HIRUN
HI TECH CIVIL ENGINEERING

HIPOT
POT BEARINGS
CE MARKED

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HIPOT
POT BEARINGS

◎COMPANY INTRODUCTION

Founded in 1998, Wuhan Hirun Engineering Equipment Co., Ltd. (HIRUN) is a professional manufacturing enterprise of research, development, production and sales in bridge and anti- seismic products.

Its headquarters are located in Wuhan, Hubei, China and comprise a workshop of 20.000 m^2, an office of 2000 m^2 and a high performance testing laboratory. The employees active in the headquarters are nearly 300 and the production capacity is over 5000 structural devices per month.

Subsidiary production facilities, marketing operation and technical offices are located in Taipei and Milano, Italy.

HIRUN is the subsidiary of China Shipbuilding Industry Corporation (CSIC), one of world's top 500 enterprises.

◎HIPOT POT BEARINGS: GENERAL

HIPOT bearings are structural devices allowing relative rotations around 3 axes between two members of a structure, and may transmit the loads in any direction preventing any displacement (Fixed Bearing HIPOT FP), or allowing displacement in one direction only (Guided Bearing HIPOT GP), or in all directions of a plane (Free Sliding Bearing HIPOT SP).

HIPOT bearings can be utilized in bridges, buildings and any kind of structure of civil engineering, including railway bridges and structures located in seismic areas.

HIPOT bearings are suitable for minimum temperatures of −40°C (type FP) or −35°C (types GPand SP) and maximum temperatures of +50°C.

The extrusion of the elastomeric pad is prevented by a brass seal that can grant a total accumulated slide path due to rotation greater than 1000 m.

HIPOT bearings are designed and manufactured according to EN 1337.5 and EN 1337.2 and are CE marked but on demand they can be manufactured in accordance with any other standard.

HIPOT bearings can grant a life span over 100 years with a very limited maintenance program.

◎FUNCTION AND STANDARD APPLICATION

Main function and standardapplications where the using of HIPOT is suggested:

◆are suitable to transmit vertical loads from zero to 100.000 kN and more.

◆can transmit high horizontal loads even in absence of a vertical load.

◆can allow rotations around 3 axes with very limited restraint moment.

◆can allow movements in one or two directions with very low friction and without any limitation.

◆can resist dynamic loads and are resistant to fatigue effects.

Main special application:

◆can be provided with anti−lift system in order to resist negative loads.

◆can be provided with an injection system in order to compensate foundation settlements.

◆can be provided with load cell and displacement transducers.

◆can be combined with Shock Transmission Unit or Hysteretic devices for special applications in seismic areas.

◎OPTIONAL ITEMS

The following items may be added to the bearings if requested:

−A protection seal to protect the PTFE sheet

−A rubber dust proofing skirt

−A displacement indicator

−A wedge plate to adapt inclined beams

−A monitor system to record loads and displacement

−An injection system to compensate foundation settlements

−A temporary sliding device to allow incremental launching of the bridges

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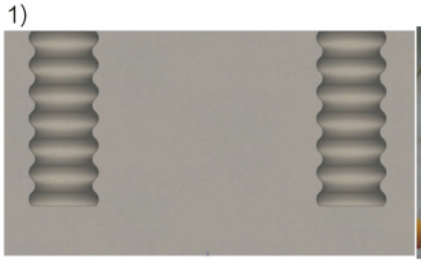
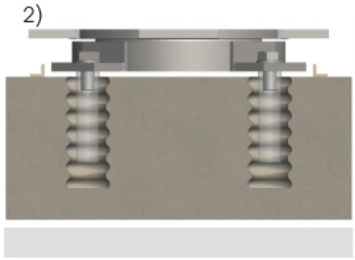
◎INSTALLATION

The correct installation of the bearings is essential to grant a long lasting performance.
The installation shall always be carried out by qualified and trained personnel, eventually with the co-operation of HIRUN specialists.
For each job HIRUN will issue a detailed and dedicated installation manually.
In the following schemes is shown one of the most common procedures for cast in situ structures.

1)

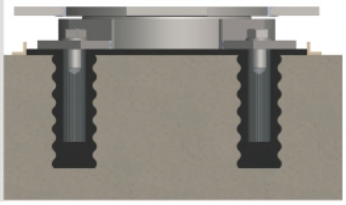


2)



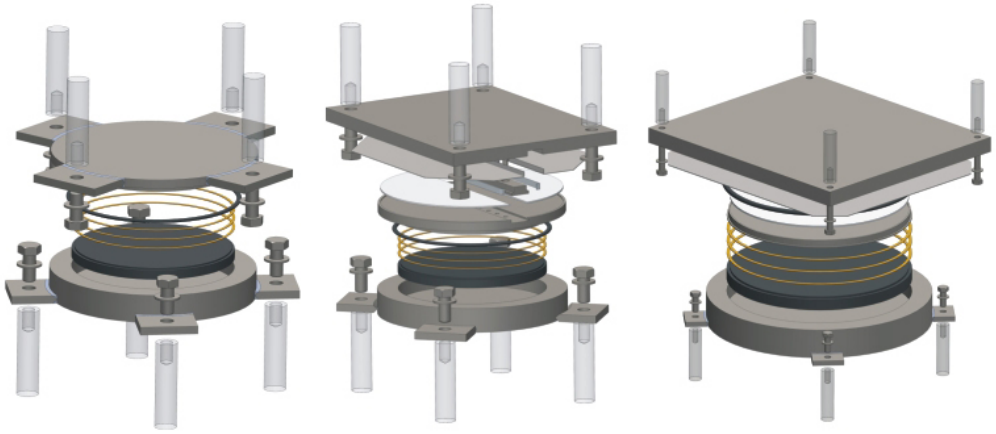
1)Formimg the holes of the anchor bolts on the top of the piers
2)Peacimg the bearing and installing the mould for injecting the concrete
3)Injecting the mortar

3)



◎DESCRIPTION

HIPOT bearings mainly consist of a rubber disc confined in a steel pot and a steel piston. The rubber disc under compression behaves as a liquid allowing the relative rotation between the pot and the piston around 3 axes. A brass seal prevent the rubber under pressure to be extruded between the pot and the piston.



There are 3 types of HIPOT bearings:

HIPOT FP Fixed. It simply consists of the pot, the piston and the rubber disc. It can transmit forces in 3 directions and allow rotations around 3 axes (3 degrees of freedom). The horizontal loads are transmitted internally through a mechanical contact between the piston and the pot and to the structure by means of bolts or steel dowels.
HIPOT SP Free Sliding. It is similar to the fixed one but with the addition of a PTFE sheet and a steel sliding plate with the surface in contact with the PTFE plated with stainless steel mirror finished. It can transmit forces in 1 direction only, allowing displacement in 2 directions and rotations around 3 axes (5 degrees of freedom).
HIPOT GP Sliding Guided. It is similar to the free sliding one but with the addition of a guide allowing the displacement in one direction and transmitting the horizontal load in the perpendicular one. It can transmit forces in 2 directions allowing displacement in one direction and rotations around 3 axes (4 degrees of freedom).

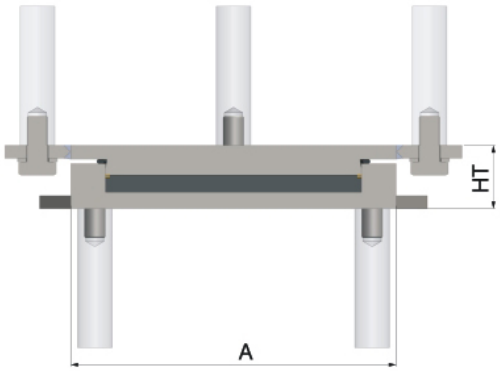
◎DIMENSIONS TABLE: HIPOT FP FIXED

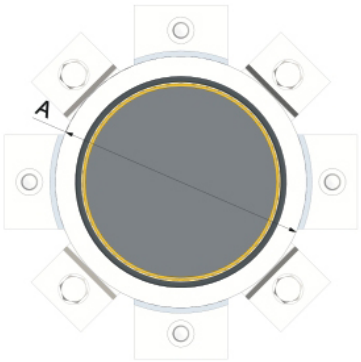
They are identified by the following Mark:

FP V_k (kN)−H_k (kN)

EXAMPLE:

FP 20000−4000: Fixed Pot Bearing with 20000 kN characteristic vertical load and 4000 kN characteristic horizontal load





V_k	V_d	H_k	A	HT
kN	kN	kN	mm	mm
1000	1400	200	250	52
2000	2800	400	360	67
3000	4200	600	430	78
4000	5600	800	490	82
5000	7000	1000	540	90
6000	8400	1200	590	95
7000	9800	1400	620	95
8000	11299	1600	670	110
9000	12600	1800	700	110
10000	14000	2000	730	110
11000	15400	2200	770	115
12000	16800	2400	800	122
13000	18200	2600	830	125
15000	21000	3000	900	132
17500	24500	3500	970	145
20000	28000	4000	1030	160
25000	35000	5000	1150	200
30000	42000	6000	1260	240
40000	56000	8000	1460	280
50000	70000	10000	1630	320
60000	84000	12000	1790	360

V_k=CHARACTERISTIC VERTICAL LOAD (SLS)

V_d=DESIGN VERTICAL LOAD (ULS)

H_K= CHARACTERISTIC HORIZONTAL LOAD (SLS)

A=BOTTOM AND UPPER PLATE DIMENSIONS

HT=TOTAL HEIGHT

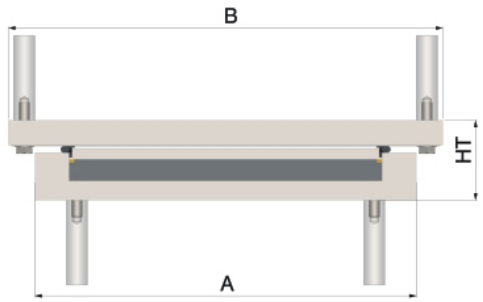
◎DIMENSIONS TABLE: HIPOT SP SLIDING

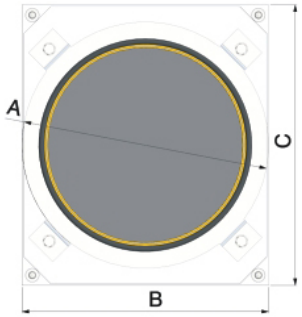
They are identified by the following Mark:

SP V_k (kN)/X (mm)/Y(mm)

EXAMPLE:

SP 20000/100/50: Free Sliding Pot Bearing with 20000 kN characteristic vertical load, 100 mm longitudinal displacement (±50 mm) and 50 mm transversal displacement (±25 mm)





V_k	V_d	Y	X	A	B	C	HT
kN	kN	mm	mm	mm	mm	mm	mm
1000	1400	±25	±50	250	300	350	75
2000	2800	±25	±50	360	410	460	97
3000	4200	±25	±50	430	480	530	112
4000	5600	±25	±50	490	540	590	119
5000	7000	±25	±50	540	590	640	130
6000	8400	±25	±50	590	640	690	138
7000	9800	±25	±50	620	670	720	139
8000	11299	±25	±50	670	720	770	157
9000	12600	±25	±50	700	750	800	159
10000	14000	±25	±50	730	780	830	161
11000	15400	±25	±50	770	820	870	168
12000	16800	±25	±50	800	850	900	177
13000	18200	±25	±50	830	880	930	181
15000	21000	±25	±50	900	950	1000	192
17500	24500	±25	±50	970	1020	1070	209
20000	28000	±25	±50	1030	1080	1130	228
25000	35000	±25	±50	1150	1200	1250	274
30000	42000	±25	±50	1260	1310	1360	321
40000	56000	±25	±50	1460	1510	1560	372
50000	70000	±25	±50	1630	1680	1730	421
60000	84000	±25	±50	1790	1840	1890	471

V_k=CHARACTERISTIC VERTICAL LOAD (SLS)
V_d=DESIGN VERTICAL LOAD (ULS)
Y=TRANSVERSAL DISPLACEMENT
X=LONGITUDINAL DISPLACEMENT

A= BOTTOM PLATE DIMENSION
B,C= UPPER PLATE DIMENSIONS
HT= TOTAL HEIGHT

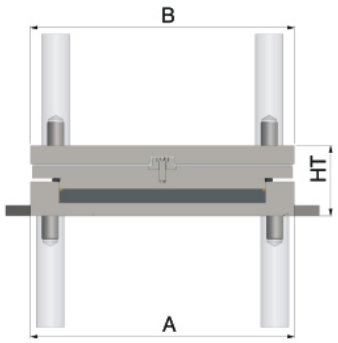
◎DIMENSIONS TABLE: HIPOT GP GUIDED

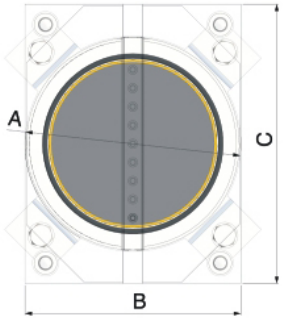
They are identified by the following Mark:

GP V_k (kN)/X (mm)−H_k(kN)

EXAMPLE:

GP 20000/100−3000: Sliding Guided Pot Bearing with 20000 kN characteristic vertical load, 100 mm longitudinal displacement (± 50 mm) and 3000 kN transversal characteristic load





V_k	V_d	H_k	X	A	B	C	HT
kN	kN	kN	mm	mm	mm	mm	mm
1000	1400	150	100	250	250	350	75
2000	2800	300	100	360	360	460	97
3000	4200	450	100	430	430	530	112
4000	5600	600	100	490	490	590	119
5000	7000	750	100	540	540	640	130
6000	8400	900	100	590	590	690	138
7000	9800	1050	100	620	620	720	139
8000	11299	1200	100	670	670	770	157
9000	12600	1350	100	700	700	800	159
10000	14000	1500	100	730	730	830	161
11000	15400	1650	100	770	770	870	168
12000	16800	1800	100	800	800	900	177
13000	18200	1950	100	830	830	930	181
15000	21000	2250	100	900	900	1000	192
17500	24500	2625	100	970	970	1070	209
20000	28000	3000	100	1030	1030	1130	228
25000	35000	3750	100	1150	1150	1250	274
30000	42000	4500	100	1260	1260	1360	321
40000	56000	6000	100	1460	1460	1560	372
50000	70000	7500	100	1630	1630	1730	421
60000	84000	9000	100	1790	1790	1890	471

V_k=CHARACTERISTIC VERTICAL LOAD (SLS)

V_d=DESIGN VERTICAL LOAD (ULS)

H_K= CHARACTERISTIC HORIZONTAL LOAD (SLS)

X=LONGITUDINAL DISPLACEMENT

A= BOTTOM PLATE DIMENSION

B,C= UPPER PLATE DIMENSIONS

HT= TOTAL HEIGHT

HIPOT
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◎STANDARD

Normally HIPOT spherical bearings are designed, manufactured and tested in accordance with EN 1337.5 and 1337.2 and CE marked with supervision of the Notified Body Applus that executes the regular audit visits as foreseen by the EN standard.
On demand HIPOT bearings can be designed and manufactured in accordance with any other standard as:

◆BS 5400
◆AASHTO
◆Others

◎QUALITY ASSURANCE

The whole production of HIRUN is subjected to a quality assurance program in accordance with ISO 9000 certified by CQC, member of the International Mutual Acknowledgment Body IQNET.
In addition the production of the pot bearings is subjected to a specific quality assurance program in accordance with EN 1337.5 Annex ZA for the CE markingwith the supervision of the Notified Body Applus.
Hirun is also certified for the execution of steel and aluminum structures with CE certificate according to EN 1090.
The relevant certificates are here shown.

HIPOT pot bearings CE certificate

ISO 9001 certificates

EN 1090 certificate

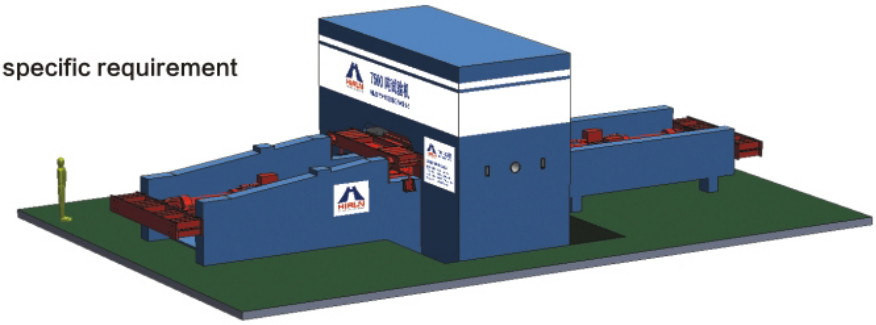
◎TESTS

All relevant tests are performed in the HIRUN testing facility having the following performances:

◆Vertical load capacity 75 MN
◆Horizontal load capacity 20 MN

The tests are performed in accordance to the specific requirement of the project and may include:

◆Vertical load tests
◆Horizontal load test
◆Friction tests
◆Wear of the sliding material tests
◆Rotation tests



◎CORROSION PROTECTION

The corrosion protection of structural steel is normally performed in accordance with EN ISO 12944.
The working life of the protective coating system on the bearing can be assumed to be fulfilled with a protective system designed for the durability “high” of more than 15 years in accordance with EN ISO 12944-5:2007, 5.5 for corrosivity category C5-I (I=industrial) for inland locations and C5-M (M=marine) for sea side locations.
Surfaces in contact with concrete need no corrosion protection, however a layer of 50 µm of the first pack is applied in order to prevent oxidation during the storage before the installation. A return of at least 50 mm is applied.
In alternative paint will conform to the Project specifications, as specified by the purchaser.

◎FIXINGS

If required by the horizontal forces acting, but always for railway bridges and earthquake zones, the bearings are provided with fixings made with bolts or dowels according to the type of structure. The fixing are connected to the bearing in such a way to allow the easy replacement of the bearing if necessary.

HIPOT BEARINGS FOR NANJING NO.4 YANGTZE RIVER BRIDGE

HIPOT BEARINGS FOR 5 HIGH-SPEED RAILWAY LINES: WUHAN-GUANGZHOU PDL、ZHENGZHOU-XI'AN PDL、FUZHOU-XIAMEN RAILWAY PART、GUANGZHOU-ZHUHAI RAPID RAIL TRANSIT AND GUANGZHOU-SHENZHEN URBAN RAIL TRANSIT.

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