盤式支承 Pot Bearing

盤式支承墊可分為固定型、單向活動型及雙向活動型。其內部的橡膠墊 (rubber pad) 為支承之主要構件，置於支承底盤 (base pot) 內，受到圍束之橡膠墊在高壓作用下其運動行為類似液態，產生均勻之應力分佈至底盤四周，橡膠墊邊緣之封環 (seal ring) 可防止在高壓下橡膠墊被擠壓破壞。橡膠墊有不可壓縮之特性，受壓時幾乎無任何體積改變，因此可承受相當大之荷重及轉角發生。而鐵氟龍板 (PTFE) 及不銹鋼鈑 (stainless steel) 為活動型支承之滑動介面，鐵氟龍板之安定性高且摩擦係數低 (0.03以下)，是非常適合用於橋樑支承。盤式支承墊設置防塵裝置以防護鐵氟龍板及橡膠墊，使得礫石及水氣等有害物質無法進入，影響支承運作。

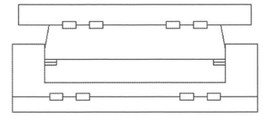
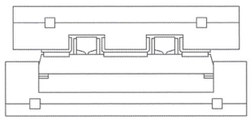
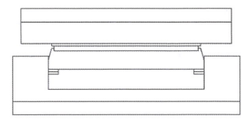
There are three types of pot bearing：fixed, guided and free movable. Rubber pad, which confined in base pot, is the most important parts of pot bearings. When subject to high vertical load, the behavior of rubber pad under high pressure is like fluid and the stresses are transferred uniformly to the pot. The seal ring is placed in the circumference of rubber pad, which prevents escape of the rubber pad through the clearance between pot wall and piston. The rubber pad is incompressible which will not change its volume when loaded; this characteristic makes it capable of bearing huge loadings and rotations. The sliding surface of movable bearings is formed by PTFE sheets and stainless plates. PTFE is a static material and has a very low coefficient of friction (less than 0.03 with stainless steel), which is a perfect material in pot bearings. The dust-protecting device can protect PTFE and rubber pad from entering of moisture and debris and other foreign particles.

■ 基本型式

- ◆ 固定型(FP)：能同時承受垂直、水平載重，但無法於水平任一方向移動。
- ◆ 單向活動型(RM)：承受垂直及單向水平載重，並可沿著無水平力作用之方向（導桿方向）位移。
- ◆ 雙向活動型(FM)：僅能承受垂直載重，不受任何方向水平力，允許於水平任一方向位移。

■ Basic Type

- ◆ Fixed bearing (FP)：Fixed bearing can accommodate vertical and horizontal load, and be fixed in any direction.
- ◆ Guided bearing (RM)：Guided bearing can accommodate vertical and transverse horizontal load, and move along the longitudinal direction.
- ◆ Free movable bearing(FM)：Free movable bearing can only accommodate vertical load but can move in any horizontal direction.

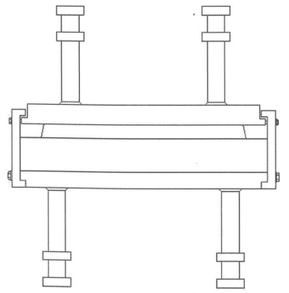
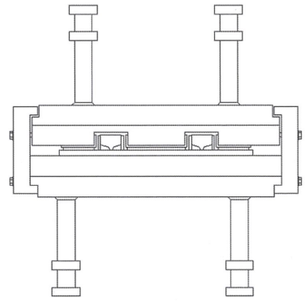
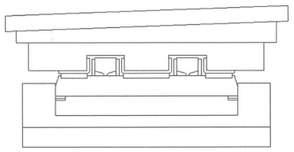
支承型式 Bearing Type	固定型 Fixed Type	單向活動型 Guided Type	雙向活動型 Free Movable Type
斷面構造 Section			

■ 特殊型式

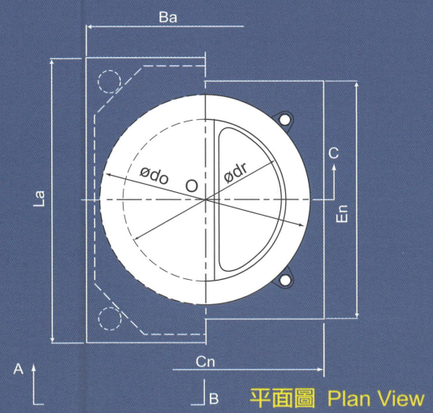
- ◆ 抗拉拔型：考慮上揚力作用時，防止支承上下組件分離，於推進工法橋樑亦可提供傾斜之楔形鈑 (wedge plate)。

■ Special Type

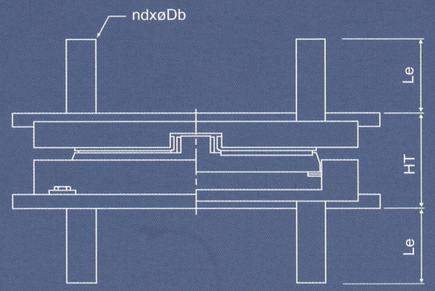
- ◆ Hold down device：For cases that bridges subject to uplift forces, anti-uplift pot bearing can be applied. Hold down devices are used to prevent bearings from separating in those cases. When Incremental Launching Method or Advanced Shoring Bridge Construction applied, Pot bearing can also function as wedge plate with proper slope.

抗拉拔固定型 Fixed with Hold Down Device	抗拉拔單向活動型 Guided with Hold Down Device	含楔形鈑 Wedge Plate
		

■ 單向活動型 Guided Movable Type



平面圖 Plan View



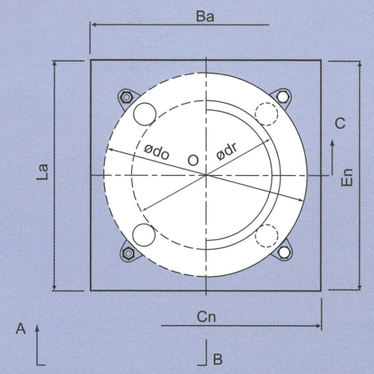
斷面(A-B-O-C)
Section(A-B-O-C)

型 號 Type	設計載重 Ton Design Load	尺 寸 mm / Dimension										支承重量 Kg Bearing Weight
		dr	do	Cn	En	Ba	La	nd	Db	Le	HT	
RM100	100	290	350	390	350	410	495	8	22	132	139	189
RM200	200	365	455	495	455	480	570	8	25	150	164	335
RM400	400	485	620	680	620	600	685	8	35	210	212	729
RM600	600	610	790	850	790	730	815	8	45	270	244	1283
RM800	800	710	950	1030	950	830	915	8	50	300	279	2003
RM1000	1000	810	1080	1160	1080	930	1015	8	55	330	300	2796
RM1200	1200	900	1210	1290	1210	1020	1105	8	60	360	327	3737
RM1500	1500	1020	1350	1450	1350	1140	1225	8	65	415	362	5090
RM2000	2000	1190	1580	1700	1580	1310	1395	9	75	450	431	8139

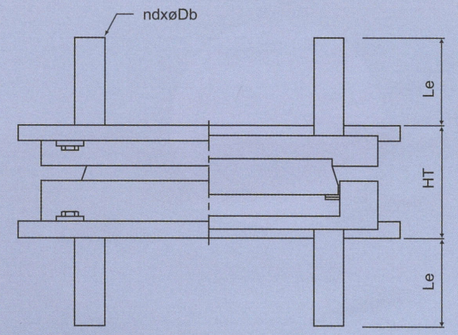
- 上表所列尺寸係依據下列設計條件，僅供參考。
- The dimensions listed above are designed according to the design conditions below and are just for reference.

設 計 條 件 表 Design Conditions							
常時荷重 ton Normal Load		地震時荷重 ton Seismic Load		活動量mm Displacement	轉角Rad. Rotation Angle	混凝土容許應力 kg/cm² Allowable Stress of Concrete	
最大荷重 Max. Load	最小荷重 Min. Load	最大荷重 Max. load	水平力 Horizontal Force			橋樑 Girder	橋墩(台) Pier
V	0.3 × V	V	0.3 × V	± 100	± 0.015	350	350

■ 固定型 Fixed Type



平面圖 Plan View



斷面(A-B-O-C)
Section(A-B-O-C)

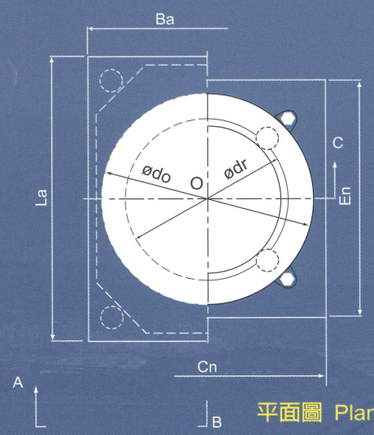
型 號 Type	設計載重 Ton Design Load	尺 寸 mm / Dimension										支承重量 Kg Bearing Weight
		dr	do	Cn	En	Ba	La	nd	Db	Le	HT	
FP100	100	240	310	310	310	360	360	4	25	150	166	156
FP200	200	340	440	440	440	470	470	4	35	210	187	338
FP400	400	465	605	605	605	620	620	4	50	300	232	750
FP600	600	570	760	760	760	740	740	4	60	360	251	1226
FP800	800	660	880	880	880	820	820	6	55	350	254	1632
FP1000	1000	730	980	980	980	880	880	9	50	320	273	2119
FP1200	1200	800	1070	1070	1070	960	960	9	55	350	278	2603
FP1500	1500	900	1200	1200	1200	1120	1120	9	65	390	313	3898
FP2000	2000	1050	1390	1390	1390	1280	1280	9	75	450	353	5740

- 上表所列尺寸係依據下列設計條件，僅供參考。
- The dimensions listed above are designed according to the design conditions below and are just for reference.

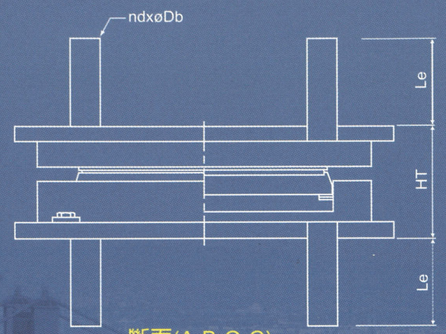
設 計 條 件 表 Design Conditions							
常時荷重 ton Normal Load		地震時荷重 ton Seismic Load		轉角Rad. Rotation Angle	混凝土容許應力 kg/cm² Allowable Stress of Concrete		
最大荷重 Max. Load	最小荷重 Min. Load	最大荷重 Max. load	水平力 Horizontal Force			橋樑 Girder	橋墩(台) Pier
V	0.3 × V	V	0.3 × V	± 0.015		350	350

盤式支承標準尺寸　The Normal Dimensions of Pot Bearing

■ 雙向活動型　Free Movable Type



平面圖 Plan View



斷面(A-B-O-C)
Section(A-B-O-C)

型號 Type	設計載重 Ton Design Load	尺寸 mm / Dimension										支承重量 Kg Bearing Weight
		dr	do	Cn	En	Ba	La	nd	Db	Le	HT	
FM100	100	230	260	260	260	250	240	4	22	132	106	60
FM200	200	330	370	370	370	350	340	4	22	132	112	129
FM400	400	470	530	530	530	490	480	4	22	132	137	313
FM600	600	580	650	650	650	600	590	4	30	180	158	544
FM800	800	670	750	750	750	690	680	4	30	180	173	793
FM1000	1000	740	840	840	840	760	750	4	36	216	180	1018
FM1200	1200	820	920	920	920	840	830	6	30	180	202	1370
FM1500	1500	920	1030	1030	1030	940	930	6	36	216	217	1857
FM2000	2000	1060	1190	1190	1190	1080	1070	6	45	270	244	2764

- 上表所列尺寸係依據下列設計條件，僅供參考。
- The dimensions listed above are designed according to the design conditions below and are just for reference.

設計條件表 Design Conditions							
常時荷重 ton Normal Load		地震時荷重 ton Seismic Load	活動量mm Displacement		轉角Rad. Rotation Angle	混凝土容許應力 kg/cm² Allowable Stress of Concrete	
最大荷重 Max. Load	最小荷重 Min. Load	最大荷重 Max. load	縱向 Vertical	橫向 Transverse		橋樑 Girder	橋墩(台) Pier
V	0.3 × V	V	± 100	± 5	± 0.015	350	350

■ 盤式支承之設計條件：

- 設計載重－ 100 ～ 4000 ton。
- 水 平 力 － 10%設計載重或實際設計所需之水平力二者取其大值。
- 轉　　角 － 除圖面另外規定，一般設計值為 ±0.015rad.(最大可達 ±0.02rad.)。
- 活 動 量 － 活動支承活動量除設計活動量外，另加上 ±25mm之餘裕量。
- 其　　他 － 橋樑上下部結構型式、強度(f'c、fy)、施工法等。

■ The Design Condition of Pot Bearing：

- Design load　－ 100 ~ 4000 ton.
- Horizontal force　－ Design horizontal load or 10% of design load, whichever is greater.
- Rotation angle　－ ±0.015rad. or assigned by bridge designer.
- Displacement　－ Design movement plus ±25mm.
- Others　－ For concerns of Type of superstructure and substructure and construction method.

■ 特點

- 有效模擬滾支承及鉸支承，旋轉勁度低。
- 支承重量輕卻可承受極大之垂直荷重及水平荷重。
- 橋樑頂升高度不大於10 mm下，即可進行抽換。
- 可抽換且維修觀測容易。
- 滑動面採用鐵氟龍(PTFE)具潤滑性，故摩擦係數低且其設計水平活動量大。
- 支承整體高度低。
- 使用壽命長、經濟效益高。

■ Characteristic of Pot Bearing

- Simulate roller and hinge, low rotation stiffness.
- Slight weight but can subject to huge vertical and horizontal load.
- Replaceable by lifting the girder less than 10mm .
- Easy maintenance and observation.
- Large horizontal movement and low coefficient of friction (PTFE).
- Low bearing height.
- Long service life and economic.

表面防蝕處理 Corrosion Control

本公司為提升國內公共工程品質，針對盤式支承之防蝕處理，不惜投入鉅資採用高標準之方法：金屬熔射。自承攬台灣高鐵工程起，所有支承產品已將鋅金屬熔射列為標準防蝕處理。其原理乃利用鋅線短路產生高溫將鋅線熔解後，再以高壓空氣噴塗於已適當處理過之鋼鈑表面；如欲噴塗之鋼鈑表面未經噴砂處理或處理不當，則熔解之鋅線無法附著其上，故採用鋅熔射等於直接地確保表面處理之品質。若採油漆方式，則即使未進行表面噴砂處理或處理不佳，亦可進行下一步之油漆處理程式，但卻對產品之防蝕效果及品質造成極為不良之影響。

To achieve the best quality, we apply metal spray on all Pillar bearings as method of corrosion protection. Zinc Arc Spray is the standard corrosion protection for Pillar bearings. By short circuits of zinc lines, the high temperature will melt the zinc line. Then we spray the melt of zinc with high pressure air to well surface treated steel plates. Only top qualified sand blasting can make zinc spray and steel plate surface cohere. So, compared with using painting, using zinc arc spray can also ensure the quality of surface treatment.

■ 鋅熔射之特點

- ◆ 可根據膜厚預估使用年限
- ◆ 單純之防蝕系統
- ◆ 不須等待乾燥時間
- ◆ 防蝕處理後遭破壞之表面仍有陰極防蝕之保護
- ◆ 良好之抗磨損能力及絕佳之附著力，無化學變化或硬化之可能性
- ◆ 防蝕處理過後不影響鋼鈑之機械性質
- ◆ 可用於任何尺寸與形狀之結構物
- ◆ 一次噴塗作業即可達所需膜厚，不須等待塗裝間隔
- ◆ 鋅熔射處理過之表面可直接以面漆上色

■ Characteristics of Zinc Arc Spray

- ◆ Evaluate using years according to coating thickness.
- ◆ Pure corroding prevention system.
- ◆ Waiting time for dry not required.
- ◆ Destroyed surface used corroding prevention work still has negative pole protection for resisting corroding.
- ◆ Good wearing resisting ability and good adhesion performance, no probability of chemical change and harden.
- ◆ No influence on mechanical property of steel plate.
- ◆ Can be applied to all types of structure and sizes.
- ◆ The required coating thickness can be obtained at one time of spraying process.
- ◆ The surface of zinc arc spray can be painted colors directly.

試驗設備 Testing Equipment

台灣皮拉工業於2000年裝設完成6000噸雙軸向加壓試驗機，提供各型支承更完善的性能測試所需。

In 2000, Taiwan Pillar set up the "6000 Ton Biaxial Press Testing System" which is the greatest testing machine in Taiwan.

■ 雙軸向加壓試驗台 6000 Ton Biaxial Press Testing System

性能 Function	6000 T			
	水平方向 Horizontal		垂直方向 Vertical	
最大出力 Max. Force	向前 Forward	668 T	向下 Downward	6155 T
	向後 Backward	540 T	向上 Upward	368 T
最大位移 Max. Movement	2600 mm（最大振幅±600 mm）		500 mm	
最大位移速度 Max. Moving Speed	13 mm/sec		0.58 mm/sec	
試驗台面尺寸 Table Size	□ 2000 x 2000 mm