

超级鼓型橡胶护舷

SUPER CELL FENDER SERIES

(TD-A)

一、TD-A型橡胶护舷压缩特点 FEATURES OF SUPER CELL FENDER SERIES

TD-A型橡胶护舷压缩变形后呈鼓形状态，又称鼓型护舷。TD-A型护舷为鼓形护舷的第二代产品，应用广泛，具备以下特点：

1、在反力不增加的情况下，变形距离增大13%，吸能量提高17%，单位反力吸能量比值（E/R·H）提高15%。

例

规格	设计压缩变形	反力(KN)	吸能量(KN·M)	吸能量提高(%)	E/R·H
普通鼓型 1000H	47.5	436	167	100	0.383
TD-A型 1000H	52.5	445	195	117	0.439

2、在压缩型护舷系列中，TD-A型护舷单位重量吸能量高；

型号	规格	制品重(橡胶) (T)	吸能量(KN·M)	吨橡胶吸能量比 (%)	备注
圆筒型 (TD-C)	1000Ø×500Ø×1000L	0.711	65.7	100	
半圆型 (TD-D)	500H×2000L	0.440	62.8	154	
拱型 (TD-B)	500H×1000L	0.220	72.0	355	
鼓型 (TD-A)	800H	0.230	98.0	453	

3、护舷前沿设有防冲钢架，从而大大降低作用于船舶傍板的面压力，根据需要，面压力可达25吨/米²以下，特别适于大型船舶靠泊；

4、由于单位反力吸能量高，特别适于外海码头的需要，特别是墩式码头；

5、在压缩型橡胶护舷系列中，TD-A鼓型护舷倾斜压缩性能变化小；

6、防冲钢架前安装PE贴面板，减小摩擦系数，使靠泊剪切力大大降低；

Features of super cell rubber fender

1、E/R-H: 15percent more:

Effectiveness of the fender is designated by E/R·H.

The value of E/R·H of super cell rubber fender is 0.450 which is 15% higher than the 0.383 for the ordinary cell fender.

The combination of super cell fender and new grade of rubber fender helps to make designing more economical.

This super cell fender with the new grade of rubber can be a size smaller but perform as well as a size larger.

Specification	Rated deflection	R(KN)	E(KN·M)	E(%)	E/R·H
Ordinary Cell 1000H	47.5	436	167	100	0.383
TD-A Type 1000H	52.5	445	195	117	0.439

2、Wider dispersion of stress:

Super cell fender is improved over the ordinary cell fender at the buckling point and the shape of edge of the leg.

Its wider dispersion of stress has been corroborated by the FEM (Finite Element Method).

The wider dispersion of stress makes it possible to increase the design deflection from 47.5% to 52.5%, resulting in superior performance of the super cell fender, as well as being durable.

3、Well performing at angular berthing:

For selecting a fender system suitable for berthing of large vessels, angular performance is one of the most important factors to be considered.

4、Sizes of Super Cell Fender:

The sizes of Super Cell Fender are selected especially by taking the most effective range for receiving large vessels from 50,000 DWT to 500,000 DWT into consideration.

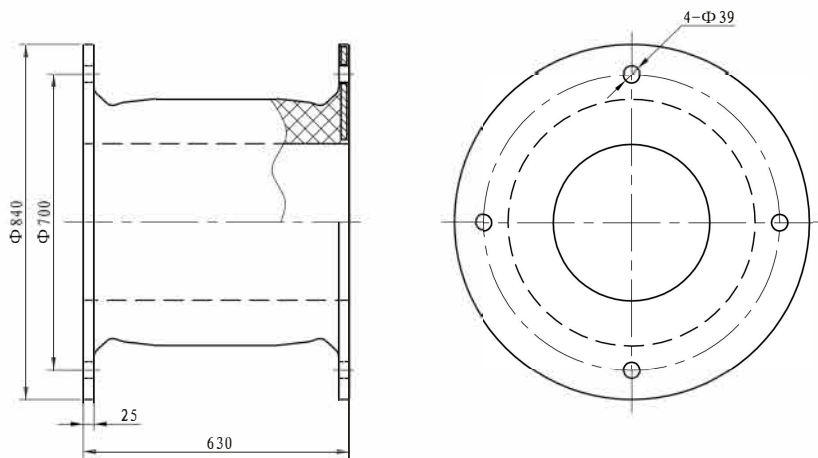
In this area, a fender which has a high absorption of energy with specially a low reaction force is required. The following sizes of our Super Cell Fenders meet this requirement:

TD-A630H,TD-A800H,TD-A1000H,TD-A1150H,TD-A1250H,TD-A1450H,TD-A1600,
TD-A1700H,TD-A2000H,TD-A2250H,TD-A2500H,TD-A3000H

As Super Cell Fender have exactly the same bolt-hole dimensions as ordinary Cell Fender have,they can be installed on wharves by using the same sizes and quantities to anchor bolts.

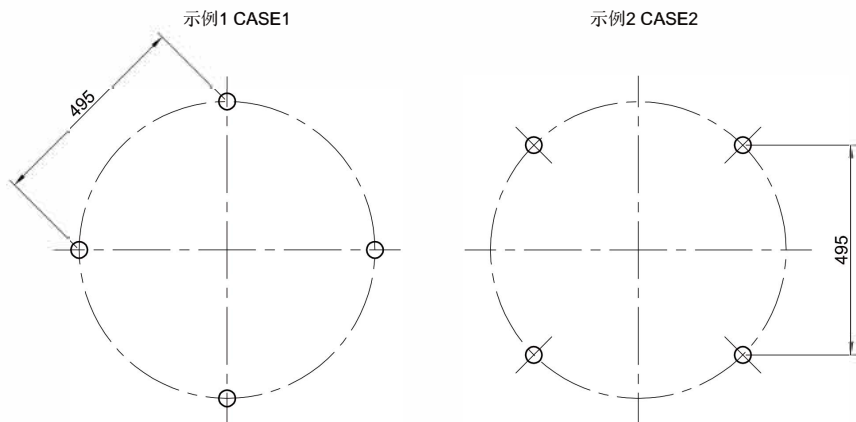
二、规格、性能 TD-A630H

1、规格 Specification



参考重量:220kg

2、安装形式 Installation type

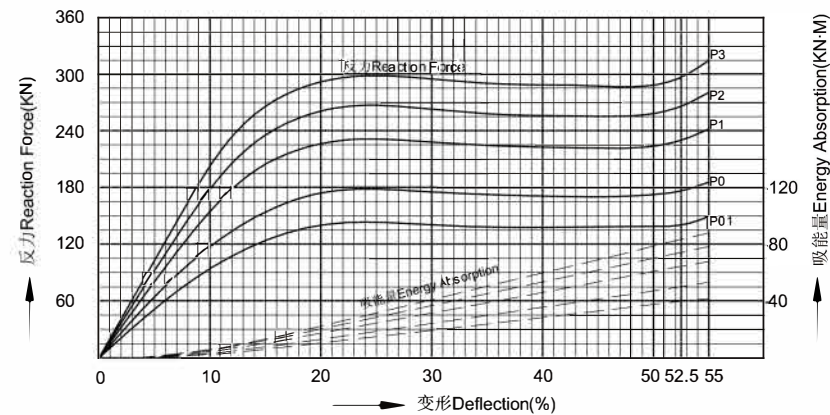


3、性能表 Performance list

性能 Performance 橡胶配方 Rubber grade	设计压缩变形 Rated deflection52.5%		最大压缩变形 Maximum deflection55%	
	反力 Reaction force (KN)	吸能量 Energy absorption (KN·M)	反力 Reaction force (KN)	吸能量 Energy absorption (KN·M)
超高反力型(P3) Superhigh reaction force(P3)	296	82	315	87
超高反力型(P2) Superhigh reaction force(P2)	263	73	279	77
高反力型(P1) High reaction force(P1)	228	63	242	68
标准反力型(P0) Standard reaction force(P0)	175	48	185	51
低反力型(P01) Low reaction force(P01)	140	39	149	41

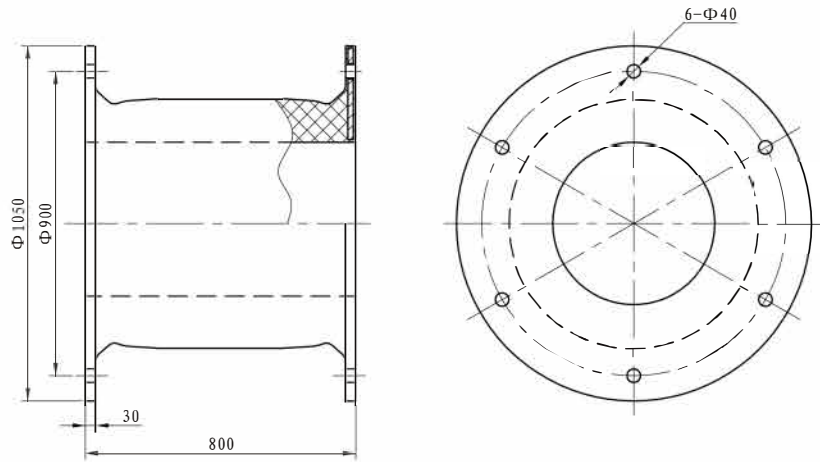
注：性能公差：±10% Note: Performance tolerance:±10%

4、性能曲线 Performance Curve



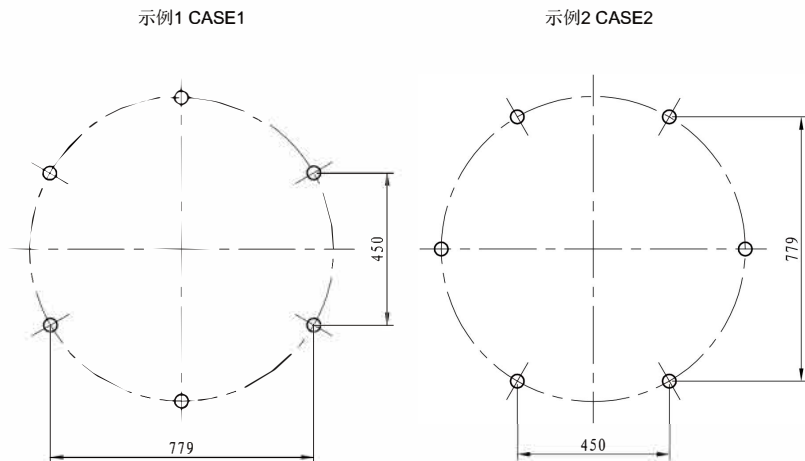
TD-A800H

1、规格 Specification



参考重量:400kg

2、安装形式 Installation type

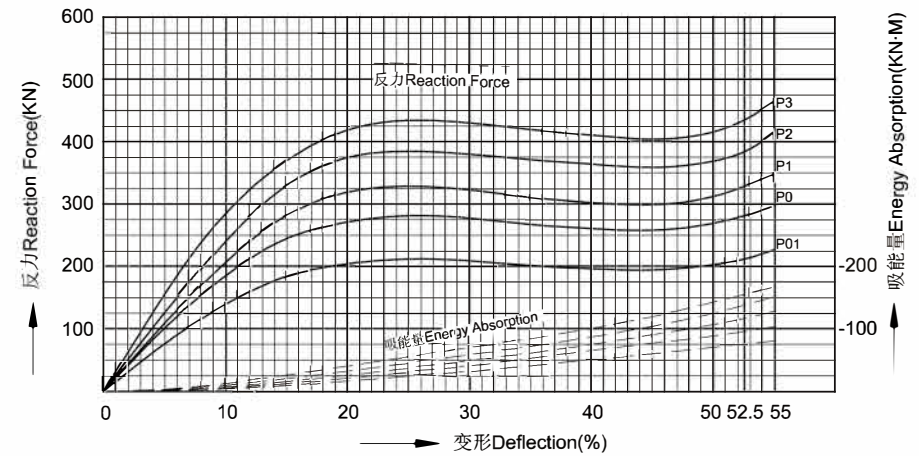


3、性能表 Performance list

性能 Performance 橡胶配方 Rubber grade	设计压缩变形 Rated deflection52.5%		最大压缩变形 Maximum deflection55%	
	反力 Reaction force (KN)	吸能量 Energy absorption (KN·M)	反力 Reaction force (KN)	吸能量 Energy absorption (KN·M)
超高反力型(P3) Superhigh reaction force(P3)	431	154	465	166
超高反力型(P2) Superhigh reaction force(P2)	383	138	413	148
高反力型(P1) High reaction force(P1)	330	118	356	128
标准反力型(P0) Standard reaction force(P0)	280	98	296	105
低反力型(P01) Low reaction force(P01)	211	75	228	80

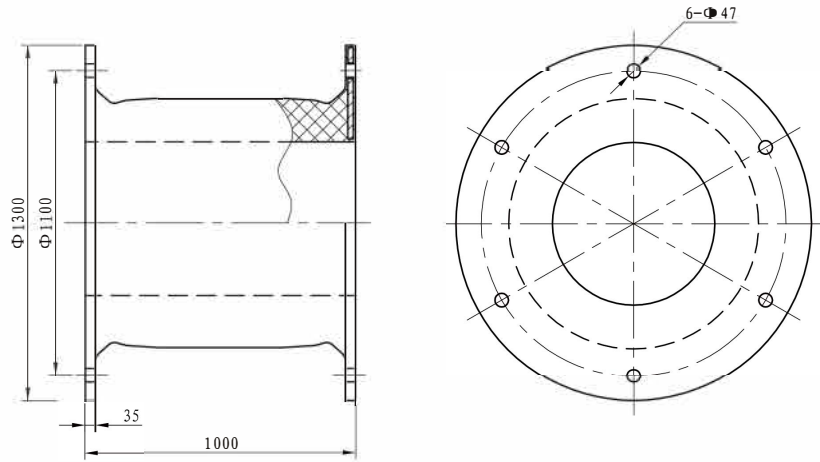
注: 性能公差:±10% Note: Performance tolerance:±10%

4、性能曲线 Performance Curve



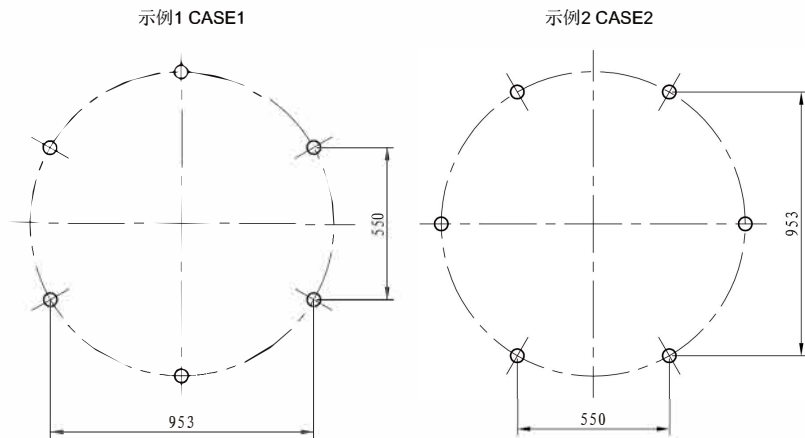
TD-A1000H

1、规格 Specification



参考重量:790kg

2、安装形式 Installation type

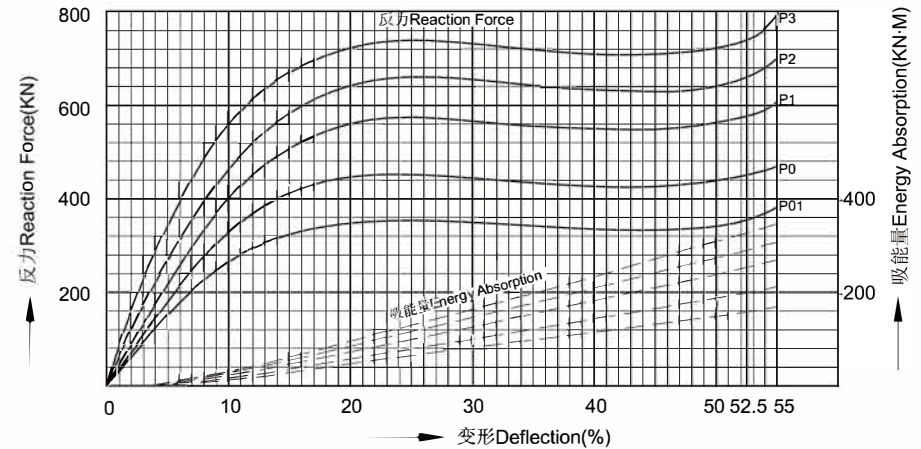


3、性能表 Performance list

性能 Performance 橡胶配方 Rubber grade	设计压缩变形Rated deflection52.5%		最大压缩变形Maximum deflection55%	
	反力 Reaction force (KN)	吸能量 Energy absorption (KN-M)	反力 Reaction force (KN)	吸能量 Energy absorption (KN-M)
超高反力型(P3) Superhigh reaction force(P3)	747	325	790	345
超高反力型(P2) Superhigh reaction force(P2)	660	289	705	306
高反力型(P1) High reaction force(P1)	572	252	610	263
标准反力型(P0) Standard reaction force(P0)	445	195	470	208
低反力型(P01) Low reaction force(P01)	355	158	380	168

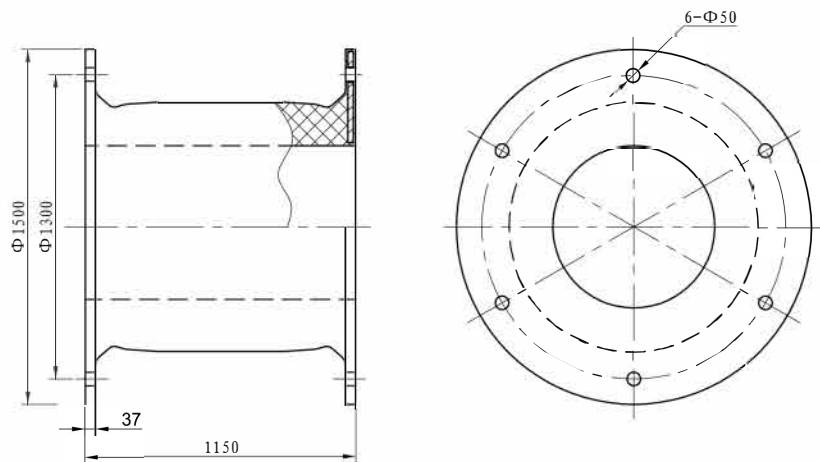
注: 性能公差:±10% Note: Performance tolerance:±10%

4、性能曲线 Performance Curve



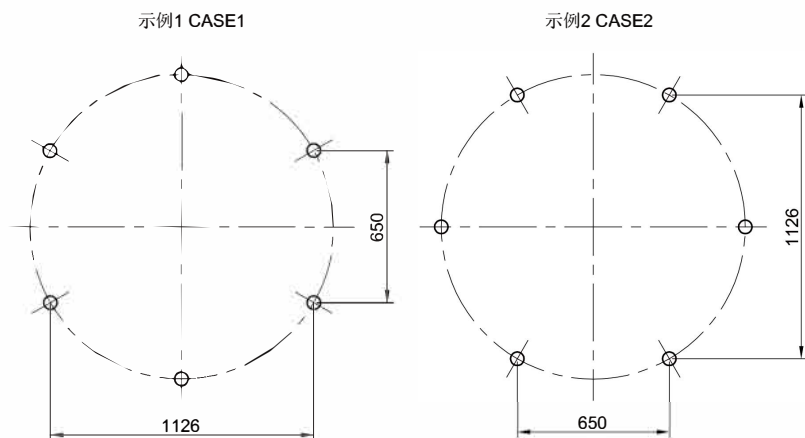
TD-A1150H

1、规格 Specification



参考重量:1200kg

2、安装形式 Installation type

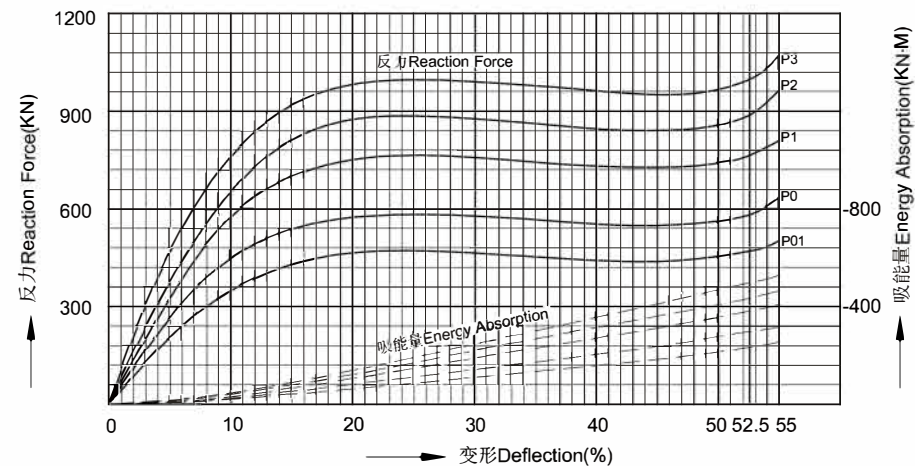


3、性能表 Performance list

性能 Performance 橡胶配方 Rubber grade	设计压缩变形Rated deflection52.5%		最大压缩变形Maximum deflection55%	
	反力 Reaction force (KN)	吸能量 Energy absorption (KN·M)	反力 Reaction force (KN)	吸能量 Energy absorption (KN·M)
超高反力型(P3) Superhigh reaction force(P3)	990	505	1050	530
超高反力型(P2) Superhigh reaction force(P2)	885	445	930	475
高反力型(P1) High reaction force(P1)	760	388	811	408
标准反力型(P0) Standard reaction force(P0)	589	297	626	315
低反力型(P01) Low reaction force(P01)	470	240	506	255

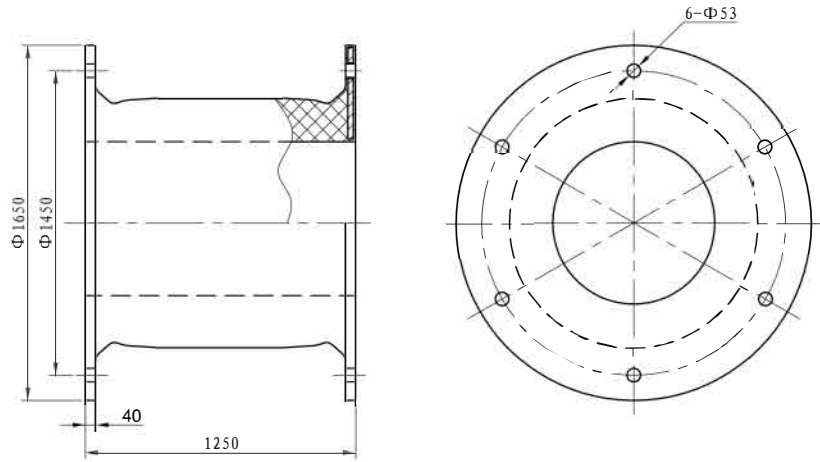
注:性能公差:±10% Note: Performance tolerance:±10%

4、性能曲线 Performance Curve



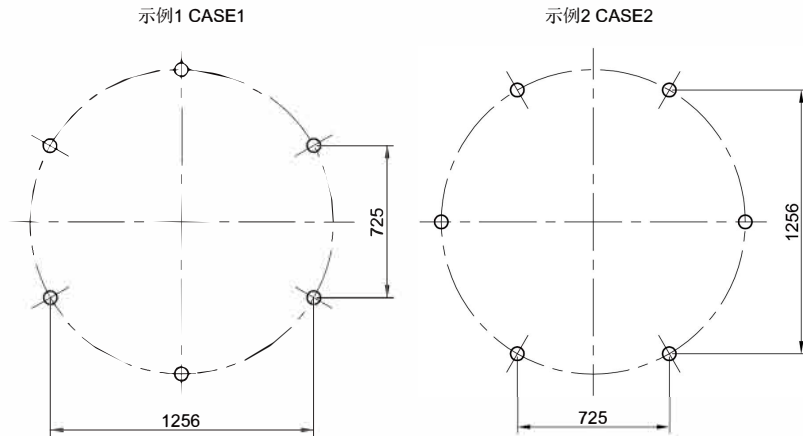
TD-A1250H

1、规格 Specification



参考重量:1500kg

2、安装形式 Installation type

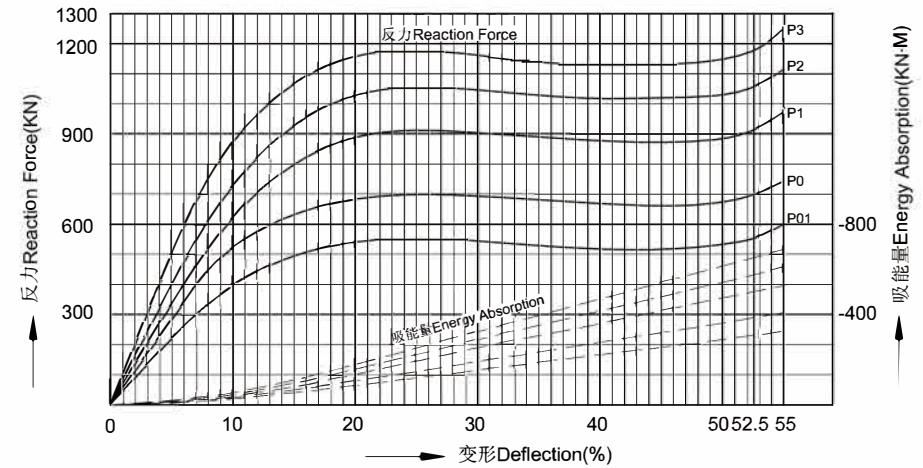


3、性能表 Performance list

性能 Performance 橡胶配方 Rubber grade	设计压缩变形Rated deflection52.5%		最大压缩变形Maximum deflection55%	
	反力 Reaction force (KN)	吸能量 Energy absorption (KN·M)	反力 Reaction force (KN)	吸能量 Energy absorption (KN·M)
超高反力型(P3) Superhigh reaction force(P3)	1175	655	1250	684
超高反力型(P2) Superhigh reaction force(P2)	1042	574	1108	607
高反力型(P1) High reaction force(P1)	902	497	960	526
标准反力型(P0) Standard reaction force(P0)	696	382	741	405
低反力型(P01) Low reaction force(P01)	552	306	590	324

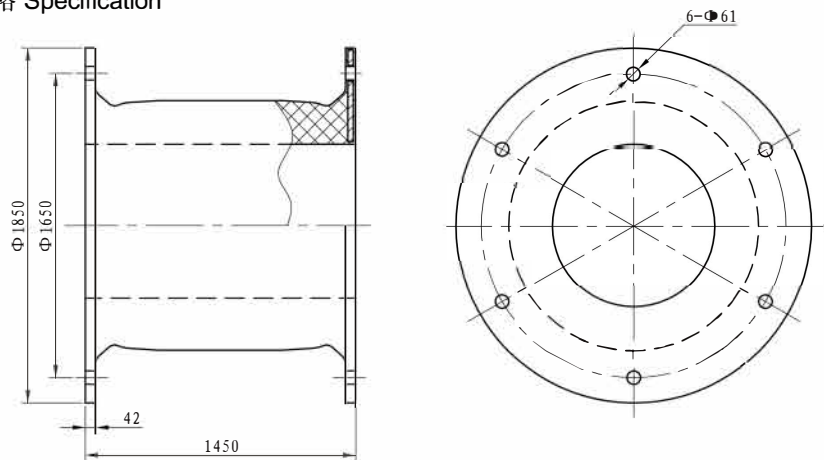
注:性能公差:±10% Note: Performance tolerance:±10%

4、性能曲线 Performance Curve



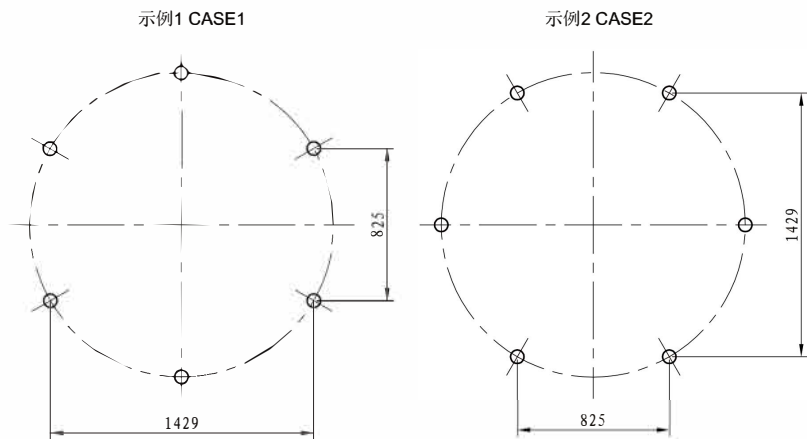
TD-A1450H

1、规格 Specification



参考重量:2300kg

2、安装形式 Installation type

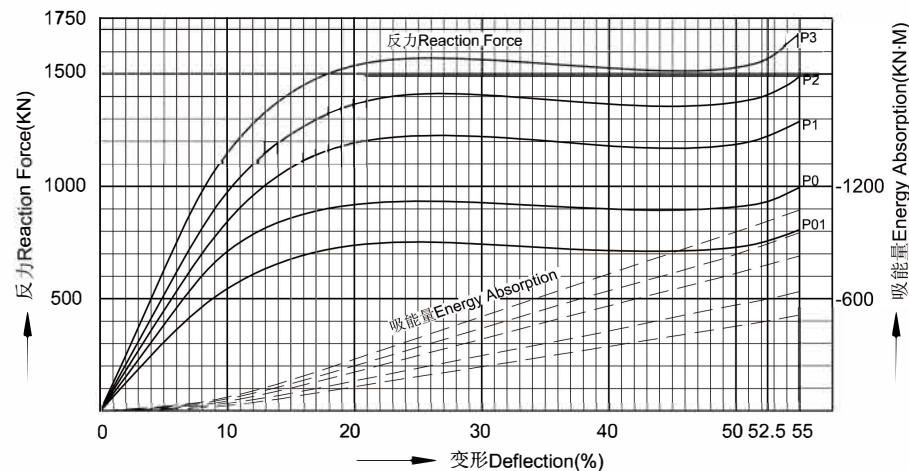


3、性能表 Performance list

性能 Performance 橡胶配方 Rubber grade	设计压缩变形 Rated deflection 52.5%		最大压缩变形 Maximum deflection 55%	
	反力 Reaction force (KN)	吸能量 Energy absorption (KN·M)	反力 Reaction force (KN)	吸能量 Energy absorption (KN·M)
超高反力型(P3) Superhigh reaction force(P3)	1580	1008	1680	1066
超高反力型(P2) Superhigh reaction force(P2)	1402	895	1491	948
高反力型(P1) High reaction force(P1)	1215	776	1292	821
标准反力型(P0) Standard reaction force(P0)	936	596	996	632
低反力型(P01) Low reaction force(P01)	750	478	794	504

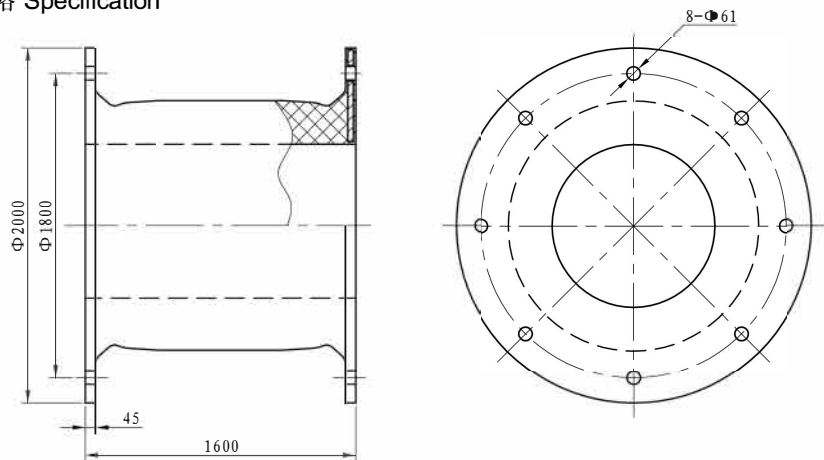
注: 性能公差:±10% Note: Performance tolerance:±10%

4、性能曲线 Performance Curve



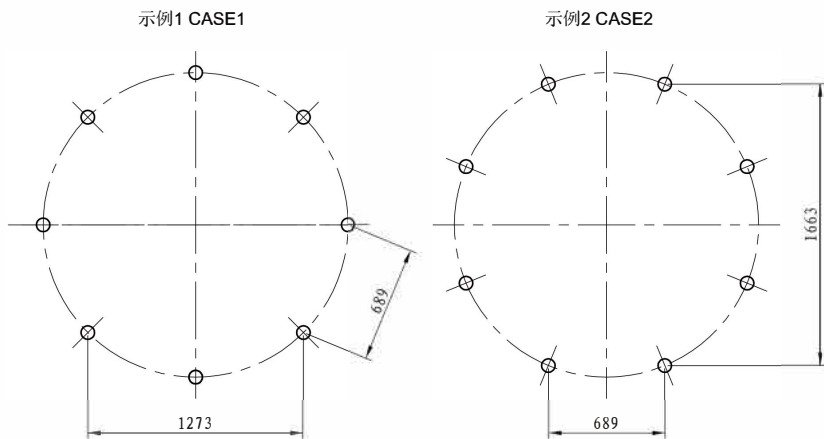
TD-A1600H

1、规格 Specification



参考重量:3000kg

2、安装形式 Installation type

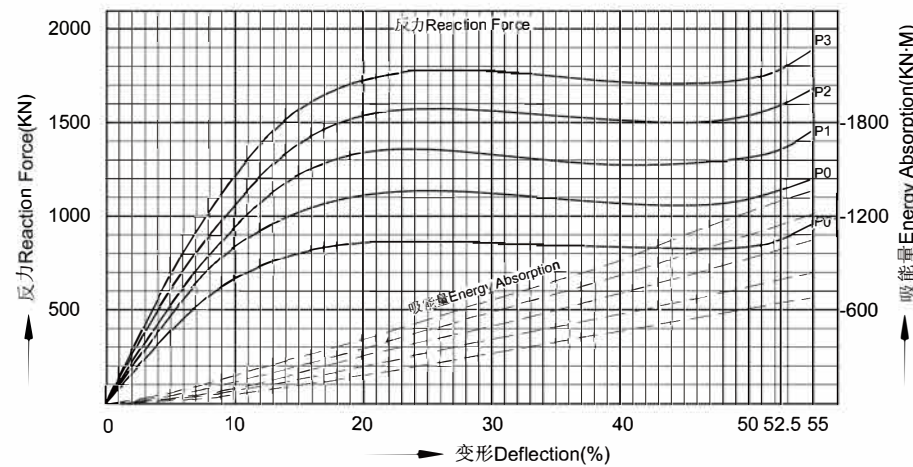


3、性能表 Performance list

性能 Performance 橡胶配方 Rubber grade	设计压缩变形Rated deflection52.5%		最大压缩变形Maximum deflection55%	
	反力 Reaction force (KN)	吸能量 Energy absorption (KN·M)	反力 Reaction force (KN)	吸能量 Energy absorption (KN·M)
超高反力型(P3) Superhigh reaction force(P3)	1756	1260	1890	1362
超高反力型(P2) Superhigh reaction force(P2)	1558	1120	1680	1210
高反力型(P1) High reaction force(P1)	1351	970	1459	1048
标准反力型(P0) Standard reaction force(P0)	1140	801	1205	836
低反力型(P01) Low reaction force(P01)	894	640	955	678

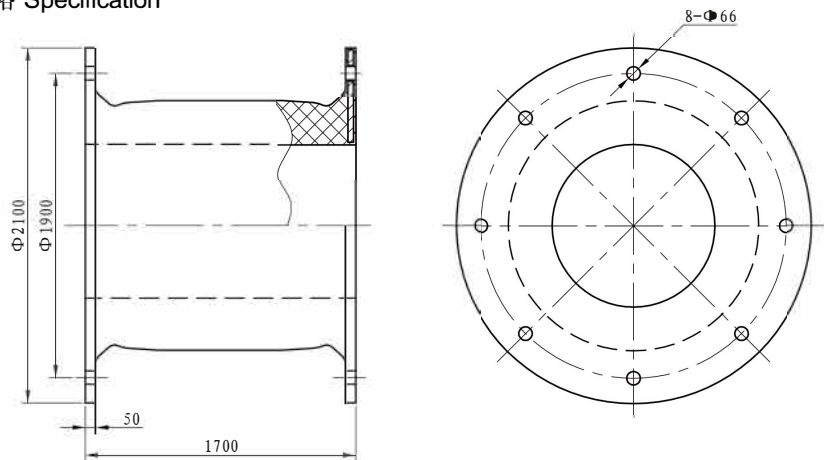
注: 性能公差:±10% Note: Performance tolerance:±10%

4、性能曲线 Performance Curve



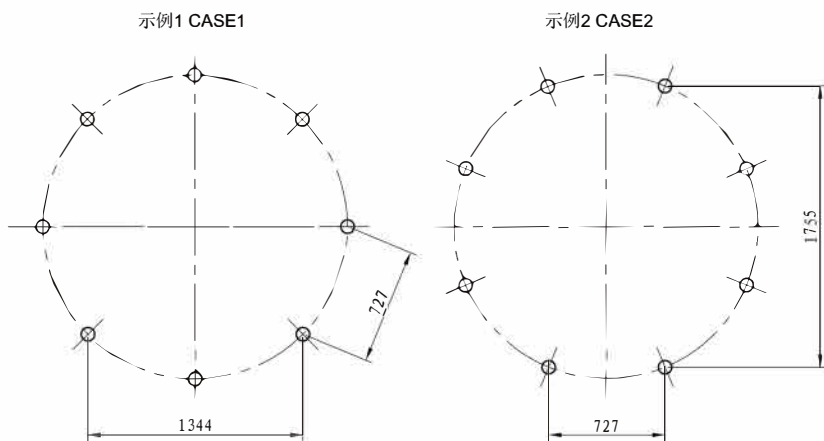
TD-A1700H

1、规格 Specification



参考重量:3700kg

2、安装形式 Installation type

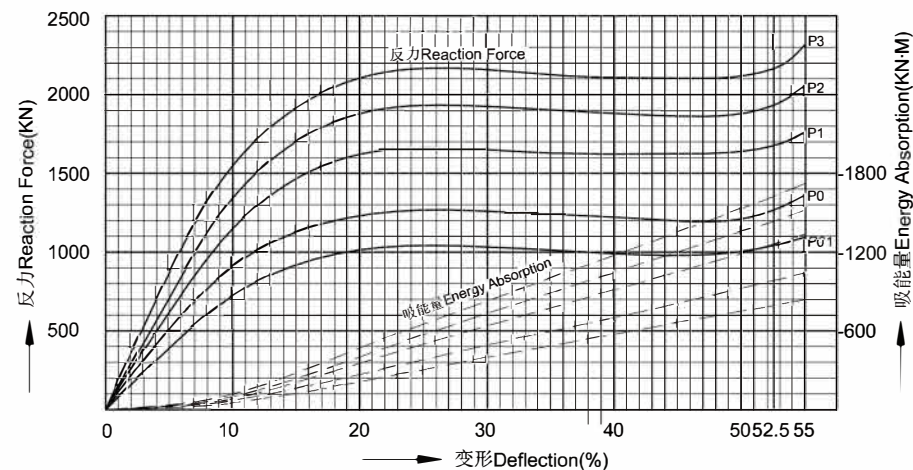


3、性能表 Performance list

性能 Performance 橡胶配方 Rubber grade	设计压缩变形Rated deflection52.5%		最大压缩变形Maximum deflection55%	
	反力 Reaction force (KN)	吸能量 Energy absorption (KN·M)	反力 Reaction force (KN)	吸能量 Energy absorption (KN·M)
超高反力型(P3) Superhigh reaction force(P3)	2171	1624	2309	1720
超高反力型(P2) Superhigh reaction force(P2)	1928	1442	2050	1526
高反力型(P1) High reaction force(P1)	1672	1250	1775	1323
标准反力型(P0) Standard reaction force(P0)	1287	960	1366	1018
低反力型(P01) Low reaction force(P01)	1027	769	1092	815

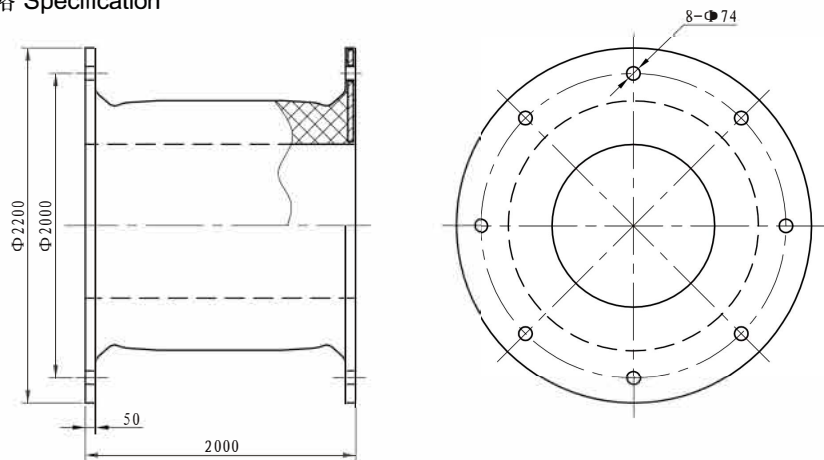
注: 性能公差:±10% Note: Performance tolerance:±10%

4、性能曲线 Performance Curve



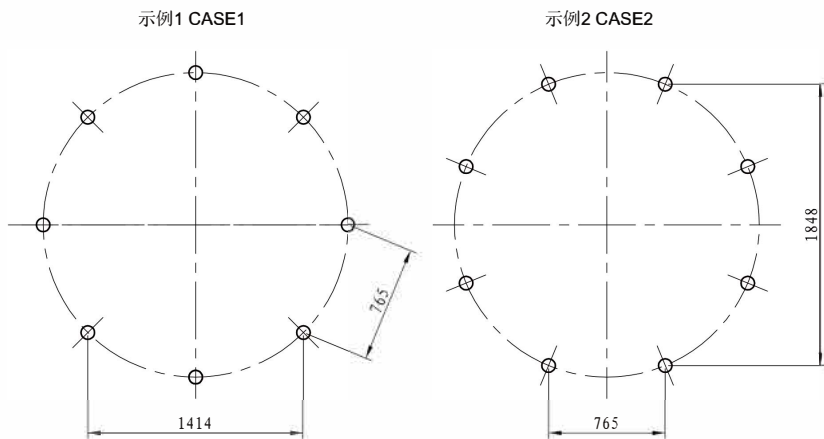
TD-A2000H

1、规格 Specification



参考重量:5000kg

2、安装形式 Installation type

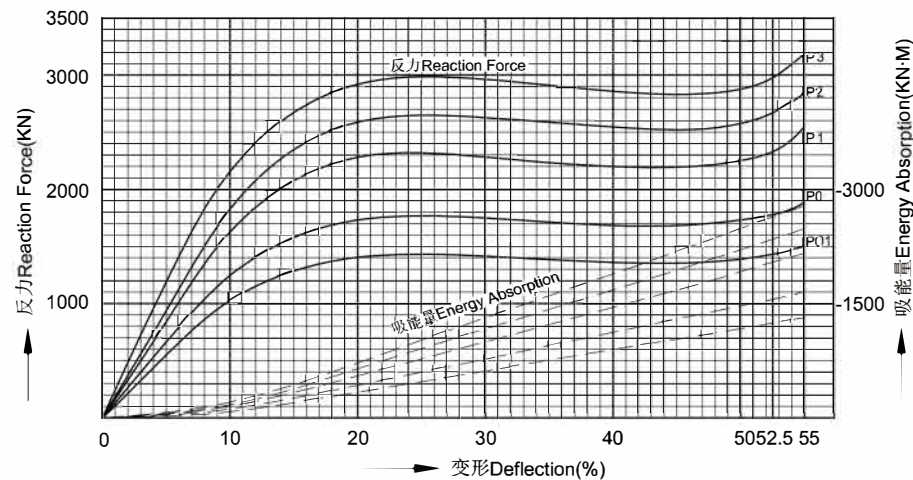


3、性能表 Performance list

性能 Performance 橡胶配方 Rubber grade	设计压缩变形Rated deflection52.5%		最大压缩变形Maximum deflection55%	
	反力 Reaction force (KN)	吸能量 Energy absorption (KN·M)	反力 Reaction force (KN)	吸能量 Energy absorption (KN·M)
超高反力型(P3) Superhigh reaction force(P3)	2995	2645	3196	2799
超高反力型(P2) Superhigh reaction force(P2)	2668	2348	2835	2486
高反力型(P1) High reaction force(P1)	2310	2040	2556	2155
标准反力型(P0) Standard reaction force(P0)	1781	1564	1892	1656
低反力型(P01) Low reaction force(P01)	1425	1252	1510	1328

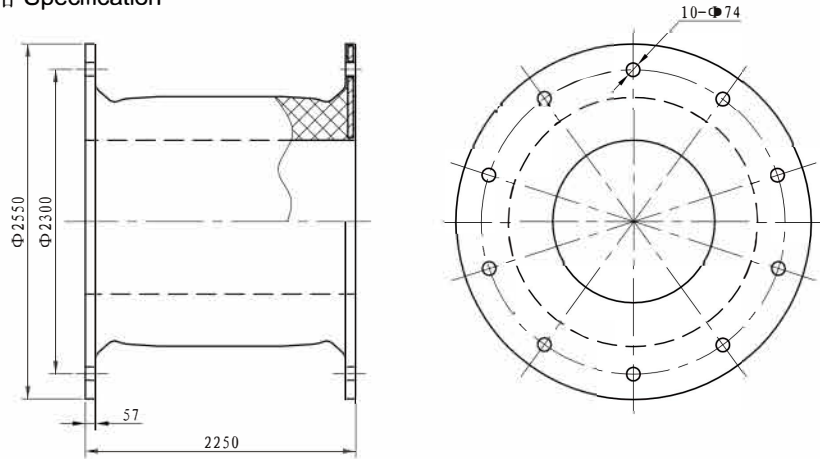
注: 性能公差:±10% Note: Performance tolerance:±10%

4、性能曲线 Performance Curve



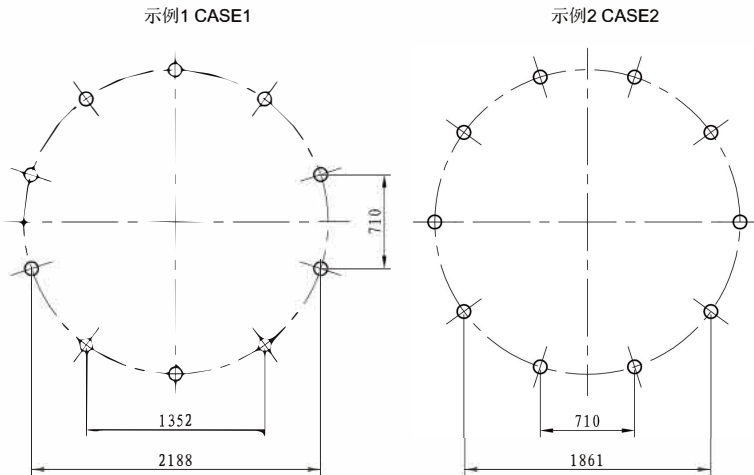
TD-A2250H

1、规格 Specification



参考重量:7400kg

2、安装形式 Installation type

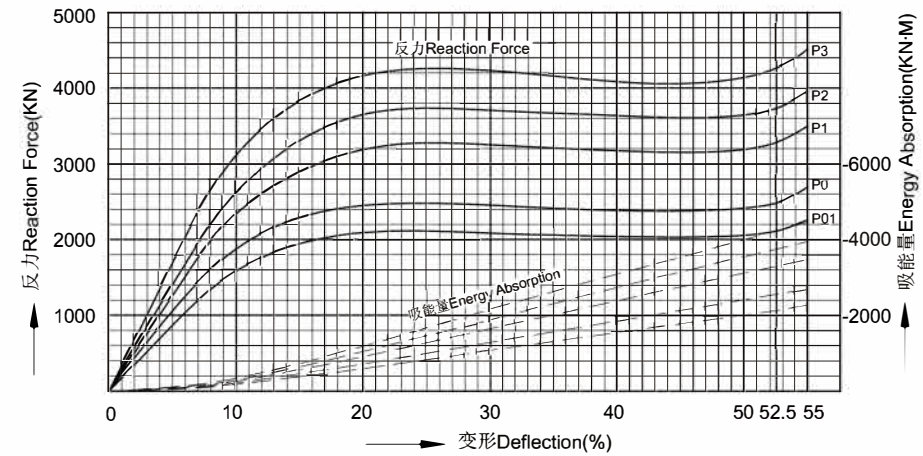


3、性能表 Performance list

性能 Performance 橡胶配方 Rubber grade	设计压缩变形Rated deflection52.5%		最大压缩变形Maximum deflection55%	
	反力 Reaction force (KN)	吸能量 Energy absorption (KN·M)	反力 Reaction force (KN)	吸能量 Energy absorption (KN·M)
超高反力型(P3) Superhigh reaction force(P3)	4226	4179	4490	4425
超高反力型(P2) Superhigh reaction force(P2)	3748	3703	3986	3927
高反力型(P1) High reaction force(P1)	3249	3215	3454	3404
标准反力型(P0) Standard reaction force(P0)	2502	2472	2660	2620
低反力型(P01) Low reaction force(P01)	2125	2104	2258	2226

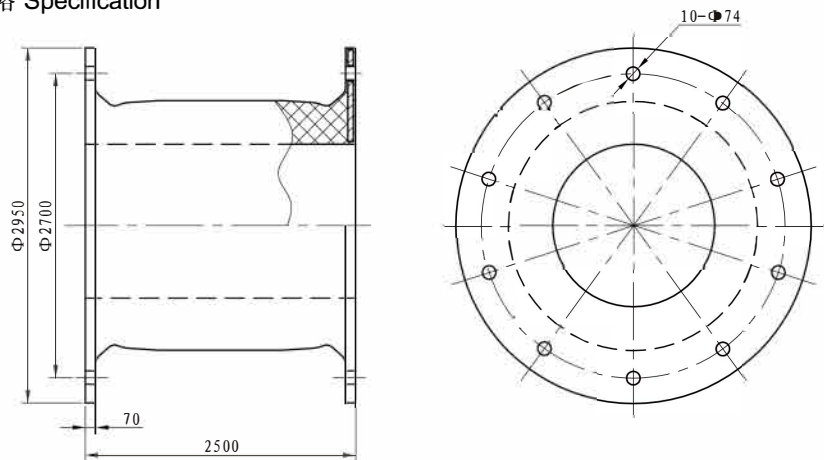
注: 性能公差:±10% Note: Performance tolerance:±10%

4、性能曲线 Performance Curve



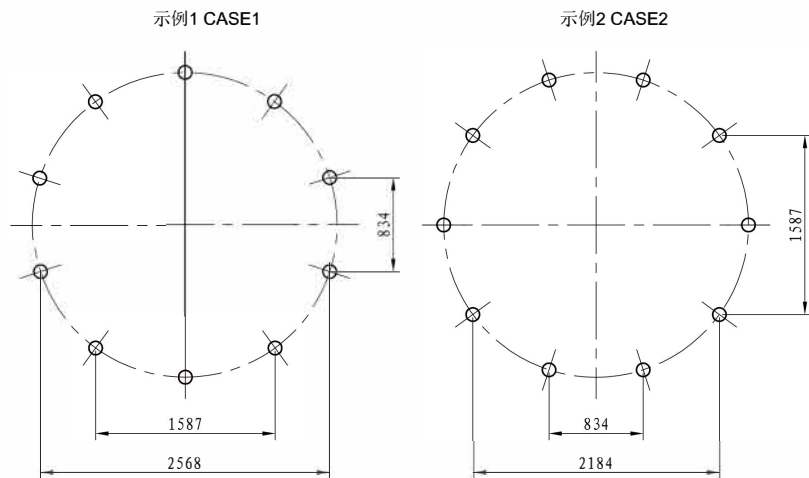
TD-A2500H

1、规格 Specification



参考重量:10700kg

2、安装形式 Installation type

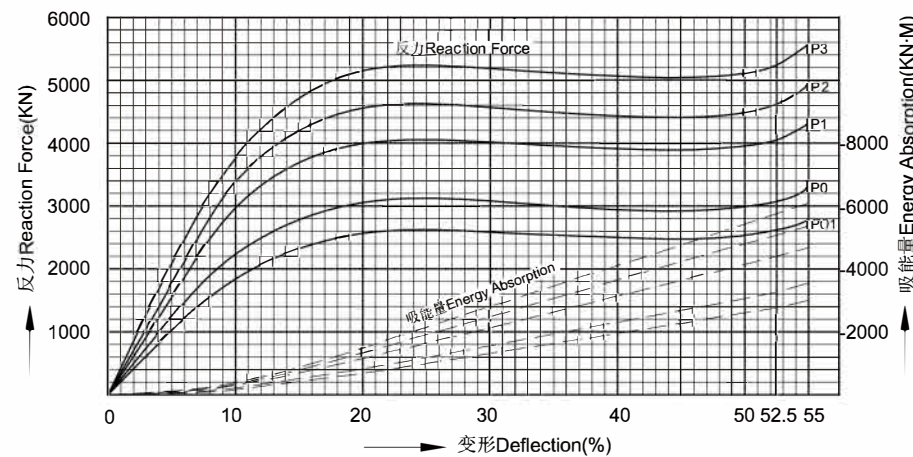


3、性能表 Performance list

性能 Performance 橡胶配方 Rubber grade	设计压缩变形Rated deflection52.5%		最大压缩变形Maximum deflection55%	
	反力 Reaction force (KN)	吸能量 Energy absorption (KN·M)	反力 Reaction force (KN)	吸能量 Energy absorption (KN·M)
超高反力型(P3) Superhigh reaction force(P3)	5217	5732	5545	6068
超高反力型(P2) Superhigh reaction force(P2)	4630	5088	4920	5386
高反力型(P1) High reaction force(P1)	4012	4410	4265	4668
标准反力型(P0) Standard reaction force(P0)	3088	3391	3280	3592
低反力型(P01) Low reaction force(P01)	2624	2885	2788	3050

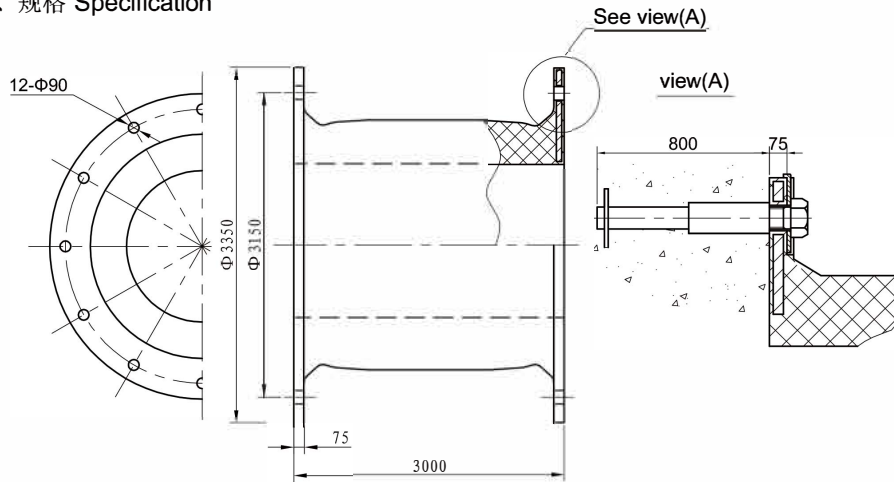
注:性能公差:±10% Note: Performance tolerance:±10%

4、性能曲线 Performance Curve



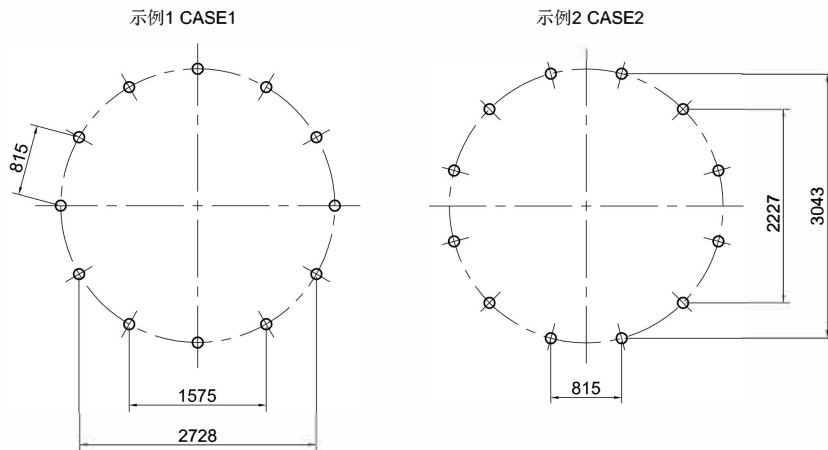
TD-A3000H

1、规格 Specification



参考重量:18500kg

2、安装形式 Installation type

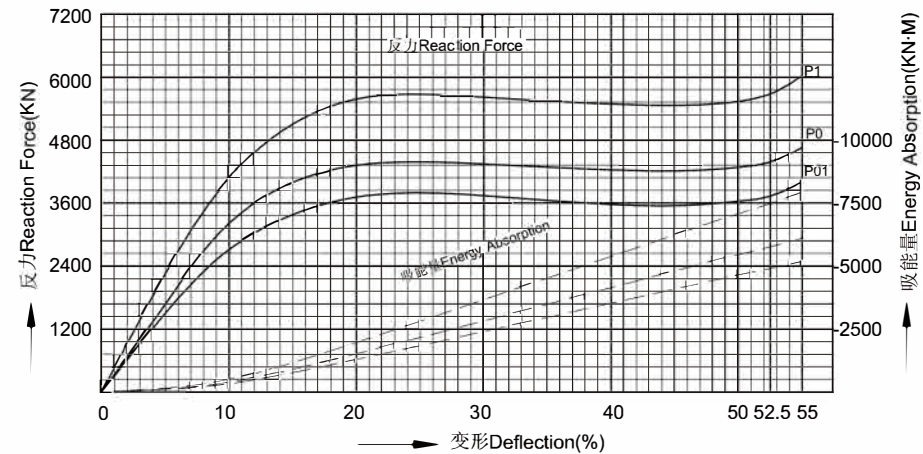


3、性能表 Performance list

性能 Performance	设计压缩变形Rated deflection52.5%		最大压缩变形Maximum deflection55%	
	反力 Reaction force (KN)	吸能量 Energy absorption (KN·M)	反力 Reaction force (KN)	吸能量 Energy absorption (KN·M)
高反力型(P1) High reaction force(P1)	5676	7472	6022	7911
标准反力型(P0) Standard reaction force(P0)	4380	5754	4640	6090
低反力型(P01) Low reaction force(P01)	3730	4894	3944	5170

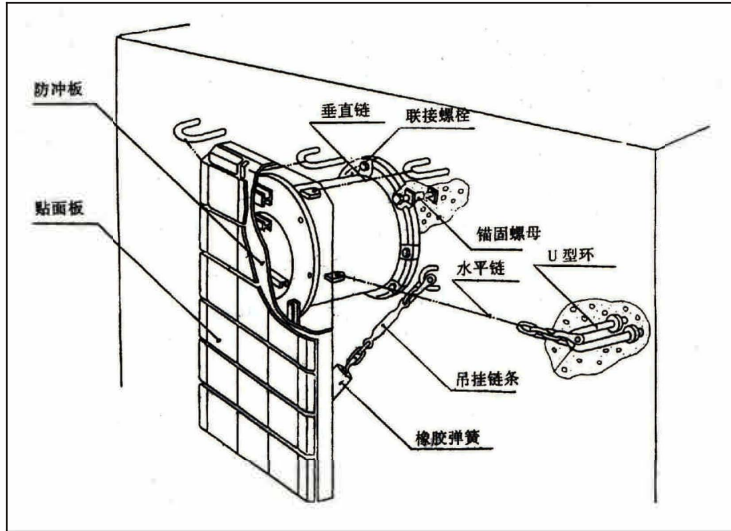
注: 性能公差:±10% Note: Performance tolerance:±10%

4、性能曲线 Performance Curve



三、总成配件

1、配件总成表：TD-A超级鼓型橡胶护舷，作为码头防冲设备，由下列配件组成。



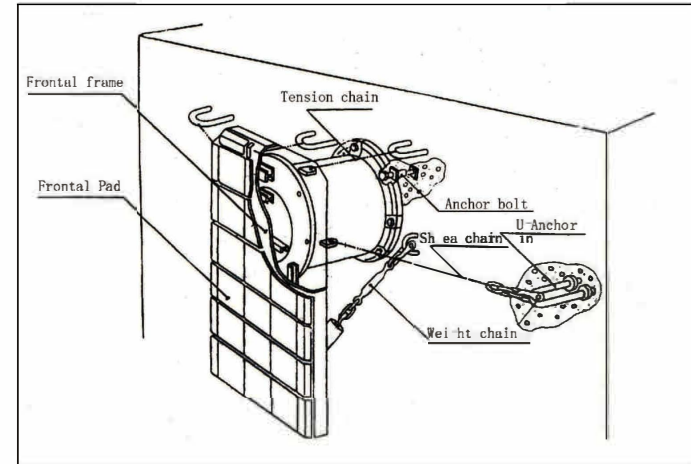
名称	用途	材质	
预埋件	U型环	吊挂链条用	Q235涂漆(或热浸锌)
	锚固螺母	橡胶护舷本体与码头联接固定	不锈钢(或Q235热浸锌)
防冲板	用以承受所产生的反力，分散其对船体的作用力，达到降低面压力之目的。	Q235涂漆或热喷锌(铝)	
贴面板	降低摩擦系数，保护船体不受损伤。	UHMW-PE	
橡胶弹簧	缓冲链条受力，减少链条损坏	橡胶	
橡胶弹簧链条	吊挂链	承受防冲板重力，减少护舷下垂	Q235热浸锌或涂漆
	水平链	约束护舷(防冲设备)系统的剪切变形	Q235热浸锌或涂漆
	垂直链	当护舷下部受力时，限制上部护舷拉伸	Q235热浸锌或涂漆
联接螺栓(母)	护舷与防冲板及其他部件联接用	不锈钢或Q235镀锌	

ACCESSORIES

1. Accessories for Super Cell Fender Series

Super Cell Fender Series are used with frontal frame as shown in the Typical Assembly of Super Cell Fender Series. And weight chain, shear and tension chain is designed occasionally depending on the design criteria.

Typical Assembly of Super Cell Fender Series:

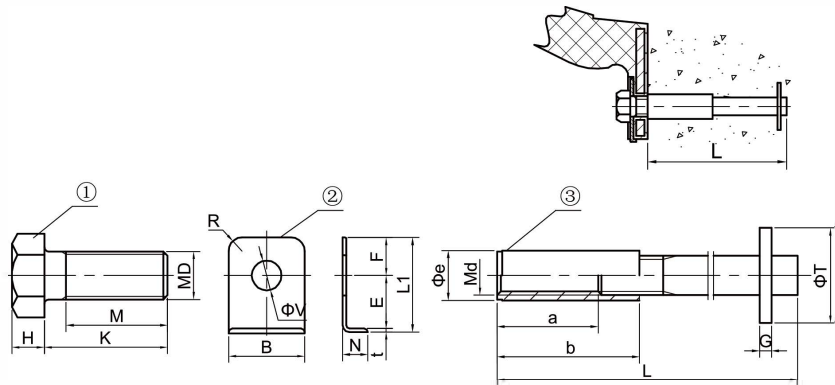


Major accessories

Accessories	Purpose	Material
Anchor Bolt	Mounting the fender on a wharf or a dolphin	Stainless steel/Q235 galvanized
U Anchor	To hang the rubber spring chain	Q235 painted/ galvanized
Frontal Frame	Protecting the hull of vessel	Q235painted/galvanized/ aluminum sprayed
Frontal Pad	Reducing the friction coefficient and protecting the ships' hull	UHMW-PE
Weight Chain	Support of frontal frame	Q235galvanized/painted
Shear Chain	Restraining the shearing deflection of the fender system	Q235galvanized/painted
Tension Chain	Resisting stretching of the fender at partial compression	Q235galvanized/painted
Bolt	To join the fender and frontal frame and other parts	Stainless steel/Q235 galvanized

2、预埋件及联接件

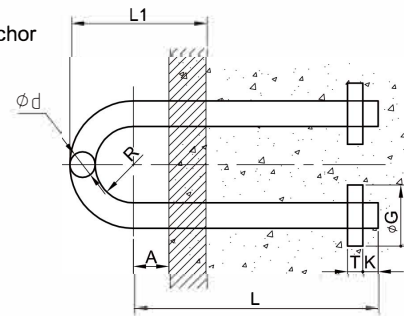
2.1 预埋螺母、螺栓及垫片 Anchor,bolt and Washer



单位:mm

名称 Description 规格 Specification	①螺栓 Bolt														②垫片 Washer					③预埋螺母 Anchor nut				
	D	K	M	H	B	L1	N	t	V	E	F	R	d	e	a	b	L	G	T					
TD-A630H	30	75	60	19	65	109.5	19.5	4.5	34	72	33	15	30	42	75	105	330	9	75					
TD-A800H	33	85	70	22	70	116.5	24.5	4.5	37	77	35	15	33	42	85	120	360	10	80					
TD-A1000H	39	95	75	26	80	148	26	6	43	102	40	25	39	50	85	125	430	10	85					
TD-A1150H	42	100	80	26	85	151	28	6	46	102	43	25	42	55	85	125	500	12	90					
TD-A1250H	45	110	90	30	90	153	31	6	49	102	45	30	45	60	95	140	500	12	110					
TD-A1450H	52	120	95	35	100	158	31	6	56	102	50	30	52	70	100	150	570	12	120					
TD-A1600H	52	135	95	35	100	158	34	6	56	102	50	30	52	70	100	150	570	12	120					
TD-A1700H	56	135	110	35	110	165	38	8	63	102	55	30	56	75	105	165	620	16	125					
TD-A2000H	64	150	125	40	116	168	40	8	70	102	58	40	64	80	125	190	700	16	130					
TD-A2250H	64	150	125	40	120	195	43	8	70	127	60	40	64	80	125	190	700	16	130					
TD-A2500H	64	170	125	40	125	202	50	10	70	127	65	50	64	80	125	190	700	16	130					
TD-A3000H	76	190	145	50	140	207	55	10	84	147	70	50	76	95	135	210	800	19	155					

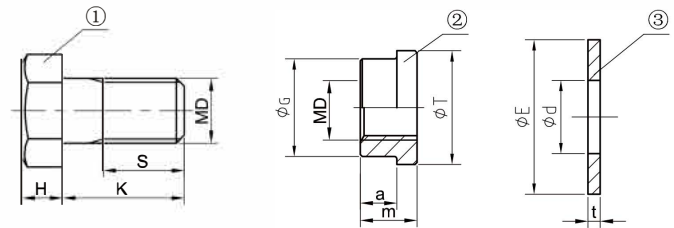
2.2 预埋U型环 U Anchor



单位:mm

规格Specification	d	R	L1	L	A	T	K	G
TD-A630H	40	60	220	440	60	25	25	100
TD-A800H	50	75	250	650	70	30	30	120
TD-A1000H	60	75	260	750	70	30	30	120
TD-A1150H	60	75	260	750	70	30	30	120
TD-A1250H	60	90	260	790	70	30	30	120
TD-A1450H	60	90	280	850	70	30	30	120
TD-A1600H	60	90	280	900	70	30	30	120
TD-A1700H	70	90	280	1100	70	30	30	130
TD-A2000H	70	90	280	1220	70	30	30	130
TD-A2250H	80	120	300	1300	70	30	30	160
TD-A2500H	80	120	300	1400	70	30	30	160
TD-A3000H	90	130	350	1500	80	30	30	180

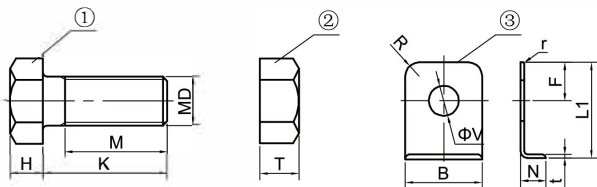
2.3 贴面板联接螺栓、螺母、垫片 Bolt, Nut and Washer of Pad



单位:mm

名称 Description 规格 Specification	①螺栓 Bolt				②螺母 Nut					③垫片 Washer			
	D	K	S	H	m	a	G	D	T	E	d	t	
	16	30	20	10	14	9	24	16	28	38	18	3	

2.4 防冲板螺栓、螺母及垫片 Bolt,nut and Washer of Frontal Frame



单位:mm

名称 Description 规格 Specification	①螺栓 Bolt ②螺母 Nut					③垫片 Washer							
	D	K	M	H	T	B	L1	N	t	V	r	F	R
TD-A630H	30	90	55	19	24	65	109.5	19.5	4.5	34	2.5	33	15
TD-A800H	33	100	60	22	28	70	116.5	24.5	4.5	37	3	35	15
TD-A1000H	39	115	65	26	32	80	148	26	6	43	3	40	25
TD-A1150H	42	125	70	26	32	85	151	28	6	46	3	43	25
TD-A1250H	45	130	75	30	38	90	153	31	6	49	3	45	30
TD-A1450H	52	145	85	35	45	100	158	31	6	56	3	50	30
TD-A1600H	52	145	85	35	45	100	158	34	6	56	3	50	30
TD-A1700H	56	160	90	35	45	110	165	38	8	63	3	55	30
TD-A2000H	64	170	95	40	51	116	168	40	8	70	4	58	40
TD-A2250H	64	170	95	40	51	120	195	43	8	70	4	60	40
TD-A2500H	64	190	95	40	51	125	202	50	10	70	5	65	50
TD-A3000H	76	215	110	50	64	140	207	55	10	84	5	70	50

材质选择	1	2	3	4
		Q235热浸锌	1Cr13 (2Cr13)	1Cr18Ni9Ti

3、防冲板

3.1 防冲板面压力按下列公式计算

$$F_p = \frac{R}{L \times B}$$

式中: F_p : 面压力 (KN/m²)

L: 防冲板接触面长度 (m)

B: 防冲板接触面宽度 (m)

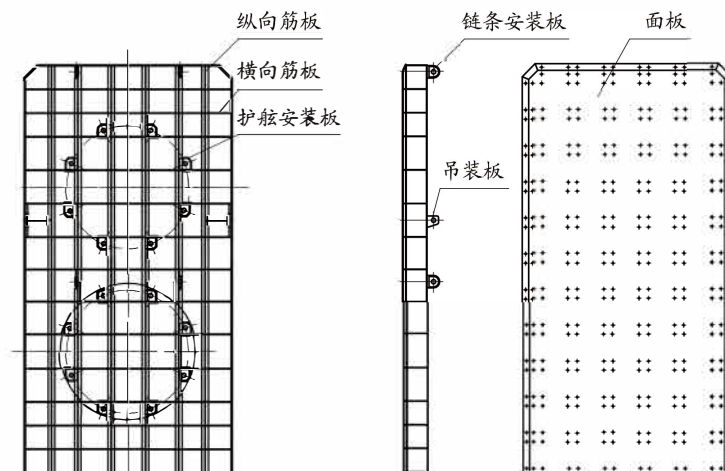
R: 护舷最大反力 (KN)

当防冲板长度和宽度确定后, 面压力按上式计算, 当面压力首先确定时, 防冲板长度和宽度可按上式算出。防冲板最终尺寸的确定, 应考虑贴面板系列规格的有效排列。(否则过多的非系列规格贴面板将导致费用增大)

※防冲板应根据码头结构、水文条件、护舷布置等多种因素综合考虑设计, 不宜有固定系列, 设计时请与本公司设计部取得联系。

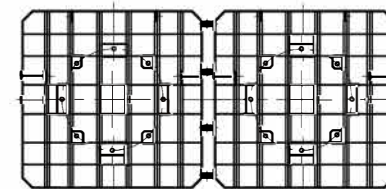
3.2 防冲板构造:

3.2.1 普通型:



3.2.2 铰接型:

当多个护舷组合, 水平排列时, 常常由于护舷间距过大造成防冲板设计强度过高, 铰接式结构防冲板是在两护舷中间采用铰链链接, 使防冲板结构轻型化。



3. Frontal Frame

3.1 Size

The size of the frame is determined to satisfy the required face pressure. If the height of frame is determined considering the tidal range and min free board, the width of the frame can be determined by the following formula:

$$F_p \geq \frac{R_{\max}}{(H-0.1) \times (W-0.2)}$$

Where

FP: required face pressure (T/㎡)

R max: the max reaction force of fender (ton)

H: height of frontal frame (m)

W: width of frontal frame (m)

If the height of the frame is not determined, the height and width can be selected by the formula, shown above.

3.2 Construction

The frame is designed of vertical and horizontal steel members and a frontal steel plate so as to withstand the reaction force arising where the fender is compressed.

Frontal pads are fixed to the frontal steel plate by bolts and nuts and are replaceable even if the pads are damaged.

After sand blasting, the frame is painted for resisting corrosion.

As designing of the steel members and eye plates for various chains is very complicated, Tiandun would like to design and recommend after obtaining the design criteria for the fender system.

3.3 Chamfer

The edges of the top and both sides of the frame are chamfered about 100mm in width so as neither to damage the hull of the vessel nor peel off the paint on the hull by the sharp edge of the frame.

Corner pads cover these edges, as we will explain on the following page.

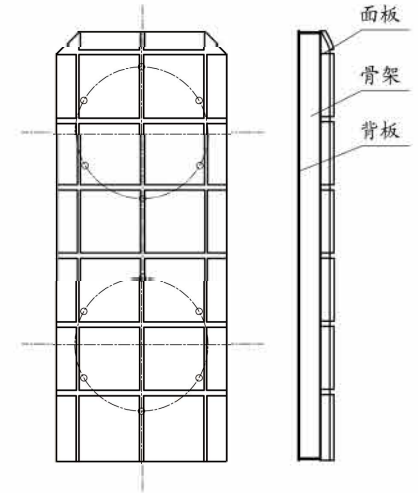
Note: a. Flat surface are determined by combinations of 600 SQ, 300 and 450 SQ mm flat pads.

b. The face pressure is calculated by the contact area of frontal frame (including pad clearance).

c. In case the face pressure corresponding to minimum size of frontal frame is less than the standard face pressure of 300, 200 and/or 200KN/m².

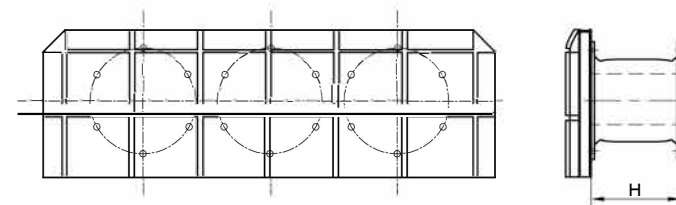
3.2.3 密闭型:

密闭式防冲板是将防冲板做成密闭式结构（用面板和背板），以增加防冲板结构强度。



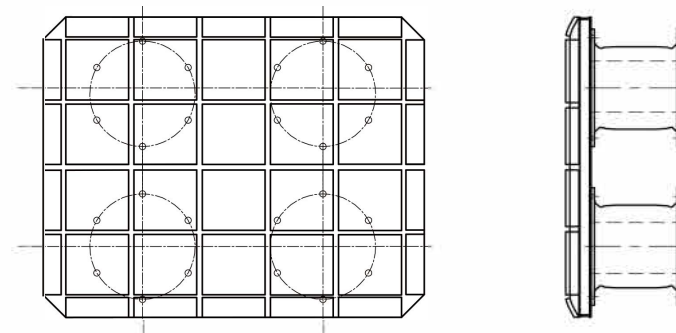
3.3 防冲板布置形式:

3.3.1 水平布置: 护舷以水平方向排列, 如: 1×1, 2×1, 3×1等。



3.3.2 垂直布置: 护舷以垂直方向排列, 如: 1×1, 1×2, 1×3等。

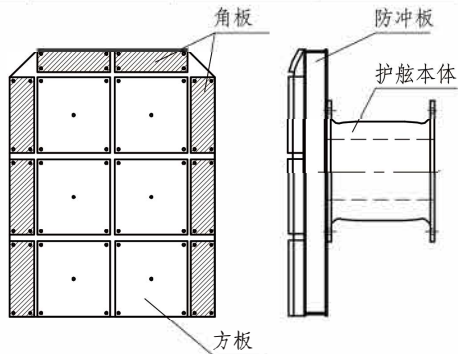
3.3.3 多个组合, 如: 2×2, 2×3等。



4、贴面板

4.1 规格:

种类	规格尺寸 (长×宽) (mm) (厚度30mm或40mm)				
平板	600×600	600×450	600×300	450×450	300×300等
角板	600×220	300×220	450×220	380×220等	



4.2 材料: 平板和角板使用超高分子量聚乙烯 (UHMW-PE) 材料制成, 它具有强度高、韧性好等特性, 各种材料物理性能见下表。

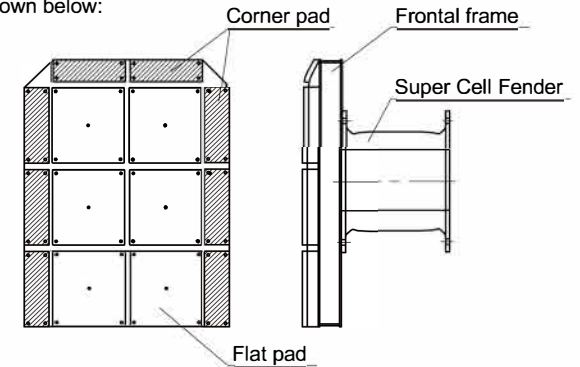
材料	超高分子量聚乙烯 (UHMW-PE)	尼龙树脂 (Nylon)	橡胶 (参考)
物理性能			
比重	0.95	1.15	1.15
拉伸强度 (Kg/cm ²)	250	750	200
伸长率 (%)	20	50~120	450
抗压强度 (Kg/cm ²)	200	900	200
抗弯强度 (Kg/cm ²)	140~210	1000	—
杨氏模量 (Kg/cm ²)	5600~10500	26000	40
抗震能力 (Kg/cm)	70	200	—
摩擦系数	0.1~0.2	0.2	0.3~0.6
耐磨比值	0.5	0.28	1

4. Frontal pad

(1) Type

There are two kinds of pads, the flat pad and the corner pad, with them typically arranged as shown below:

Pad arrangement



(2) Materials

The material for the flat and corner pads is synthetic resin (polyethylene or nylon) and unless specifically requested polyethylene is used for both the flat and corner pads.

The material and their physical properties are shown in table.

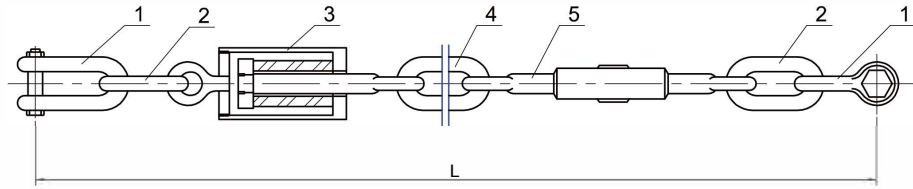
Physical properties

Material	Polyethylene resin	Nylon resin	Rubber (Reference)
Physical Properties			
Specific gravity	0.95	1.15	1.15
Tensile strength (Kg/cm ²)	250	750	200
Elongation (%)	20	50~120	450
Compression strength (Kg/cm ²)	200	900	200
Bending strength (Kg/cm ²)	140~210	1000	—
Yong modulus (Kg/cm ²)	5600~10500	26000	40
Resistance to shock (Kg/cm)	70	200	—
Friction coefficient	0.1~0.2	0.2	0.3~0.6
Ratio of wearing	0.5	0.28	1

5、橡胶弹簧链条

橡胶弹簧链条是指在链条中设置橡胶弹簧，以减少链条受力，保障安全。

5.1 橡胶弹簧链条组成



编号	名称	材质	编号	名称	材质
1	末端卸扣	Q235热浸锌	4	普通链环	Q235热浸锌
2	末端链环	Q235热浸锌	5	螺旋扣	Q235热浸锌
3	橡胶弹簧框架	橡胶,Q235热浸锌			

5.2 橡胶弹簧链条规格

规格	普通链环	末端链环	末端卸扣	弹簧框	螺旋扣
TD-A630H	Φ22	Φ25	M30	Φ32	M36
TD-A800H	Φ25	Φ28	M36	Φ36	M36
TD-A1000H	Φ28	Φ30	M36	Φ36	M36
TD-A1150H	Φ28	Φ30	M36	Φ36	M36
TD-A1250H	Φ28	Φ30	M36	Φ36	M36
TD-A1450H	Φ30	Φ34	M42	Φ42	M42
TD-A1600H	Φ30	Φ34	M42	Φ42	M42
TD-A1700H	Φ34	Φ36	M48	Φ52	M52
TD-A2000H	Φ38	Φ40	M48	Φ52	M52
TD-A2250H	Φ38	Φ40	M56	Φ60	M60
TD-A2500H	Φ40	Φ42	M56	Φ60	M60
TD-A3000H	Φ46	Φ48	M56	Φ60	M60

5.3 吊挂链条设置:

当防冲板重量超过下表允许负荷时，应设置吊挂链条，以防止护舷鼓筒下垂。当护舷垂直排列时，防冲板允许静载荷（单个护舷）见下表：

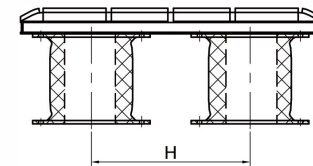
规格 重量 配方 (Kg)	630H	800H	1000H	1150H	1250H	1450H	1600H	1700H	2000H	2250H	2500H	3000H
P01	150	460	850	1140	1310	1370	1630	1770	2100	3050	3280	4570
P0	180	560	1030	1370	1570	1730	2070	2260	2680	3900	4330	6090
P1	235	720	1340	1780	2040	2380	2860	3140	3730	5430	6210	8820
P2	272	840	1550	2050	2360	2750	3220	3630	4330	6430	7430	—
P3	308	950	1750	2320	2670	3180	3840	4220	5020	7450	8680	—

注：当护舷为水平方向排列时，防冲板允许重量取上表的80%。

6、护舷安装最小间距

当护舷被压缩时，其筒体呈鼓形向外膨胀，所以护舷组合安装时，必须有适当间距，避免相互碰撞。

规格	630H	800H	1000H	1150H	1250H	1450H	1600H	1700H	2000H	2250H	2500H	3000H
最小间距 H(mm)	880	1120	1500	1730	1870	2180	2400	2550	2880	3360	3730	4500



5.3 Weight chain:

In the cell rubber fender systems, the super cell fender itself can support the steel frontal frame. If the weight of the frame exceeds and allowable static load, the values in the table below, rubber Flex Chains or other suitable supports must be used to support the frame.

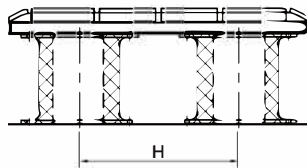
Allowable static load are shown in table:

Spec Weight Grade (Kg)	630H	800H	1000H	1150H	1250H	1450H	1600H	1700H	2000H	2250H	2500H	3000H
P01	150	460	850	1140	1310	1370	1630	1770	2100	3050	3280	4570
P0	180	560	1030	1370	1570	1730	2070	2260	2680	3900	4330	6090
P1	235	720	1340	1780	2040	2380	2860	3140	3730	5430	6210	8820
P2	272	840	1550	2050	2360	2750	3220	3630	4330	6430	7430	—
P3	308	950	1750	2320	2670	3180	3840	4220	5020	7450	8680	—

6. Minimum spacing for installation

When the super cell fender series is compressed, the outer diameter expands. Therefore, the fenders should be installed in such a way that they will not collide with each other.

Spec	630H	800H	1000H	1150H	1250H	1450H	1600H	1700H	2000H	2250H	2500H	3000H
H(mm)	880	1120	1500	1730	1870	2180	2400	2550	2880	3360	3730	4500



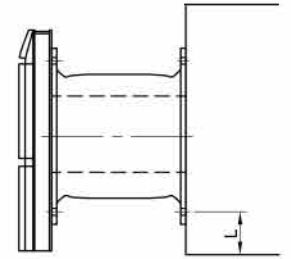
7、倾斜压缩性能

TD-A护舷具有倾斜压缩性能折减少的优点，当码头布置间距较小时，可以不考虑性能影响。在一般情况下，特别是当布置间距过大或靠船角度大时，要考虑这一折减的影响，下表是TD-A型护舷在不同倾斜压缩试验时反力及吸能量修正系数，供参考使用。

角度 (°) 修正系数	3	4	5	6	8	10	15
反力 修正系数(CR)	0.96	0.94	0.93	0.93	0.92	0.92	0.90
吸能量 修正系数(ER)	0.94	0.92	0.87	0.87	0.84	0.80	0.72

8、其他

护舷预埋螺母埋入水泥构件时，预埋螺母与水泥构件边缘的距离（L），一般应不小于所用预埋螺母的长度，请设计者引为注意。如果与边缘距离不够时，预埋螺母也可焊接在水泥构件的钢筋架上，以确保护舷受到剪切力和拉力时，靠船墩不致损坏。



不同规格鼓型护舷与码头边缘的间距L如下：

规格	630H	800H	1000H	1150H	1250H	1450H	1600H	1700H	2000H	2250H	2500H	3000H
间距 L(mm)	330	360	430	500	500	570	570	620	700	700	700	800

7. Angular performance

In case of dolphin and a super-structured berth for large vessels, the effect of angular compression on the fender is generally considered in designing.

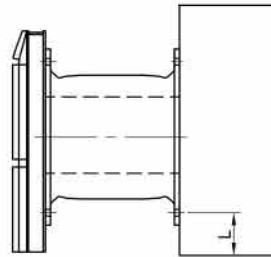
Angle(Deg.) Correction factor	3	4	5	6	8	10	15
Reaction force (CR)	0.96	0.94	0.93	0.93	0.92	0.92	0.90
Energy absorption (ER)	0.94	0.92	0.87	0.87	0.84	0.80	0.72

Remarks: Tolerance of reaction and energy absorption for angular loading is $\pm 15\%$.

8. Minimum clearance from the edge of the concrete structure

When anchor bolts embedded in a concrete structure are used for holding super cell fender on the structure, it is necessary for the distance between the anchor position of the super cell fender and the edge of the concrete structure to be the length of the minimum size of anchor bolt used. When the super cell fender is compressed, shear force or pull-out force is generated and there is danger of the concrete structure becoming damaged.

In case of sufficient length cannot be obtained, anchor bolts should be welded securely to ferroconcrete reinforcement of the concrete so that it can withstand shear force of pull-out force.



Spec	630H	800H	1000H	1150H	1250H	1450H	1600H	1700H	2000H	2250H	2500H	3000H
L(mm)	330	360	430	500	500	570	570	620	700	700	700	800