD 64 10 10. If other specifications are requested, special orders are possible.

● Vertical Fitting Bolt Method



● Cross Fitting Bolt Method



● Dimension

Size		DC 150H×Ø75	DC 200H×Ø100	DC 250H×Ø125	DC 300H×Ø150	DC 400H×Ø200	DC 500H×Ø250
Fender	D ø	75	100	125	150	200	250
	d ø	55	65	70	70	90	100
	C	50	65	80	90	100	120
	G	60	75	100	125	150	175
	H	150	200	250	300	400	500
	l	22	30	43	52	70	88
	J	220	280	350	400	520	640
	T	16	19	22	25	28	32
Frame	W	150	200	250	300	400	500
	A ø	20	25	28	28	36	42
	MB	M16(5/8)	M20(3/4)	M24(1)	M24(1)	M30(1 1/4)	M36(1 1/2)
	E	40	50	60	70	80	90
	F	80	95	112	132	180	210
	Y	32	38	42	48	54	62
	P	250~350					
Q	150~200						

● Performance Table

Size		150H×Ø75	200H×Ø100	250H×Ø125	300H×Ø150	400H×Ø200	500H×Ø250
DC-Type (DD)	R·F(kN)	102.9	137.2	171.5	205.8	274.4	343.0
	E·A(kJ)	2.8	5.1	7.8	11.4	20.2	31.6
RC-Type (RD)	R·F(kN)	164.6	219.5	274.4	329.3	439.0	548.8
	E·A(kJ)	5.2	9.2	14.4	20.8	36.9	57.7

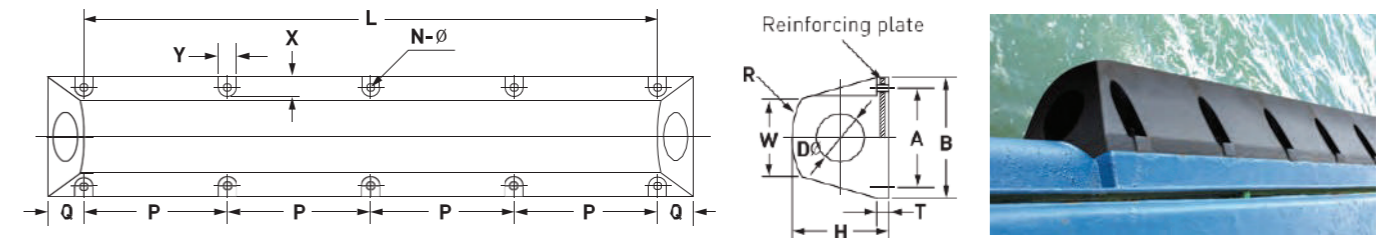
- Note**
1. R·F: Reaction Force(kN) - E·A : Energy Absorption(kJ) - Tolerance : ±10% - Deflection : 50%
 2. Additionally, If other performance grades / tolerance are required for fender, we can manufacture various grades / tolerance to meet your requirement. Please inquire to DRF.
 3. The above data can be changed due to the quality improvement of the manufacturer.



MC Fender

MC펜더는 동양기업에서만 볼수 있는 독특한 형태의 펜더이다. 예인선의 측면에 설치되어 펜더만으로도 예인 및 접안이 가능하다.

According to KSD 64 10 10. If other specifications are requested, special orders are possible.



● Dimension

Fender	MD	A	B	D ø	L	N-ø	P	Q	R	T	W	X	Y
400H	M24(1)	410	500	200	Max 3000	10-30	500	150	350	55	300	80	90

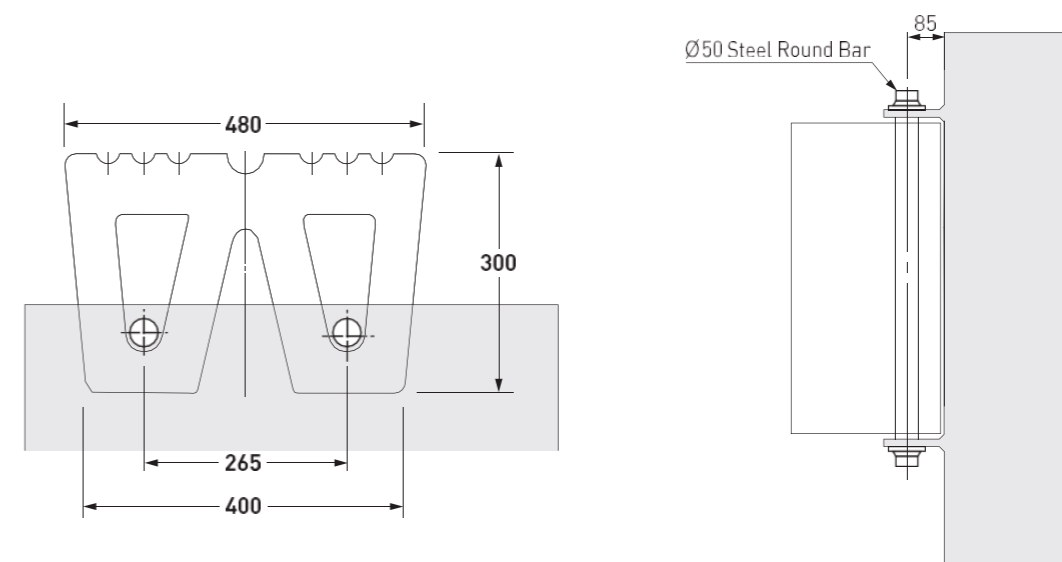
(Unit:mm)



WO Fender

W형 펜더는 예인선의 푸시패드로 사용하기 위해 개발되었으며, 폰툰의 접안 부분을 보호하거나 교량 말뚝을 보고하는데 적합하다. 이 펜더는 탄성을 지속적으로 유지하기 위해 일렬로 설치된다

According to KSD 64 10 10. If other specifications are requested, special orders are possible.

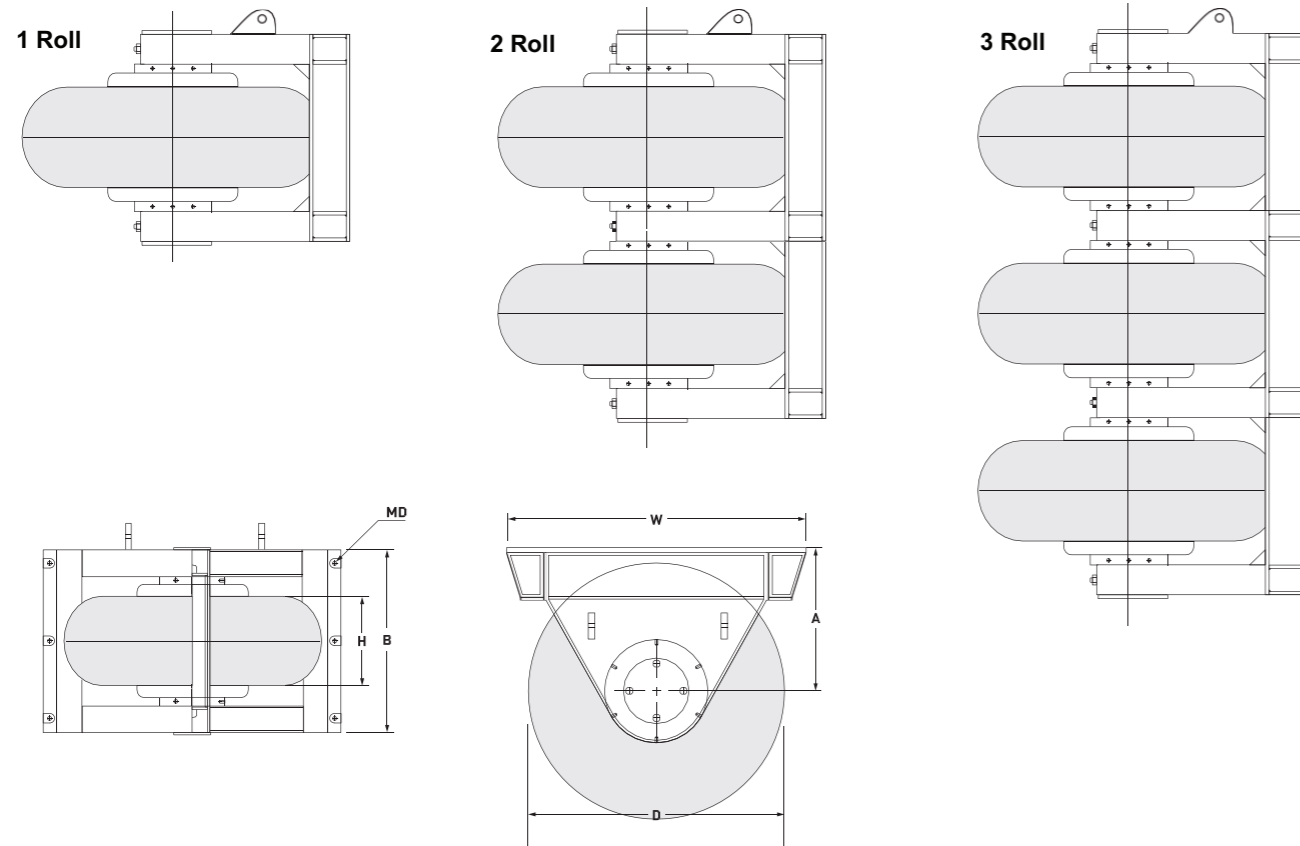




According to KSD 64 10 10. If other specifications are requested, special orders are possible.

Roller Fender

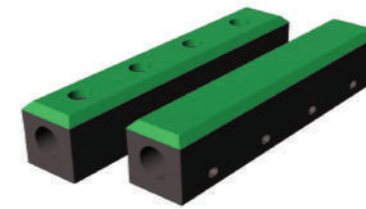
축 고정 롤러펜더(Roller fender)는 중간정도의 처짐과 운동 에너지 흡수 특성을 가진 높은 반응하중에 적합한 간단하고 효과적인 펜더이다. 드라이 도크 및 폰툰과 같은 제한된 공간에서 선박을 조종하는데 도움이 되도록 특별히 설계되었다. 이 유형의 유닛은 노출된 조건에 있는 건물이나 드라이 도크에 설치된다. 간단한 롤러 펜더의 배열을 통해 선박은 확실하게 하나 이상의 펜더에 접촉이 가능하며, 선박을 마찰저항 없이 안전하게 접안할 수 있다.



● Dimension

(Unit:mm)

Type Size	MD	Roller Fender		Frame				
		D	H	A	W	1Roll -B	2Roll -B	3Roll -B
R600	M22 (7/8)	600	200	350	695	420	780	1120
R750	M22 (7/8)	750	250	420	870	510	935	1360
R900	M24 (1)	900	300	520	1040	610	1120	1630
R1200	M27 (1 1/8)	1200	400	670	1380	820	1500	2180
R1400	M30 (1 1/4)	1400	400	772	1400	820	1500	2180
R1500	M30 (1 1/4)	1500	500	850	1740	1010	1850	2690
R1800	M36 (1 1/2)	1800	600	960	2080	1210	2215	3220
R2100	M42 (1 3/4)	2100	700	1155	2440	1410	2590	3770
R2400	M48 (2)	2400	800	1280	2770	1610	2950	4290
R2700	M56 (2 1/4)	2700	900	1440	3130	1810	3300	4790
R3000	M64 (2 1/2)	3000	1000	1600	3480	2010	3660	5310

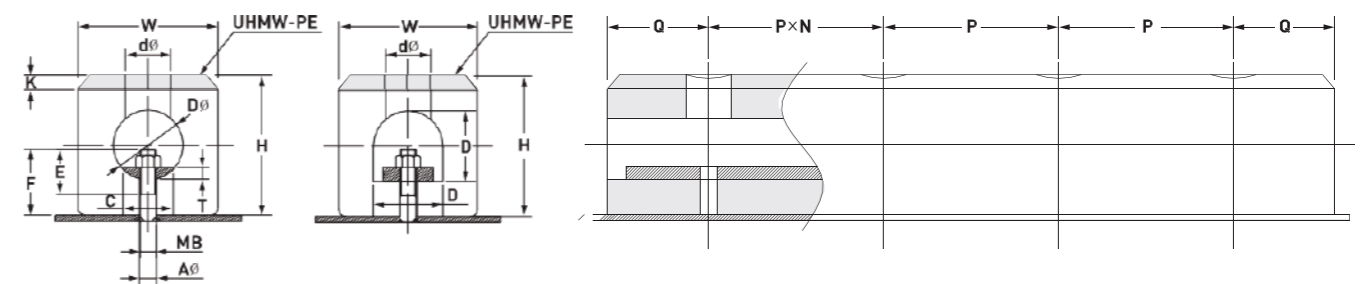


According to KSD 64 10 10. If other specifications are requested, special orders are possible.

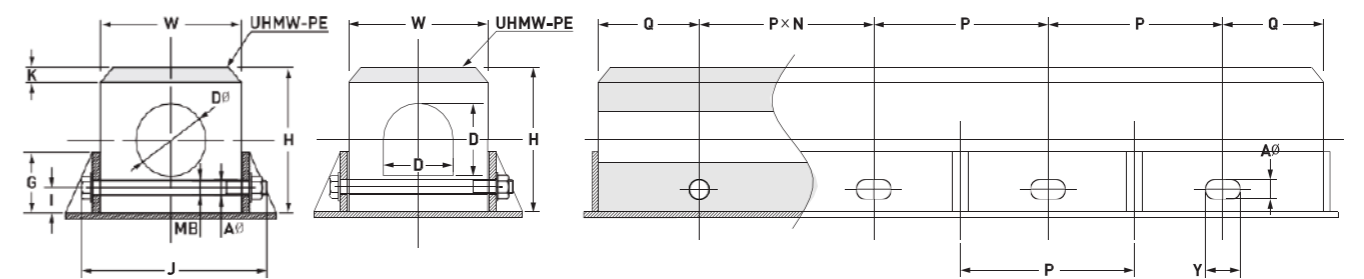
Composite Fender

Composite 펜더는 작업선과 좁은 수로에 설치 가능하다. Composite 펜더의 장점은 고무 몸체와 UHMW-PE가 하나의 제품으로 만들어 지기 때문에 마찰 특성이 낮아 에너지 흡수가 크다는 것이다. 가항 과정에서 엘라스토머의 단면과 UHMW-PE사이의 강한 접착력을 갖도록 특수한 제조기술을 적용하였다. 따라서 기계적 고정 장치의 설치가 필요없다.

Vertical Fitting Bolt Method



Cross Fitting Bolt Method



● Dimension

(Unit:mm)

Size	Fender											Frame					
	C	DØ	dØ	G	H	I	K	P	Q	T	W	AØ	MB	E	F	J	Y
150H×75Ø	50	75	60	60	150	26	20	250 ~ 350	150~ 200	16	150	22	M16 (5/8)	40	80	220	32
200H×100Ø	65	100	65	75	200	35	25			19	200	25	M20 (3/4)	50	95	280	38
250H×125Ø	80	125	70	100	250	43	30			22	250	28	M24 (1)	60	112	350	42
300H×150Ø	90	150	80	125	300	52	30			25	300	32	M24 (1)	70	132	400	48

SM-Type Fender



Lord-Type Fender



Turtle-Type Fender



Corner Fender



BP-Type



AOV-Type



CYL-Type

Seal



Meeting Face



D Shaped Seal



P-Type Seal



Bearing Pad



Soft Type Seal



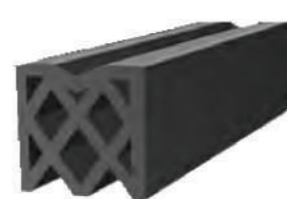
Bottom Seal



Omega Seal



Water Stop



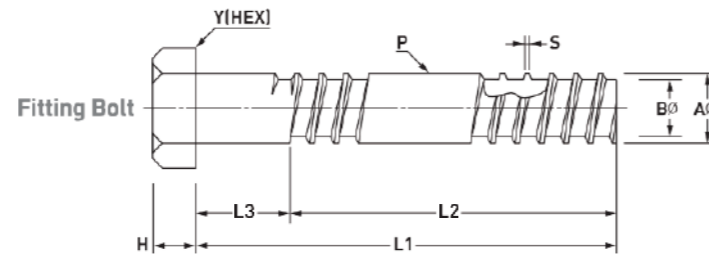
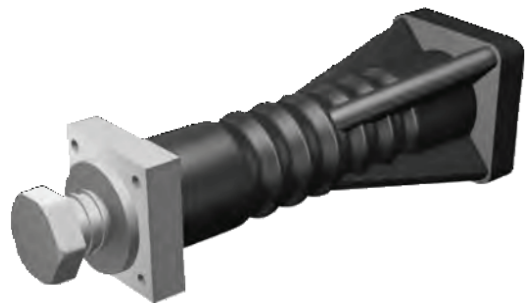
Water Seal

Rubber Properties

Property	Testing Standard	Condition	Requirement
Tensile Strength	DIN 53504 ASTM D 412 Die C AS 1180.2 BS ISO 37 JIS K 6251	Original	16.0 MPa (Min.)
		Aged for 96 hours at 70°C	12.8 MPa (Min.)
Elongation at Break	DIN 53504 ASTM D 412 Die C AS 1180.2 BS ISO 37 JIS K 6251	Original	350%
		Aged for 96 hours at 70°C	280%
Hardness	DIN 53505 ASTM D 2240 AS 1683.15.2 JIS K 6253	Original	78° Shore A (Max.)
		Aged for 96 hours at 70°C	Original + 8° Shore A (Max.)
Compression Set	ASTM D 395 Method B AS 1683.13 Method B BS 903 A6 ISO 815 JIS K 6259	22 hours at 70°C	30% (Max.)
Tear Resistance	ASTM D 624 Die B AS 1683.12 BS ISO 34-1 JIS K 6252	Original	70kN/m (Min.)
Ozone Resistance	DIN 53509 ASTM D 1149 AS 1683-24 BS ISO 1431-1 JIS K 6259	50pphm at 20% strain, 40°C, 100 hours	No cracks
Seawater Resistance	BS ISO 1817 ASTM D 471	28 days at 95°C	Hardness : ± 10 Shore A (Max.) Volume : ± 10/-5% (Max.)
Abrasion	BS 903 A9, Method B	3000 revolution	1.5cc (Max.)
Bond Strength	ASTM D 429, Method B BS 903.A21 Section 21.1	Rubber to steel	7N/mm (Min.)

Resin Anchor Bolt

TR Unit (1000H-1300H), TR-S (150H-1000H), ACV (200H-1300H)



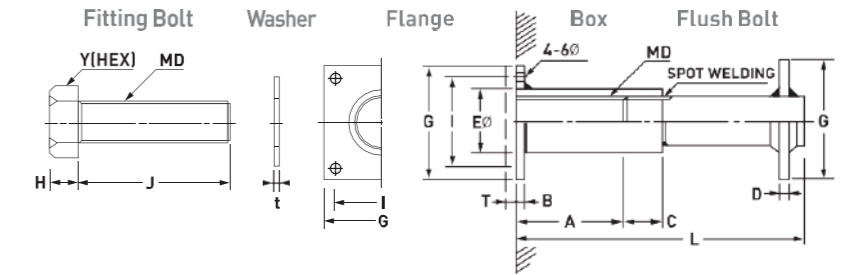
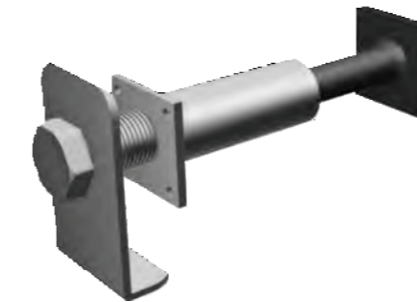
Parts	Material	Remarks
Fitting Bolt	Stainless Steel	-
Plug	Resin	-

● Fitting Bolt Dimension

WD	H	Y	L1	L2	L3	AØ	BØ	S	P (pitches/inch)
3/4	13	30	160	105	55	19	14	2.0	2 3/4
1	18	41	210	145	65	25	18	2.0	2 1/2
1 1/4	22	50	270	185	85	32	24	2.5	2
1 1/2	27	58	330	235	95	38	30	2.5	2
1 3/4	32	67	330	235	95	44	35	3.0	1 3/4
2	36	77	395	265	130	50	40	3.5	1 1/2
2 1/2	45	95	410	275	135	65	53	4.0	1 1/4
3	55	110	440	305	135	76	62	4.5	1

I-Type Anchor Bolt

SSPFender / General, Especially AOV, NV & SBP Fender



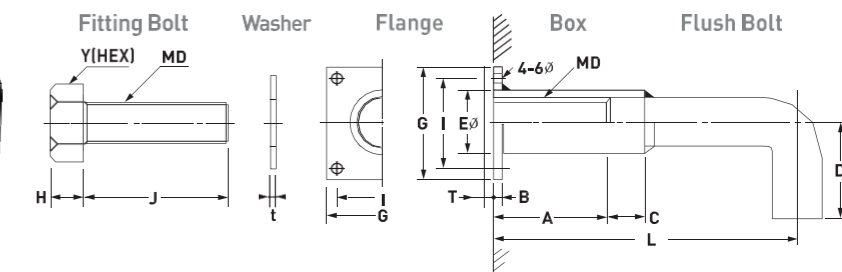
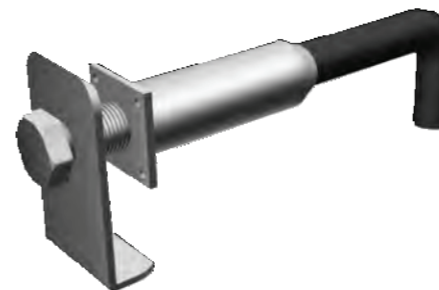
Parts	Material	Remarks
Fitting Bolt, Flange, Box	Stainless Steel	-
Flush Bolt	Rolled Steel	-

● Dimension

MD	Fitting Bolt				Flange, Box, Flush Bolt							
	H	Y	Z	J	A	B	C	D	EØ	G	I	L
M22 (7/8)	14(15)	32(35)	30	t+T+Z (round up to nearest 5mm)	50	6	25	6	28	65	50	165
M24 (1)	15(18)	36(41)	35		55	6	25	6	32	70	55	175
M27 (1 1/8)	17(20)	41(46)	37		60	6	30	9	35	75	60	200
M30 (1 1/4)	19(22)	46(50)	40		65	6	30	9	38	75	60	225
M36 (1 1/2)	23(27)	55(58)	45		70	6	35	9	45	85	70	270
M42 (1 3/4)	26(32)	65(67)	50		75	6	40	12	55	90	75	325
M48 (2)	30(36)	75(77)	60		85	6	45	12	65	120	95	360
M56 (2 1/4)	35(40)	85(85)	70		90	6	55	16	75	125	100	435
M64 (2 1/2)	40(45)	95(95)	75		100	6	60	16	80	130	105	475
M76 (3)	45(55)	110(110)	80		120	6	75	19	95	155	120	550

J-Type Anchor Bolt

SSPFender / General, Especially AOV, NV & SBP Fender

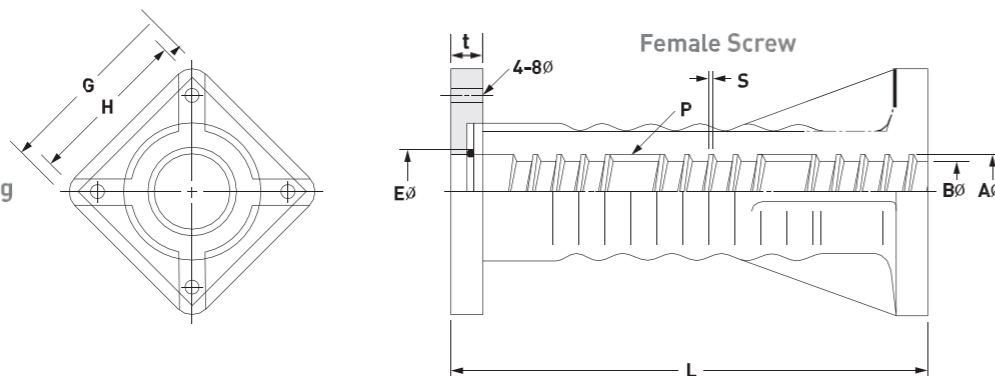


Parts	Material	Remarks
Fitting Bolt, Flange, Box	Stainless Steel	-
Flush Bolt	Rolled Steel	-

● Dimension

MD	Fitting Bolt				Flange, Box, Flush Bolt							
	H	Y	Z	J	A	B	C	D	EØ	G	I	L
M22 (7/8)	14(15)	32(35)	30	t+T+Z (round up to nearest 5mm)	50	6	25	50	28	65	50	175
M24 (1)	15(18)	36(41)	35		55	6	25	50	32	70	55	185
M27 (1 1/8)	17(20)	41(46)	37		60	6	30	75	35	75	60	210
M30 (1 1/4)	19(22)	46(50)	40		65	6	30	85	38	75	60	230
M36 (1 1/2)	23(27)	55(58)	45		70	6	35	100	45	85	70	255
M42 (1 3/4)	26(32)	65(67)	50		75	6	40	100	55	90	75	290
M48 (2)	30(36)	75(77)	60		85	6	45	120	65	120	95	325
M56 (2 1/4)	35(40)	85(85)	70		90	6	55	140	75	125	100	350
M64 (2 1/2)	40(45)	95(95)	75		100	6	60	160	80	130	105	375
M76 (3)	45(55)	110(110)	80		120	6	75	160	95	155	120	450

Outside of Resin Plug

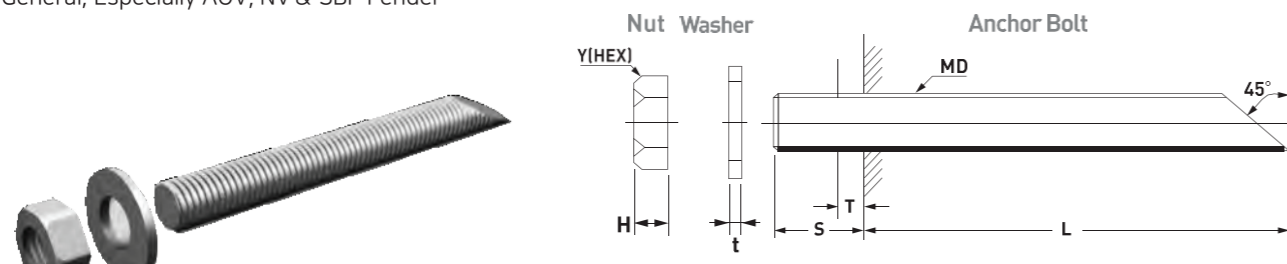


● Resin Plug Dimension

WD	Outside of Resin Plug Body					Female Screw			
	EØ	G	H	t	L	AØ	BØ	S	P (pitches/inch)
3/4	27.0	60	55	25	150	21	16	3	2 3/4
1	35.5	63	75	25	200	26	19	3	2 1/2
1 1/4	42.5	100	80	30	250	33	25	3	2
1 1/2	50.0	120	110	30	300	40	31	3.5	2
1 3/4	57.0	120	110	30	300	46	36	3.5	1 3/4
2	63.0	160	150	30	360	53	41.5	4	1 1/2
2 1/2	78.0	160	150	30	360	68	54.5	4.5	1 1/4
3	88.0	180	170	30	400	79	64	5	1

Stud-Type Anchor Bolt

General, Especially AOV, NV & SBP Fender



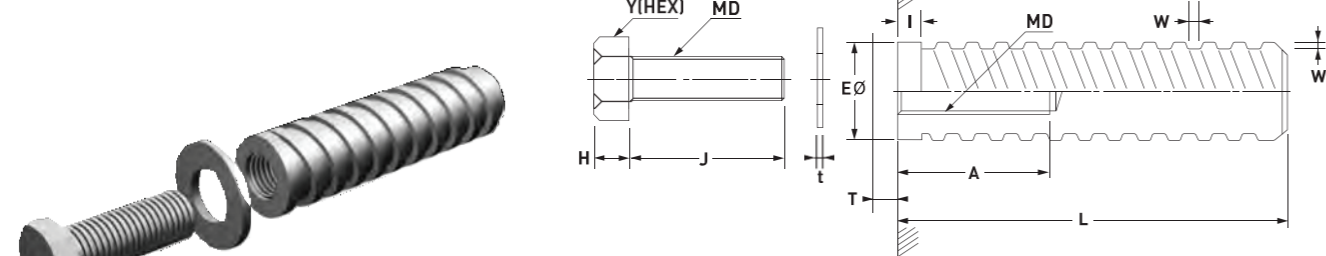
Parts	Material	Remarks
Anchor Bolt	Stainless Steel	-

● Dimension

MD	Nut			Anchor Bolt		S
	H	Y	Z	L		
M22 (7/8)	18(18)	32(35)	8	145		H+t+T+Z (Rounded up to nearest 5mm)
M24 (1)	19(20)	36(41)	10	175		
M27 (1 1/8)	22(22)	41(46)	10	210		
M30 (1 1/4)	24(25)	46(50)	11	210		
M36 (1 1/2)	29(30)	55(58)	12	250		
M42 (1 3/4)	32(35)	65(67)	13	320		
M48 (2)	38(40)	75(77)	15	320		
M56 (2 1/4)	45(45)	85(85)	18	400		
M64 (2 1/2)	51(50)	95(95)	20	450		
M76 (3)	61(62)	110(110)	20	550		

Chemical-Type Anchor Bolt

General, Especially AOV, NV & SBP Fender

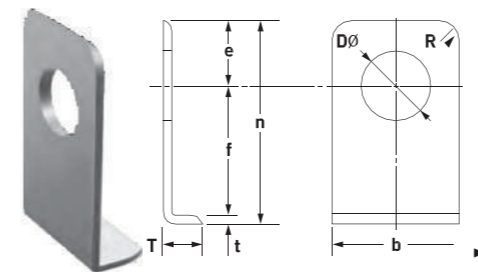


Parts	Material	Remarks
Fitting Bolt	Stainless Steel	-
Box		

● Dimension

MD	Fitting Bolt				Box				
	H	Y	Z	J	A	I	E	L	W
M22 (7/8)	14(15)	32(35)	30	t+T+Z (round up to nearest 5mm)	100	15	32	200	2
M24 (1)	15(18)	36(41)	35		100	15	35	250	2
M27 (1 1/8)	17(20)	41(46)	37		100	15	40	250	2
M30 (1 1/4)	19(22)	46(50)	40		100	15	45	250	2
M36 (1 1/2)	23(27)	55(58)	45		120	15	55	300	2.5
M42 (1 3/4)	26(32)	65(67)	50		120	15	60	350	2.5
M48 (2)	30(36)	75(77)	60		120	15	65	350	2.5
M56 (2 1/4)	35(45)	85(85)	70		120	15	70	400	2.5
M64 (2 1/2)	40(45)	95(95)	75		120	15	80	450	2.5
M76 (3)	45(55)	110(110)	80		150	15	95	450	2.5

Washer



● L-Type Washer Dimension

MD	Size	AOV, NV Fender							
		b	D	e	f	n	R	T	t
M22 (7/8)	150H	68	25	23	32	59.5	10	12	4.5
M24 (1)	200H	74	29	33	42	79.5	10	14	4.5
M27 (1 1/8)	250H	88	34	42	48	94.5	10	16	4.5
M30 (1 1/4)	300H	100	37	47	58	109.5	10	19	4.5
M36 (1 1/2)	400H	119	43	52	68	126	10	22	6
M42 (1 3/4)	500H	127	49	56	83	145	10	25	6
M48 (2)	600H	139	56	61	98	165	10	28	6
M64 (2 1/2)	800H	195	70	100	134	242	10	32	8
	1000H	215	70	110	164	282	10	36	8

● Round Washer Dimension

MD	General			TR Unit, TR-S, ACV		
	C	D	t	C	D	t
M20 (3/4)	-	-	-	80	24	6
M22 (7/8)	44	26	5	-	-	-
M24 (1)	52	28	5	90	28	6
M27 (1 1/8)	58	31	5	-	-	-
M30 (1 1/4)	62	35	5	90	35	6
M36 (1 1/2)	72	41	8	130	41	9
M42 (1 3/4)	82	47	8	140	47	9
M48 (2)	95	54	8	160	54	12
M64 (2 1/2)	115	70	10	180	70	12
M76 (3)	135	82	10	180	82	12

● Rectangle Washer Dimension

MD	General				SSP-TYPE Fender			
	m	n	D	t	m	n	D	t
M20 (3/4)	50	45	24	5	45	40	22	5
M22 (7/8)	70	50	26	5	-	-	-	-
M24 (1)	75	55	28	5	65	50	28	5
M27 (1 1/8)	85	60	31	5	85	60	31	5
M30 (1 1/4)	100	65	35	5	85	60	35	5
M36 (1 1/2)	115	75	41	8	100	65	41	8
M42 (1 3/4)	140	90	47	8	105	90	47	8
M48 (2)	165	100	54	8	130	110	54	8
M56 (2 1/2)	185	125	62	8	120	100	62	8
M64 (2 1/2)	210	135	70	10	140	110	70	10
M64 (2 1/2)	-	-	-	-	160	120	70	10
M76 (3)	230	150	80	10	-	-	-	-

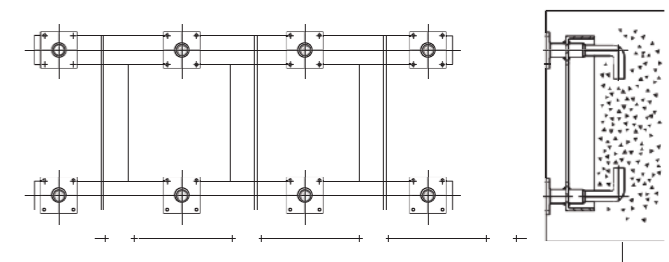
Chain & U-Anchor



Template



● Template can be used for all type of fenders. This can be imbedded in a newly constructed dock. This would ensure precise fitting of the fenders.





Rubber Ladder

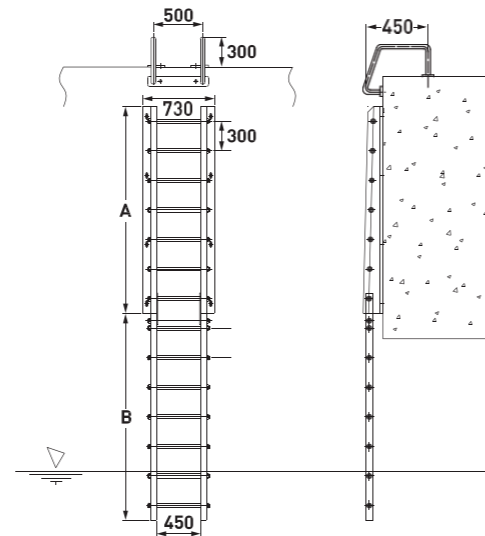
고무 사다리는 유연하고 부식에 강하며 대부분의 우발적 충격을 견딜 수 있다. 따라서 유지보수가 전혀 필요하지 않다. 고무 사다리는 다양한 분야에 사용가능하도록 여러 옵션 및 핸드레일과 결합된다.

● Specifications

Total Width	730mm
Length of Rungs	450mm
Interval of Rungs	300mm

● Dimension

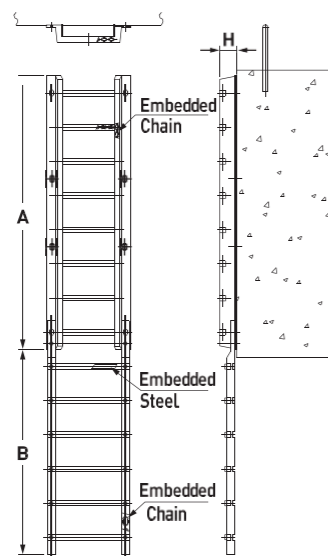
Slope Type Ladder			
A (Main) Length(mm)	B (Joint) Length(mm)	Number of Rungs	Number of Anchors
1200	600	4	2X3
1500	900	5	2X3
1800	1200	6	2X3
2100	1500	7	2X4
2400	1800	8	2X4
2700	2100	9	2X4
3000	2400	10	2X5



● Other Type Ladder

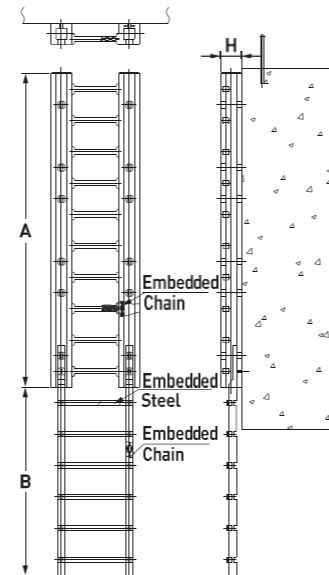
Height 150H

A (Main) Length(mm)	B (Joint) Length(mm)
600	600
900	900
1200	1200
1500	1500
1800	1800
2100	
2400	
2700	
3000	



Height 200H

A (Main) Length(mm)	B (Joint) Length(mm)
900	600
1200	900
1500	1200
1800	1500
2100	1800
2400	
2700	



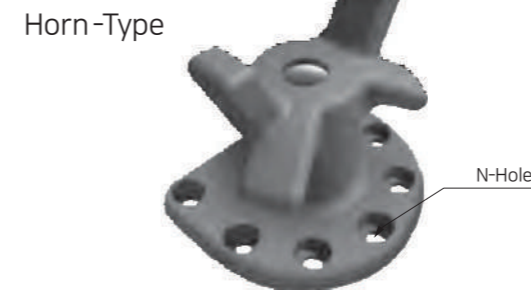
Bollard



ton	5	10	15	25	35	50	70	100	150	200
N	4	4	4	4	6	6	6	6	6	6



ton	15	25	35	50	70	100	150	200
N	4	6	6	6	6	8	8	8



ton	10	15	20	30	50	75	100	125	150	200
N	4	4	5	5	5	6	7	7	7	8

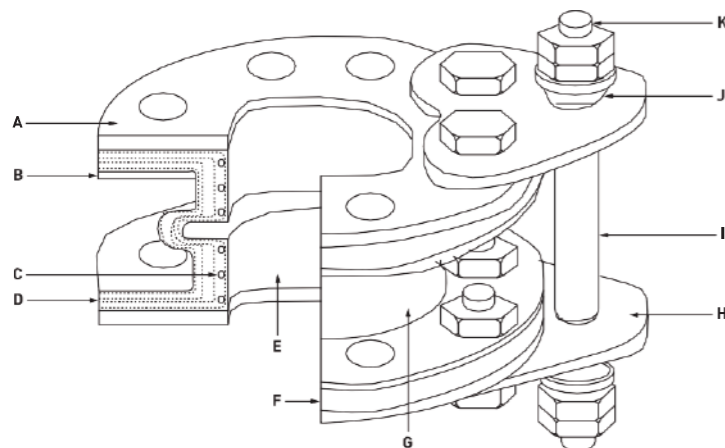


ton	10	15	20	30	50	75	100	125	150	200
N	4	4	5	5	5	6	7	7	7	8

Expansion Joint



Expansion Joint는 과도한 응력을 줄여주고 진동을 흡수하며, 파이프 연결부의 소음을 줄여주도록 설계되었으며, 외부는 오일 및 오존에 강하다. 높은 유연성을 위해 고품질 고무 화합물로 제작되었다. 이 화합물은 진공을 위해 강한 합성 섬유로 결합되어지며, 접합부의 몸체는 강철 와이어로 보강된다. 모든 Expansion Joint는 우수한 품질의 고무로 제작된다. 내부 보강재는 내부식성, 내마모성 및 물에 강하고 유연성이 좋으며 높은 압력을 유지한다.



- A : Matching Flange
- B : Split Metal Retaining Ring
- C : Carcass Metal Reinforcing
- D : Carcass Fabric Reinforcing
- E : Tube
- F : Rubber Expansion Joint
- G : Cover
- H : Control Rod Plate
- I : Pipe Sleeve
- J : Ball Seat
- K : Control Rod Stud Bolt

Tube

A protective, leak proof lining made of synthetic or natural rubber as the application dictates. This is a seamless tube that extends through the bore to the outside edges of the flanges. Its purpose is to eliminate the possibility of the materials being handled penetrating the carcass and weakening the fabric.

Reinforcing Fabric

The carcass reinforcing fabric is the flexible and supporting member between the inner tube and outer cover. Standard constructions normally utilize high quality synthetic fabric.

Cover

The exterior surface of the joint is formed from natural or synthetic rubber, depending on service requirements.

Reinforcing Wire

Reinforcing Wire imbedded in the carcass are frequently used as strengthening member of the joint. The use of metal sometimes raises the rated working pressure and can supply rigidity to the joint for vacuum service.

● Rubber

Rubber		Hardness (HS)		Tensile strength (kg/cm ²)		Elongation (%)	
Cover	Tube	Cover	Tube	Cover	Tube	Cover	Tube
CR	CR	Max.70	Max.70	Min.120	Min.120	Min.400	Min.400
CR	NR	Max.70	Max.70	Min.120	Min.160	Min.400	Min.400
CR	NBR	Max.70	Max.70	Min.120	Min.80	Min.400	Min.350
CIIR	CIIR	Max.70	Max.70	Min.100	Min.100	Min.350	Min.350
EPDM	EPDM	Max.70	Max.70	Min.80	Min.80	Min.300	Min.300
CR	FDA-NBR	Max.70	Max.70	Min.120	Min.100	Min.400	Min.400

● Reinforcing Fabric

Nominal Size I·D (Inch)	Fabric	Density (E·P·I)	Tensile Strength (kg/cm)	Elongation (%)	Shrinkage 150°C×30min(%)	Weight (g/m ²)
18~	PolyesterT/C1000D/3	26	Min.180	Min.15	Max.6	430

● Retaining Ring & Control Unit

Item	KS	Comparison	
		JIS	ASTM
Heavy Hex Bolt & Control Rod Stud Bolt	D3755.SNB7	G41007.SNB7	A193.B7
	D3503.3SS400	G3101.SS400	A307.B
	D3706.STS304	G4303.SUS304	A276.304
	D3706.STS316	G4303.SUS316	A276.316
	- -	- -	A193.B8(304)
Heavy Hex Nut & Jam Nuts	D3752.SM45C	G4051.S45C	A194.2H
	D4101.SC42	G5101.SC42	A563.A
	D3706.STS304	G4303.SUS304	A276.304
	D3706.STS316	G4303.SUS316	A276.316
	- -	- -	A194.8N(304N)
Pipe Sleeve	D3562.SPPS42	G3454.STPG42	A53.B
	D3570.SPHT42	G3456.STPT42	A106.B
	D3576.STS316TP	G3456.SUS316TP	A358.316
	D3576.STS304TP	G3459.SUS304TP	A358.304
	- -	- -	A194.8MN(316N)
Control Rod Plate & Ball Seat & Retaining Ring	D3503.SS400	G3101.SS400	A36
	D3706.STS304	G4303.SUS304	A276.304
	D3706.STS316	G4303.SUS316	A276.316
	- -	- -	- -

● Anticorrosive Coating

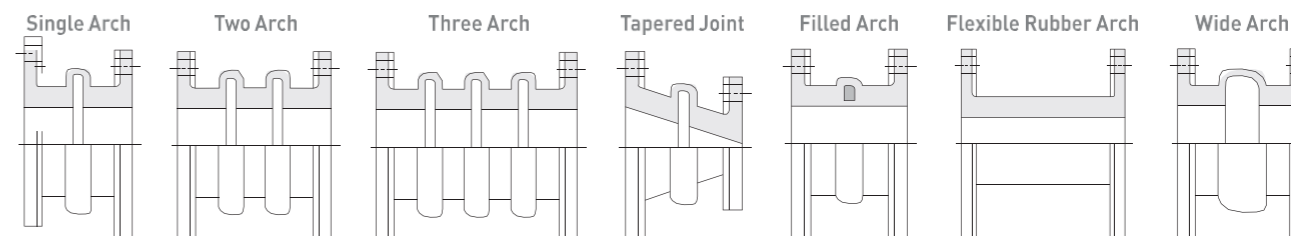
Item	Coating	KS	Comparison	
			JIS	ASTM
Retaining Ring & Pipe Sleeve	ZINC Hot Dip Galvanizing	D8308.HDZ40 (MIN. 400g/m ²)	H8641.HDZ40 (MIN. 400g/m ²)	A123 (MIN. 458g/m ²)
Other Steel Part	Electroplated Coating of Zincon Iron and Steel	D8304.ZP3 (THK. MIN. 8µm)	H8610.ZP3 (THK. MIN. 8µm)	B633 (THK. MIN. 8µm)

● Pressure Characteristics of Rubber Expansion Joint

Design of Expansion Joint Construction	EXP -J Nominal Size I·D (Inch)					
	Positive	PSIG	42~66	68~96	98~108	114
	Negative	kg/cm ²	80	70	60	50
		ln.of Hg	5.6	4.9	4.2	3.5
		mmHg	26	26	26	26
			660.4	660.4	660.4	660.4

● Minimum Face-To-Face Dimension

Nominal Size I·D (Inch)	Single Arch (mm)	Nominal Size I·D (Inch)	Double Arch (mm)	Nominal Size I·D (Inch)	Triple Arch (mm)
42 ~ 114	305(12")	22 ~ 78 84 ~ 108	356 (14") 406 (16")	22 ~ 96 102 ~ 114	457 (18") 508 (20")



Oil Suc. & Dis. Hose With Flange (S10, S15 Type)

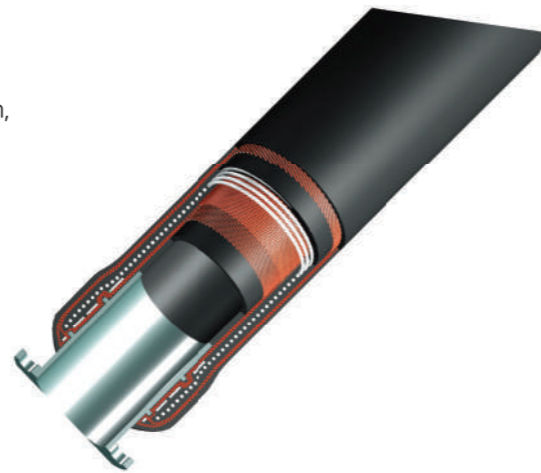
Transportation of gasoline, petroleum, and oil with aromatic content up to 50% / mainly used in offshore landing stations, ships, and barges

Product structure

- Interior rubber:** Oil resistant RMA class A Nitrile Butadiene Rubber (NBR)
- Reinforcing layer:** High strength synthetic fiber and hard steel wire formation, high strength synthetic fiber spiral and static preventing wire formation
- Exterior rubber:** Abrasion/oil/weathering/ozone-resistant synthetic rubber

Product information

- Usage temperature:** -30°C ~ 80°C (-20°F ~ 180°F)
- Vacuum:** 737mmHg / 29inHg
- Maximum production length:** 20m / 66ft



Oil Suc. & Dis. Hose With Flange (L10, L15 Type)

Transportation of gasoline, petroleum, and oil with aromatic content up to 50% / mainly used in offshore landing stations, ships, and barges (for discharge)

Product structure

- Interior rubber:** Oil resistant RMA class A Nitrile Butadiene Rubber (NBR)
- Reinforcing layer:** high strength synthetic fiber spiral and static preventing wire formation
- Exterior rubber:** Abrasion/oil/weathering/ozone-resistant synthetic rubber

Product information

- Usage temperature:** -30°C ~ 80°C (-20°F ~ 180°F)
- Maximum production length:** 20m / 66ft



PartNo.	Hose interior diameter		Hose exterior diameter		Maximum usage pressure		Minimum rupture pressure		Curve radius		Product weight	
	inch	mm	inch	mm	bar	psi	bar	psi	inch	mm	kg/m	lb/ft
	※Weight: Hose section											
OB10SBK (Black exterior)												
OB10SBK-402	4	101.6	4.92	125.0	10	150	40	600	24	600	8.10	5.44
OB10SBK-604	6	152.4	7.05	179.0	10	150	40	600	34	850	14.20	9.54
OB10SBK-804	8	203.2	9.41	239.0	10	150	40	600	44	1,100	23.00	15.46
OB10SBK-1008	10	254.0	11.54	293.0	10	150	40	600	54	1,350	31.40	21.10
OB10SBK-1210	12	304.8	13.66	347.0	10	150	40	600	64	1,600	38.70	26.00
OB10SBK-1412	14	355.6	15.83	402.0	10	150	40	600	84	2,100	48.80	32.79
OB15SBK (Black exterior)												
※Weight: Hose section												
OB15SBK-404	4	101.6	5.00	127.0	15	225	60	900	24	600	8.90	5.98
OB15SBK-604	6	152.4	7.13	181.0	15	225	60	900	34	850	14.60	9.81
OB15SBK-806	8	203.2	9.49	241.0	15	225	60	900	44	1,100	23.90	16.06
OB15SBK-1010	10	254.0	11.61	295.0	15	225	60	900	54	1,350	33.10	22.24
OB15SBK-1212	12	304.8	13.74	349.0	15	225	60	900	64	1,600	40.70	27.35
OB15SBK-1414	14	355.6	15.91	404.0	15	225	60	900	84	2,100	51.10	34.34

PartNo.	Hose interior diameter		Hose exterior diameter		Maximum usage pressure		Minimum rupture pressure		Curve radius		Product weight	
	inch	mm	inch	mm	bar	psi	bar	psi	inch	mm	kg/m	lb/ft
	※Weight: Hose section											
OB10LBK (Black exterior)												
OB10LBK-402	4	101.6	4.49	114.0	10	150	40	600	-	-	2.90	1.95
OB10LBK-604	6	152.4	6.61	168.0	10	150	40	600	-	-	5.50	3.70
OB10LBK-806	8	203.2	8.82	224.0	10	150	40	600	-	-	9.50	6.38
OB10LBK-006	10	254.0	10.91	277.0	10	150	40	600	-	-	12.30	8.27
OB10LBK-1208	12	304.8	13.03	331.0	10	150	40	600	-	-	19.50	13.10
OB10LBK-1410	14	355.6	15.24	387.0	10	150	40	600	-	-	26.30	17.67
OB15LBK (Black exterior)												
※Weight: Hose section												
OB15LBK-404	4	101.6	4.61	117.0	15	225	60	900	-	-	3.60	2.42
OB15LBK-606	6	152.4	6.73	171.0	15	225	60	900	-	-	6.50	4.37
OB15LBK-808	8	203.2	8.98	228.0	15	225	60	900	-	-	12.50	8.40
OB15LBK-1010	10	254.0	11.14	283.0	15	225	60	900	-	-	17.60	11.83
OB15LBK-1210	12	304.8	13.15	334.0	15	225	60	900	-	-	21.50	14.45
OB15LBK-1412	14	355.6	15.35	390.0	15	225	60	900	-	-	28.50	19.15

AIR SUCTION HOSE (CUF ED END)

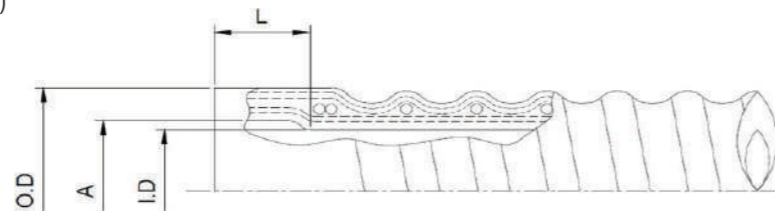
Used as hose for Air & Water in various industries and construction sites

Product structure

- Interior rubber:** High strength synthetic fiber and hard steel wire formation
- Reinforcing layer:** Synthetic rubber with high abrasion, weathering, and ozone resistance
- Exterior rubber:** Synthetic rubber with high abrasion, weathering, and ozone resistance

Product information

- Usage temperature:** -30°C ~ 80°C (-20°F ~ 180°F)
- Vacuum:** 737mmHg / 29inHg
- Maximum production length:** 20m / 66ft



PartNo.	Hose interior diameter		Hose exterior diameter		Maximum usage pressure		Minimum rupture pressure		Curve radius		Product weight	
	inch	mm	inch	mm	bar	psi	bar	psi	inch	mm	kg/m	lb/ft
	ASCE ※Exterior shape: recoil											
ASCE-302	3	76.2	3.76	95.4	10	150	30	450	12	300	3.59	2.41
ASCE-402	4	101.6	4.76	120.8	10	150	30	450	20	500	4.64	3.12
ASCE-502	5	127.0	5.76	146.2	10	150	30	450	25	650	5.65	3.80
ASCE-602	6	152.4	6.88	174.8	10	150	30	450	36	900	7.83	5.26
ASCE-802	8	203.2	9.03	229.4	10	150	30	450	56	1,400	12.33	8.29
ASCE-102	10	254.0	11.20	284.6	10	150	30	450	70	1,800	17.49	11.75

※Min/max measurement

Class	3"	4"	5"	6"	8"	10"
A	Ø89.1	Ø114.3	Ø139.8	Ø165.2	Ø216.3	Ø267.4
O.D	Ø104.0	Ø134.0	Ø156.4	Ø184.0	Ø237.7	Ø291.2
L	260mm					

WATER SUC. & DIS.HOSE

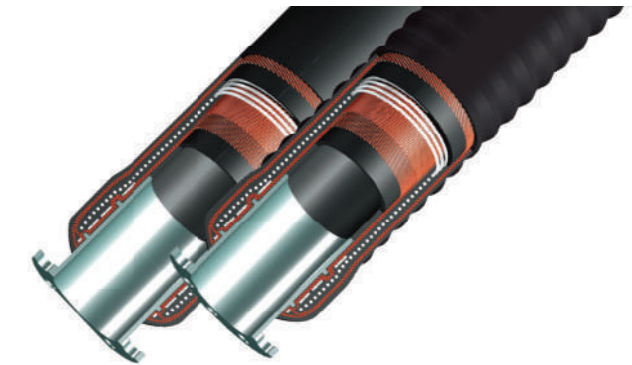
Used to transport industrial water through various industrial areas

Product structure

- Interior rubber:** NR/SBR branding synthetic rubber with good mechanical properties (lining or non-lining shape)
- Reinforcing layer:** Synthetic rubber with high abrasion, weathering, and ozone resistance
- Exterior rubber:** Synthetic rubber with high abrasion, weathering, and ozone resistance

Product information

- Usage temperature:** -30°C ~ 80°C (-20°F ~ 180°F)
- Vacuum:** 737mmHg / 29inHg
- Maximum production length:** 20m / 66ft



PartNo.	Hose interior diameter		Hose exterior diameter		Maximum usage pressure		Minimum rupture pressure		Curve radius		Product weight	
	inch	mm	inch	mm	bar	psi	bar	psi	inch	mm	kg/m	lb/ft
	WBLS ※ Exterior shape: flat / Weight: Hose section											
WBLS-13	1 1/4	31.8	1.93	49.0	15	225	60	900	7	180	1.45	0.97
WBLS-15	1 1/2	38.1	2.17	55.0	15	225	60	900	9	230	1.69	1.14
WBLS-20	2	50.8	2.72	69.0	15	225	60	900	14	350	2.47	1.66
WBLS-25	2 1/2	63.5	3.23	82.0	15	225	60	900	16	400	2.97	2.00
WBLS-30	3	76.2	3.82	97.0	15	225	60	900	18	450	4.12	2.77
WBLS-40	4	101.6	5.00	127.0	15	225	60	900	24	600	8.51	5.72
WBLS-50	5	127.0	6.02	153.0	15	225	60	900	30	750	10.33	6.94
WBLS-60	6	152.4	7.13	181.0	15	225	60	900	34	850	14.08	9.46
WBLS-80	8	203.2	9.37	238.0	15	225	60	900	44	1,100	21.33	14.33
WBLS-100	10	254.0	11.54	293.0	15	225	60	900	54	1,350	30.71	20.64
WBLS-120	12	304.8	13.70	348.0	15	225	60	900	64	1,600	39.66	26.65
WBLC ※ Exterior shape: recoil / Weight: Hose section												
WBLC-13	1 1/4	31.8	2.05	52.0	15	225	60	900	5	130	1.31	0.88
WBLC-15	1 1/2	38.1	2.28	58.0	15	225	60	900	6	150	1.57	1.05
WBLC-20	2	50.8	2.87	73.0	15	225	60	900	8	200	2.29	1.54
WBLC-25	2 1/2	63.5	3.39	86.0	15	225	60	900	10	250	2.76	1.85
WBLC-30	3	76.2	4.02	102.0	15	225	60	900	12	300	3.65	2.45
WBLC-40	4	101.6	5.24	133.0	15	225	60	900	16	400	6.33	4.25
WBLC-50	5	127.0	6.42	163.0	15	225	60	900	20	500	7.72	5.19
WBLC-60	6	152.4	7.60	193.0	15	225	60	900	30	750	10.55	7.09
WBLC-80	8	203.2	9.92	252.0	15	225	60	900	40	1,000	16.73	11.24
WBLC-100	10	254.0	12.20	310.0	15	225	60	900	50	1,300	23.72	15.94
WBLC-120	12	304.8	14.49	368.0	15	225	60	900	60	1,500	31.34	21.06

CERAMIC DISCHARGE HOSE

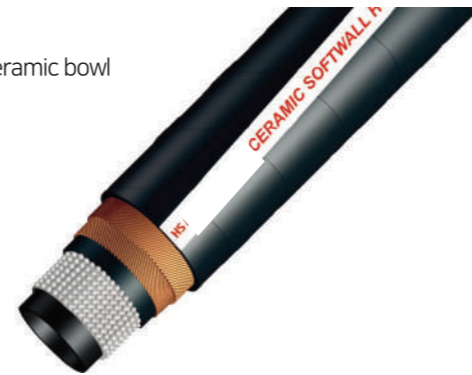
Used to transport (discharge) metal casting, steel, stone, etc.

Product structure

- Interior rubber:** NR/SBR branding synthetic rubber with good abrasion resistance & ceramic bowl
- Reinforcing layer:** High strength synthetic fiber spiral formation
- Exterior rubber:** Synthetic rubber with good abrasion, wearing, and ozone resistance

Product information

- Usage temperature:** -30°C ~ 80°C (-20°F ~ 180°F)
- Maximum production length:** 20m / 65ft



PartNo.	Hose interior diameter		Hose exterior diameter		Maximum usage pressure		Minimum rupture pressure		Curve radius		Product weight	
	inch	mm	inch	mm	bar	psi	bar	psi	inch	mm	kg/m	lb/ft
CEMD ※ Exterior shape: flat												
CEMD-132	1 1/4	31.8	2.18	55.4	10	150	40	600	-	-	2.60	1.75
CEMD-152	1 1/2	38.1	2.43	61.7	10	150	40	600	-	-	3.30	2.22
CEMD-202	2	50.8	2.97	75.4	10	150	40	600	-	-	4.70	3.16
CEMD-252	2 1/2	63.5	3.47	88.1	10	150	40	600	-	-	5.60	3.76
CEMD-302	3	76.2	4.01	101.8	10	150	40	600	-	-	6.60	4.43
CEMD-404	4	101.6	5.06	128.6	10	150	40	600	-	-	8.70	5.85

CERAMIC SUCTION HOSE

Used to transport (discharge) metal casting, steel, stone, etc.

Product structure

- Interior rubber:** NR/SBR branding synthetic rubber with good abrasion resistance & ceramic bowl
- Reinforcing layer:** High strength synthetic fiber and hard steel wire formation
- Exterior rubber:** Synthetic rubber with good abrasion, wearing, and ozone resistance

Product information

- Usage temperature:** -30°C ~ 80°C (-20°F ~ 180°F)
- Vacuum:** 737mmHg / 29inHg
- Maximum production length:** 20m / 65ft



PartNo.	Hose interior diameter		Hose exterior diameter		Maximum usage pressure		Minimum rupture pressure		Curve radius		Product weight	
	inch	mm	inch	mm	bar	psi	bar	psi	inch	mm	kg/m	lb/ft
CEMS ※ Exterior shape: flat												
CEMS-152	1 1/2	38.1	2.56	65.0	10	150	40	600	12	300	4.00	2.69
CEMS-202	2	50.8	3.15	80.0	10	150	40	600	16	400	5.60	3.76
CEMS-252	2 1/2	63.5	3.58	91.0	10	150	40	600	20	500	6.90	4.64
CEMS-302	3	76.2	4.09	104.0	10	150	40	600	24	600	8.00	5.38
CEMS-404	4	101.6	5.28	134.0	10	150	40	600	32	800	10.20	6.85

MUD SUC. & DIS. HOSE WITH FLANGE

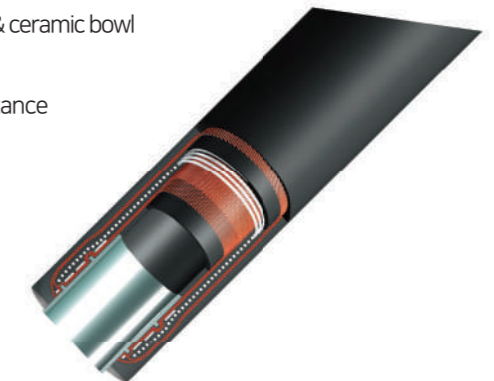
Used to transport dirt in construction sites

Product structure

- Interior rubber:** NR/SBR branding synthetic rubber with good abrasion resistance & ceramic bowl
- Reinforcing layer:** High strength synthetic fiber and hard steel wire formation
- Exterior rubber:** Synthetic rubber with good abrasion, wearing, and ozone resistance

Product information

- Usage temperature:** -30°C ~ 80°C (-20°F ~ 180°F)
- Vacuum:** 737mmHg / 29inHg
- Maximum production length:** 20m / 65ft



PartNo.	Hose interior diameter		Hose exterior diameter		Maximum usage pressure		Minimum rupture pressure		Curve radius		Product weight	
	inch	mm	inch	mm	bar	psi	bar	psi	inch	mm	kg/m	lb/ft
MUDS ※ Weight: Hose section												
MUDS-60	6	152.4	8.39	213.0	7	100	28	400	34	300	20.65	13.88
MUDS-80	8	203.2	9.84	250.0	7	100	28	400	44	800	26.88	18.06