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Technological Isolator Systems

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**POT BEARING**

# TIS POT BEARING (TPB)

## Description

TIS Pot Bearing (TPB), produced by TIS Technological Isolator Systems Inc., is a structural bearing which is used for connecting different structural elements (substructure and superstructure) and controlling force and displacement demands developed between the structural elements. The working mechanism of TPB is to transfer the forces developed on the superstructure to the substructure with desired rate, and to allow the rotations on the substructure and the other movements developed by the actions listed below.

- Loads
- Shrinkage and expansion in concrete
- Seismic effects
- Temperature changes

TPB devices are designed according to the requirements applicable to relevant parts of EN 1337, mainly EN 1337-2 and EN 1337-5.

## Bearing Types

TPB devices are produced in three different types according to the force and displacement interactions that need to be accommodated. TPB's that TIS Inc. produce are listed below.

- Fixed pot bearing : TPB-FX
- Free sliding pot bearing : TPB-FS
- Guided sliding pot bearing : TPB-GS



**TPB-FX**



**TPB-FS**



**TPB-GS**

## TPB-FX

TPB-FX consists of an elastomeric pad placed inside a steel pot, and a steel piston pressing and rotating on the elastomeric pad. This type of bearings resists horizontal displacement demands in any direction and only allows superstructure to rotate about any horizontal axis. Elastomeric pad, placed inside the pot, resists the compressive pressure that the vertical load produces by behaving like an incompressible fluid in a confined volume, and allows the rotation of the piston with shear deformation in the elastomer. The contact between the piston and the pot wall transfers the horizontal forces on the superstructure and the piston connected to it, to the substructure.

## TPB-FS

TPB-FS is composed of a TPB-FX type device and an upper plate that is free to slide on top of the piston in any horizontal direction. This sliding surface is composed of a dimpled PTFE sheet fixed in a recess on the piston and a polished stainless steel fixed on the lower surface of the upper plate. This sliding surface allows the superstructure to move freely in any horizontal direction relative to the substructure, with the low friction provided by the lubricant in the dimples of PTFE sheet. Besides, the horizontal forces on the superstructure are not transferred to the substructure.

## TPB-GS

TPB-GS is almost the same as TPB-FS but this type of bearing has a guide in the middle of the top of the PTFE-placed piston, in the direction of the design movement. Besides there is a canal in the middle of the upper sliding plate that the guide is placed and slide inside. The guide allows the superstructure to move only in the direction of the design displacement and prevents it to move in all other horizontal directions and while doing that, transfers the horizontal forces developed in those directions to the subassembly and to the substructure with the contact between the guide and sliding plate.

## Device Components

1. Pot
2. Elastomeric pad and internal seal
3. Piston
4. PTFE
5. Guide
6. CM1 Composite material
7. Upper sliding plate
8. Polished stainless steel
9. Anchorage bolts
10. Dust protection



## Materials

Pot, piston, guide and upper sliding plates of the TPB devices are produced from S355 structural steel. It is advantageous to use S355 structural steel for both design and production of the devices since it is a well-known material. This material has also proven its performance under various structural loads.

Elastomeric pad, which has a 60 MPa compressive strength and a hardness of at least Shore A 50, transfers the vertical loads to the substructure without damaging the bearing, and provides strength against the rotational movements without being damaged during the operating time of the device.

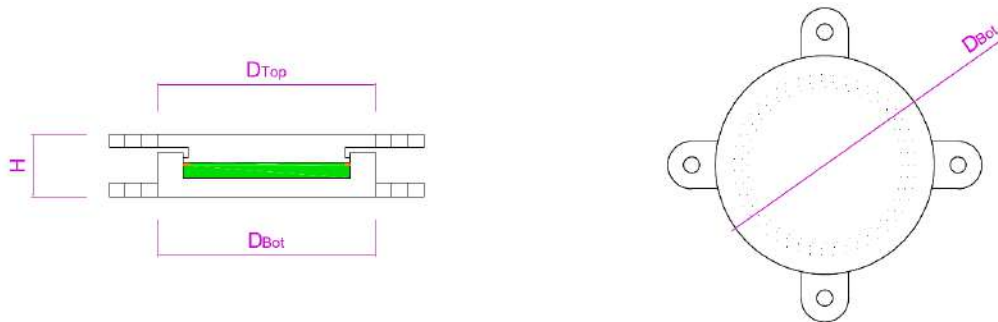
Seal is used in order to prevent the elastomeric pad from bursting out of the pot and prevent any pad damage during the rotational movements.

Dimpled PTFE sheets, having a compressive strength of 90 MPa, is used in TPB-GS and TPB-FS devices and lubricants are used to provide high compressive strength against vertical loads and low friction for sliding movements.

Composite material with a compressive strength of 200 MPa and a low friction coefficient is used on the sides of guides in TPB-GS in order to resist high horizontal loads transferred from upper sliding plate to the guide.

### TIS Pot Bearing – Fixed Type (TPB-FX)

	<b>N<sub>Sd</sub></b>	<b>N<sub>S,min</sub></b>	<b>V<sub>Sd</sub></b>	<b>D<sub>Bot</sub></b>	<b>D<sub>Top</sub></b>	<b>H</b>	<b>W</b>
<b>Device Code</b>	<b>(kN)</b>	<b>(kN)</b>	<b>(kN)</b>	<b>(mm)</b>	<b>(mm)</b>	<b>(mm)</b>	<b>(kg)</b>
TPB-FX-1000-141	1000	250	100	210	210	45	10
TPB-FX-2000-282	2000	500	200	300	300	54	24
TPB-FX-3000-424	3000	750	300	360	360	70	46
TPB-FX-4000-566	4000	1000	400	430	430	71	65
TPB-FX-5000-707	5000	1250	500	480	480	81	92
TPB-FX-6000-849	6000	1500	600	530	530	84	115
TPB-FX-7000-990	7000	1750	700	570	570	91	143
TPB-FX-8000-1131	8000	2000	800	610	610	96	173
TPB-FX-9000-1273	9000	2250	900	650	650	105	217
TPB-FX-10000-1414	10000	2500	1000	680	680	112	254
TPB-FX-12000-1697	12000	3000	1200	750	750	127	352
TPB-FX-14000-1980	14000	3500	1400	800	800	134	422
TPB-FX-16000-2263	16000	4000	1600	860	860	144	522
TPB-FX-18000-2546	18000	4500	1800	910	910	150	607
TPB-FX-20000-2828	20000	5000	2000	940	940	166	724
TPB-FX-25000-3536	25000	6250	2500	1050	1050	182	986
TPB-FX-30000-4243	30000	7500	3000	1150	1150	200	1302
TPB-FX-50000-7071	50000	12500	5000	1500	1500	255	2830

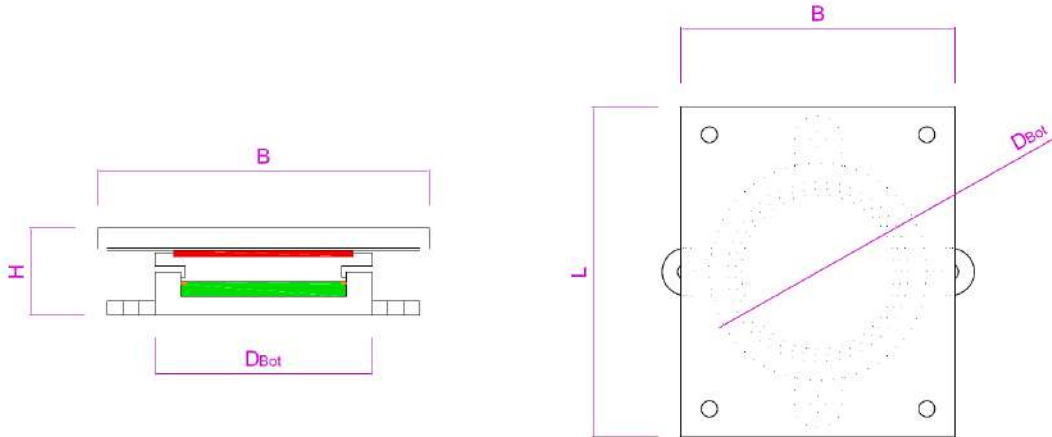


#### Notes:

1. Horizontal force in one direction is assumed as 10% of the vertical force. Total horizontal force is taken as resultant of horizontal forces, i.e.  $V_{Sd} = \sqrt{V_{Sd,x}^2 + V_{Sd,y}^2}$
2. The bearing dimension table is prepared considering C30/37 sub- and super-structure, and C60 grout concrete applied with necessary thickness and dimensions.
3. The bearings are assumed to have a rotation capacity of  $\pm 0.01$  rad.
4. Bearings with design forces and assumptions different from this table can be designed accordingly.

### TIS Pot Bearing – Free Sliding Type (TPB-FS) – Small Displacements

	$N_{sd}$	$N_{s,min}$	$d_x / d_y$	$D_{Bot}$	B	L	H	W
Device Code	(kN)	(kN)	(mm)	(mm)	(mm)	(mm)	(mm)	(kg)
TPB-FS-1000-50/10	1000	250	50/10	200	260	340	65	23
TPB-FS-2000-50/10	2000	500	50/10	280	330	410	77	45
TPB-FS-3000-50/10	3000	750	50/10	340	390	470	84	69
TPB-FS-4000-50/10	4000	1000	50/10	400	440	520	92	97
TPB-FS-5000-50/10	5000	1250	50/10	450	480	560	100	127
TPB-FS-6000-50/10	6000	1500	50/10	480	510	590	108	155
TPB-FS-7000-50/10	7000	1750	50/10	530	550	630	113	190
TPB-FS-8000-50/10	8000	2000	50/10	560	570	650	118	214
TPB-FS-9000-50/10	9000	2250	50/10	600	620	700	130	276
TPB-FS-10000-50/10	10000	2500	50/10	630	640	720	134	307
TPB-FS-12000-50/10	12000	3000	50/10	690	700	780	148	402
TPB-FS-14000-50/10	14000	3500	50/10	740	740	820	156	481
TPB-FS-16000-50/10	16000	4000	50/10	800	790	870	163	575
TPB-FS-18000-50/10	18000	4500	50/10	840	830	910	170	660
TPB-FS-20000-50/10	20000	5000	50/10	890	880	960	185	808
TPB-FS-25000-50/10	25000	6250	50/10	990	970	1050	199	1057
TPB-FS-30000-50/10	30000	7500	50/10	1080	1050	1130	216	1351
TPB-FS-50000-50/10	50000	12500	50/10	1400	1330	1410	276	2866



#### Notes:

1. Horizontal displacement in X and Y directions are assumed to be  $\pm 50$  mm and  $\pm 10$  mm, respectively.
2. The bearing dimension table is prepared considering C30/37 sub- and super-structure, and C60 grout concrete applied with necessary thickness and dimensions.
3. The bearings are assumed to have a rotation capacity of  $\pm 0.01$  rad.
4. Bearings with design forces and assumptions different from this table can be designed accordingly.

### TIS Pot Bearing – Free Sliding Type (TPB-FS) – Medium Displacements

	$N_{sd}$	$N_{s,min}$	$d_x / d_y$	$D_{pot}$	B	L	H	W
Device Code	(kN)	(kN)	(mm)	(mm)	(mm)	(mm)	(mm)	(kg)
TPB-FS-1000-100/20	1000	250	100/20	200	280	440	68	32
TPB-FS-2000-100/20	2000	500	100/20	280	350	510	80	57
TPB-FS-3000-100/20	3000	750	100/20	340	410	570	88	87
TPB-FS-4000-100/20	4000	1000	100/20	400	460	620	95	118
TPB-FS-5000-100/20	5000	1250	100/20	450	500	660	104	153
TPB-FS-6000-100/20	6000	1500	100/20	480	530	690	111	181
TPB-FS-7000-100/20	7000	1750	100/20	530	570	730	117	223
TPB-FS-8000-100/20	8000	2000	100/20	560	590	750	122	250
TPB-FS-9000-100/20	9000	2250	100/20	600	640	800	134	317
TPB-FS-10000-100/20	10000	2500	100/20	630	660	820	138	350
TPB-FS-12000-100/20	12000	3000	100/20	690	720	880	152	453
TPB-FS-14000-100/20	14000	3500	100/20	740	760	920	159	532
TPB-FS-16000-100/20	16000	4000	100/20	800	810	970	166	633
TPB-FS-18000-100/20	18000	4500	100/20	840	850	1010	173	722
TPB-FS-20000-100/20	20000	5000	100/20	890	900	1060	188	879
TPB-FS-25000-100/20	25000	6250	100/20	990	990	1150	202	1141
TPB-FS-30000-100/20	30000	7500	100/20	1080	1070	1230	220	1458
TPB-FS-50000-100/20	50000	12500	100/20	1400	1350	1510	276	2987



#### Notes:

1. Horizontal displacement in X and Y directions are assumed to be  $\pm 100$  mm and  $\pm 20$  mm, respectively.
2. The bearing dimension table is prepared considering C30/37 sub- and super-structure, and C60 grout concrete applied with necessary thickness and dimensions.
3. The bearings are assumed to have a rotation capacity of  $\pm 0.01$  rad.
4. Bearings with design forces and assumptions different from this table can be designed accordingly.

### TIS Pot Bearing – Free Sliding Type (TPB-FS) – Large Displacements

	$N_{sd}$	$N_{S\_min}$	$d_x / d_y$	$D_{pot}$	$B$	$L$	$H$	$W$
Device Code	(kN)	(kN)	(mm)	(mm)	(mm)	(mm)	(mm)	(kg)
TPB-FS-1000-250/50	1000	250	250/50	200	340	740	80	79
TPB-FS-2000-250/50	2000	500	250/50	280	410	810	92	122
TPB-FS-3000-250/50	3000	750	250/50	340	470	870	99	166
TPB-FS-4000-250/50	4000	1000	250/50	400	520	920	107	214
TPB-FS-5000-250/50	5000	1250	250/50	450	560	960	115	259
TPB-FS-6000-250/50	6000	1500	250/50	480	590	990	123	300
TPB-FS-7000-250/50	7000	1750	250/50	530	630	1030	128	353
TPB-FS-8000-250/50	8000	2000	250/50	560	650	1050	133	387
TPB-FS-9000-250/50	9000	2250	250/50	600	700	1100	145	474
TPB-FS-10000-250/50	10000	2500	250/50	630	720	1120	149	514
TPB-FS-12000-250/50	12000	3000	250/50	690	780	1180	163	641
TPB-FS-14000-250/50	14000	3500	250/50	740	820	1220	170	738
TPB-FS-16000-250/50	16000	4000	250/50	800	870	1270	177	862
TPB-FS-18000-250/50	18000	4500	250/50	840	910	1310	184	971
TPB-FS-20000-250/50	20000	5000	250/50	890	960	1360	199	1153
TPB-FS-25000-250/50	25000	6250	250/50	990	1050	1450	213	1464
TPB-FS-30000-250/50	30000	7500	250/50	1080	1130	1530	231	1829
TPB-FS-50000-250/50	50000	12500	250/50	1400	1410	1810	282	3489

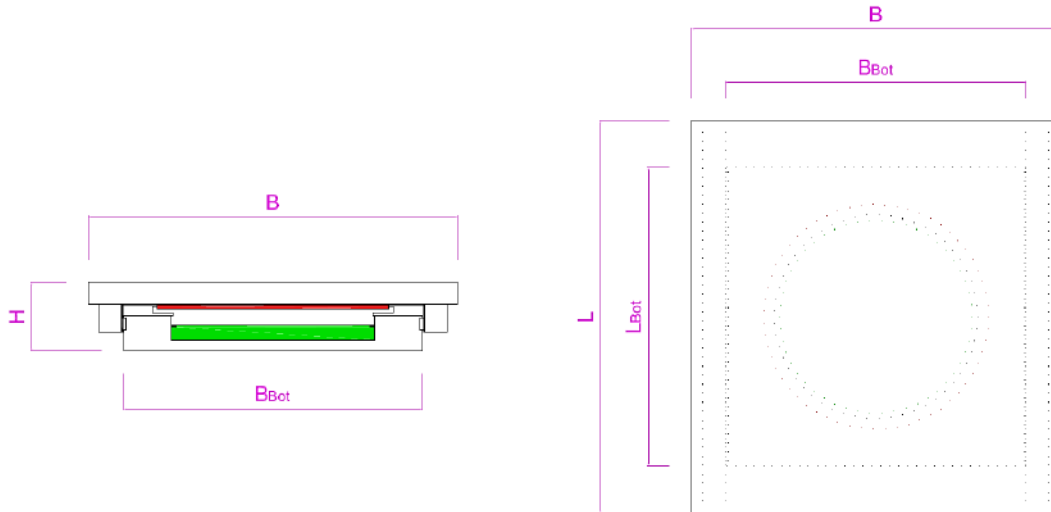


#### Notes:

1. Horizontal displacement in X and Y directions are assumed to be  $\pm 250$  mm and  $\pm 50$  mm, respectively.
2. The bearing dimension table is prepared considering C30/37 sub- and super-structure, and C60 grout concrete applied with necessary thickness and dimensions.
3. The bearings are assumed to have a rotation capacity of  $\pm 0.01$  rad.
4. Bearings with design forces and assumptions different from this table can be designed accordingly.

### TIS Pot Bearing – Guided Sliding Type (TPB-GS) – Small Displacements

	$N_{Sd}$	$N_{S,min}$	$V_{Sd}$	$d_x$	$B, L_{Bot}$	$B$	$L$	$H$	$W$
Device Code	(kN)	(kN)	(kN)	(mm)	(mm)	(mm)	(mm)	(mm)	(kg)
TPB-GS-1000/100-50	1000	250	100	50	210	270	375	67	30
TPB-GS-2000/200-50	2000	500	200	50	300	375	475	79	66
TPB-GS-3000/300-50	3000	750	300	50	360	440	540	88	99
TPB-GS-4000/400-50	4000	1000	400	50	420	500	600	98	141
TPB-GS-5000/500-50	5000	1250	500	50	470	565	660	110	195
TPB-GS-6000/600-50	6000	1500	600	50	510	610	710	117	243
TPB-GS-7000/700-50	7000	1750	700	50	560	665	765	124	304
TPB-GS-8000/800-50	8000	2000	800	50	600	710	810	130	363
TPB-GS-9000/900-50	9000	2250	900	50	640	765	855	140	441
TPB-GS-10000/1000-50	10000	2500	1000	50	670	800	890	145	498
TPB-GS-12000/1200-50	12000	3000	1200	50	740	880	970	162	667
TPB-GS-14000/1400-50	14000	3500	1400	50	790	940	1030	172	806
TPB-GS-16000/1600-50	16000	4000	1600	50	860	1020	1105	181	992
TPB-GS-18000/1800-50	18000	4500	1800	50	910	1070	1160	188	1145
TPB-GS-20000/2000-50	20000	5000	2000	50	950	1115	1205	200	1311
TPB-GS-25000/2500-50	25000	6250	2500	50	1060	1240	1335	219	1776
TPB-GS-30000/3000-50	30000	7500	3000	50	1160	1350	1450	240	2310
TPB-GS-50000/5000-50	50000	12500	5000	50	1480	1715	1815	311	4811



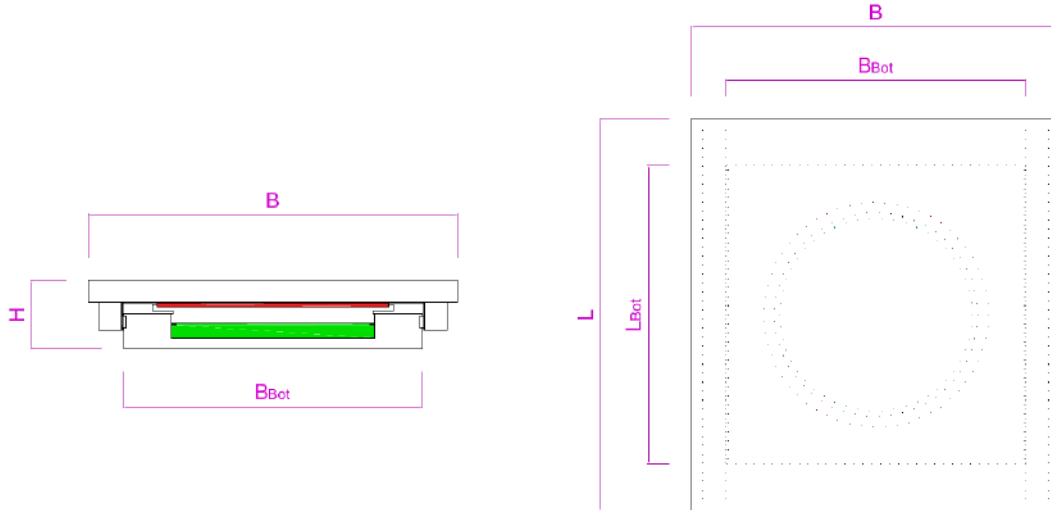
#### Notes:

1. Horizontal displacement in the direction of movement is assumed to be  $\pm 50$  mm.
2. The bearing dimension table is prepared considering C30/37 sub- and super-structure, and C60 grout concrete applied with necessary thickness and dimensions.
3. The bearings are assumed to have a rotation capacity of  $\pm 0.01$  rad.
4. Bearings with design forces and assumptions different from this table can be designed accordingly.



### TIS Pot Bearing – Guided Sliding Type (TPB-GS) – Medium Displacements

	$N_{Sd}$	$N_{S,min}$	$V_{Sd}$	$d_x$	$B, L_{Bot}$	$B$	$L$	$H$	$W$
Device Code	(kN)	(kN)	(kN)	(mm)	(mm)	(mm)	(mm)	(mm)	(kg)
TPB-GS-1000/100-100	1000	250	100	100	210	270	475	70	38
TPB-GS-2000/200-100	2000	500	200	100	300	375	575	82	80
TPB-GS-3000/300-100	3000	750	300	100	360	440	640	93	120
TPB-GS-4000/400-100	4000	1000	400	100	420	500	700	101	165
TPB-GS-5000/500-100	5000	1250	500	100	470	565	760	113	224
TPB-GS-6000/600-100	6000	1500	600	100	510	610	810	120	277
TPB-GS-7000/700-100	7000	1750	700	100	560	665	865	127	343
TPB-GS-8000/800-100	8000	2000	800	100	600	710	910	133	407
TPB-GS-9000/900-100	9000	2250	900	100	640	765	955	143	491
TPB-GS-10000/1000-100	10000	2500	1000	100	670	800	990	148	552
TPB-GS-12000/1200-100	12000	3000	1200	100	740	880	1070	165	731
TPB-GS-14000/1400-100	14000	3500	1400	100	790	940	1130	175	878
TPB-GS-16000/1600-100	16000	4000	1600	100	860	1020	1205	184	1077
TPB-GS-18000/1800-100	18000	4500	1800	100	910	1070	1260	191	1238
TPB-GS-20000/2000-100	20000	5000	2000	100	950	1115	1305	203	1411
TPB-GS-25000/2500-100	25000	6250	2500	100	1060	1240	1435	222	1899
TPB-GS-30000/3000-100	30000	7500	3000	100	1160	1350	1550	243	2455
TPB-GS-50000/5000-100	50000	12500	5000	100	1480	1715	1915	311	4968

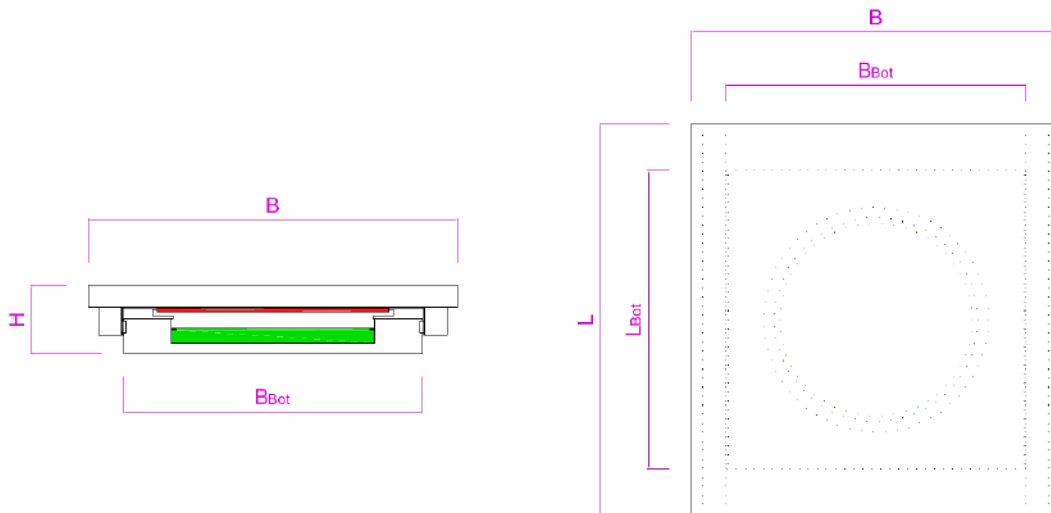


#### Notes:

1. Horizontal displacement in the direction of movement is assumed to be  $\pm 100$  mm.
2. The bearing dimension table is prepared considering C30/37 sub- and super-structure, and C60 grout concrete applied with necessary thickness and dimensions.
3. The bearings are assumed to have a rotation capacity of  $\pm 0.01$  rad.
4. Bearings with design forces and assumptions different from this table can be designed accordingly.

### TIS Pot Bearing – Guided Sliding Type (TPB-GS) – Large Displacements

	$N_{Sd}$	$N_{S\_min}$	$V_{Sd}$	$d_x$	$B, L_{Bot}$	$B$	$L$	$H$	$W$
Device Code	(kN)	(kN)	(kN)	(mm)	(mm)	(mm)	(mm)	(mm)	(kg)
TPB-GS-1000/100-250	1000	250	100	250	210	270	775	81	75
TPB-GS-2000/200-250	2000	500	200	250	300	375	875	93	139
TPB-GS-3000/300-250	3000	750	300	250	360	440	940	102	192
TPB-GS-4000/400-250	4000	1000	400	250	420	500	1000	111	253
TPB-GS-5000/500-250	5000	1250	500	250	470	565	1060	124	336
TPB-GS-6000/600-250	6000	1500	600	250	510	610	1110	130	399
TPB-GS-7000/700-250	7000	1750	700	250	560	665	1165	137	484
TPB-GS-8000/800-250	8000	2000	800	250	600	710	1210	143	566
TPB-GS-9000/900-250	9000	2250	900	250	640	765	1255	153	668
TPB-GS-10000/1000-250	10000	2500	1000	250	670	800	1290	158	743
TPB-GS-12000/1200-250	12000	3000	1200	250	740	880	1370	175	959
TPB-GS-14000/1400-250	14000	3500	1400	250	790	940	1430	185	1133
TPB-GS-16000/1600-250	16000	4000	1600	250	860	1020	1505	193	1359
TPB-GS-18000/1800-250	18000	4500	1800	250	910	1070	1560	200	1546
TPB-GS-20000/2000-250	20000	5000	2000	250	950	1115	1605	213	1756
TPB-GS-25000/2500-250	25000	6250	2500	250	1060	1240	1735	232	2317
TPB-GS-30000/3000-250	30000	7500	3000	250	1160	1350	1850	252	2927
TPB-GS-50000/5000-250	50000	12500	5000	250	1480	1715	2215	321	5735



#### Notes:

1. Horizontal displacement in the direction of movement is assumed to be  $\pm 250$  mm.
2. The bearing dimension table is prepared considering C30/37 sub- and super-structure, and C60 grout concrete applied with necessary thickness and dimensions.
3. The bearings are assumed to have a rotation capacity of  $\pm 0.01$  rad.
4. Bearings with design forces and assumptions different from this table can be designed accordingly.