HIRUN
HI TECH CIVIL ENGINEERING

HIFLOW

SPHERICAL BEARINGS

CE MARKED

G&P intech
Distributore esclusivo

HIFLOW SPHERICAL 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, marketingoperation 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.

◎HIFLOWSPHERICALBEARINGS: GENERAL

HIFLOW 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 Spherical Bearing HIFLOW FS), or allowing displacement in one direction only (Guided Spherical Bearing HIFLOW GS), or in all directions of a plane (Free Sliding Spherical Bearing HIFLOW SS).

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

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

In their standard version HIFLOW bearings are designed and manufactured in accordance with EN 1337.7 and are CE marked.

The design rotation of HIFLOW bearings may be increased up ± 3° (0,05 rad) or more. This allows the compensations not only of the elastic rotations of the bridge but also that due to the inclination of the beams or the manufacturing and installation tolerances of the prefabricated beams. With such an allowable rotation the installation of prefabricated beams is greatly simplified, avoiding the use of expensive wedge plates. It is possible to achieve a considerable saving and speed up the erection of the beams.

◎CORROSION PROTECTION

The corrosion protection of structural steel is normally performed in accordance with EN ISO 12944.

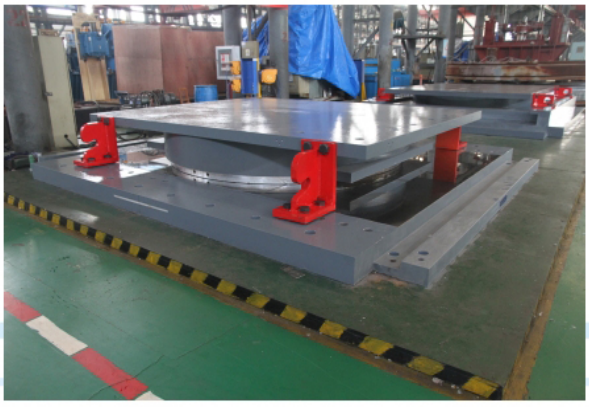
The working life of the protective coating system on the bearing can be assumed to be fulfilled with a protective system designed for the durability "high" of more than 15 years in accordance with EN ISO 12944-5:2007, 5.5 for corrosivity category C5-I (I=industrial) for inland locations and C5-M (M=marine) 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.



Manufacturing of a HIFLOW bearing of 130 MN

◎INSTALLATION

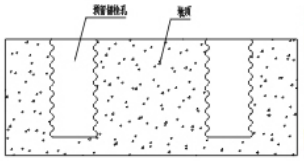
The use of HIFLOW bearings can minimize the cost of the bridge erection, especially if the beams are prefabricated. In that case the bearings are installed with the main sliding surface at the bottom, whilst the upper part of the bearing, with its rotation capability of 0,05 rad can accommodate the inclination of the beam due to the slope of the bridge or to the fabrication tolerances of the beam. The erection of the bridge is greatly simplified and there is no need of expensive wedge plates or temporary bearings. The beams may be directly laid down on the bearings as shown in the following picture.

The correct installation of the bearings is essential to grant a long lasting performance.

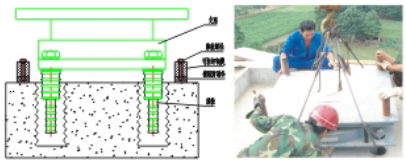
The installation shall always be carried out by qualified and trained personnel, eventually with the co-operation of HIRUN specialists.

HIRUN will provide installation manual conforming to EN 1337.11 or dedicated manuals for particular jobs

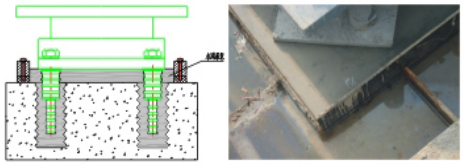
In the following schemes is shown one of the most common procedures for cast in situ structures.



Casting the pier with void formers in the position of the anchors



Placing the bearing and installing the mould for injecting the concrete



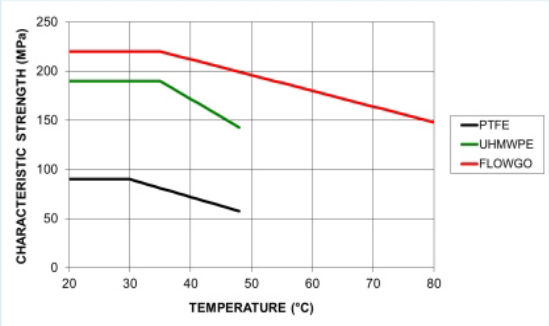
Grouting the mortar

◎HIFLOW SPHERICAL BEARINGS WITH FLOWGO SLIDING MATERIAL

FLowGo is an innovative sliding material, with increased wear resistance at high temperature.
Its main physical-mechanical properties as well as the friction coefficients are given in the following tables.

Property	Standard	Requirement	Tolerance
Compression strength at 20°C	CUAP 03.01/35:2013	220 MPa	⩾
Compression strength at 70°C	CUAP 03.01/35:2013	180 MPa	⩾
Elasticity modulus	EN ISO 527-1 e 3	1000 MPa	± 20%
Melting temperature	ISO 11357-3	200°C	⩾

The superior mechanical properties of FLowGo in comparison with the other most common sliding materials are clearly put in evidence in the following diagram.



Compressive strength of various sliding materials in function of the temperature

The friction coefficientof the dimpled and lubricated FLowGo mating with polished stainless steel are given in the following table.

NOTES:

$\mu_{s,T}$ is the static friction coefficient at temperature T

$\mu_{dyn,T}$ is the dynamic friction coefficient at temperature T

Coefficient of friction	Operating temperature			
	-35°C	0°C	+21°C	+70°C
$\mu_{s,T}$	0,020	0,012	0,008	0,005
$\mu_{dyn,}$	0,015	0,009	0,006	0,004

The main advantages provided by the spherical bearings with special sliding material FLowGo:

◆The useful life of the bearings is extended by a factor at least 5. It is well known that for bridges subjected to heavy traffic the sliding material will continuously slide and will be worn out after a certain period. FLowGo has a resistance to wear at least 5 times greater than PTFE.

◆The field of temperature of the bearings is extended up to + 80°C and more.

◆The dimensions of the bearings may be gratly reduced because the characteristic compression strength of FLowGo is more than twice that of PTFE. This can help when the space available is limited.

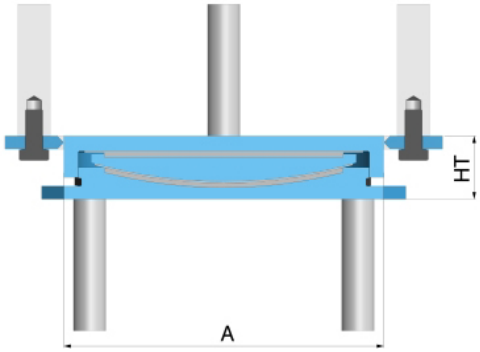
◎DIMENSIONS TABLE: HIFLOW FS

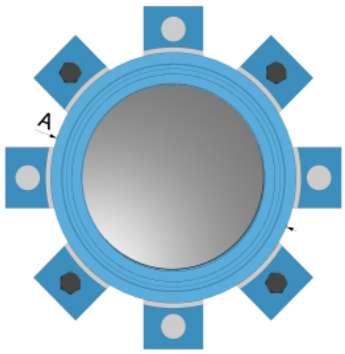
They are identified by the following Mark:

FS V_k (kN)−H_d (kN)

EXAMPLE:

FS 20000−4000: Fixed Spherical Bearing with 20000 kN Characteristic vertical load and 40000 kN design horizontal load





HIFLOW FS FIXED SPHERICAL BEARINGS

V_k	V_d	H_d	A	HT
kN	kN	kN	mm	mm
3000	4200	600	430	89
4000	5600	800	490	95
5000	7000	1000	540	101
6000	8400	1200	590	107
7000	9800	1400	620	112
8000	11200	1600	670	117
9000	12600	1800	700	120
10000	14000	2000	730	135
11000	15400	2200	770	139
12000	16800	2400	800	143
13000	18200	2600	830	146
15000	21000	3000	900	153
17500	24500	3500	970	160
20000	28000	4000	1030	168
25000	35000	5000	1150	181
30000	42000	6000	1260	194
40000	56000	8000	1460	215
50000	70000	10000	1630	233
60000	84000	12000	1790	251

V_k = Characteristic vertical load (SLS)

V_d = Design vertical load (ULS)

H_d = Design horizontal load (ULS)

A = Bottom and upper plate dimension

HT = Total height

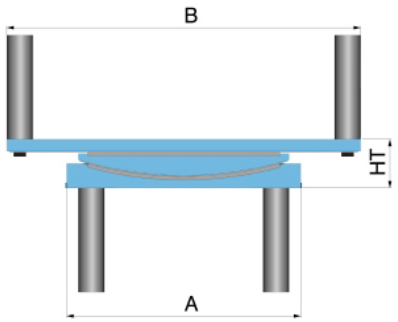
◎DIMENSIONS TABLE: HIFLOW SS

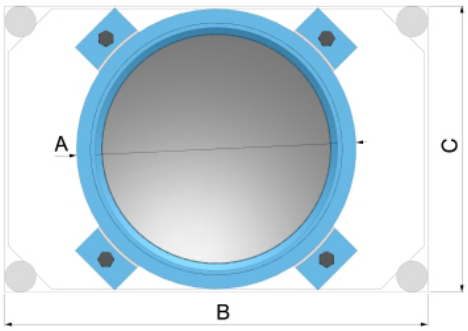
They are identified by the following Mark:

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

EXAMPLE:

SS 20000/400/100: Free Sliding Spherical Bearing with 20000 kN Characteristic vertical load, 400 mm longitudinal displacement (±200 mm) and 100 mm transversal displacement (±50 mm)





HIFLOW SS FREE SLIDING SPHERICAL BEARINGS

V_k	V_d	X	Y	A	B	C	HT
kN	kN	mm	mm	mm	mm	mm	mm
3000	4200	±100	±25	430	480	630	89
4000	5600	±100	±25	490	540	590	95
5000	7000	±100	±25	540	590	690	101
6000	8400	±150	±25	590	640	740	107
7000	9800	±150	±25	620	670	890	112
8000	11200	±150	±25	670	720	970	117
9000	12600	±150	±25	700	750	1000	120
10000	14000	±150	±25	730	780	1030	135
11000	15400	±150	±25	770	820	1070	139
12000	16800	±150	±25	800	850	1100	143
13000	18200	±150	±25	830	880	1130	146
15000	21000	±150	±25	900	950	1200	153
17500	24500	±150	±25	970	1020	1270	160
20000	28000	±200	±25	1030	1080	1430	168
25000	35000	±200	±25	1150	1200	1550	181
30000	42000	±200	±25	1260	1310	1660	194
40000	56000	±200	±25	1460	1510	1860	215
50000	70000	±200	±25	1630	1680	2030	233
60000	84000	±200	±25	1790	1840	2190	251

V_k = Characteristic vertical load (SLS)

V_d = Design vertical load (ULS)

X = Longitudinal displacement

Y = Transversal displacement

A =Bottom plate dimension

B, C = Top plate dimensions

HT = Total height

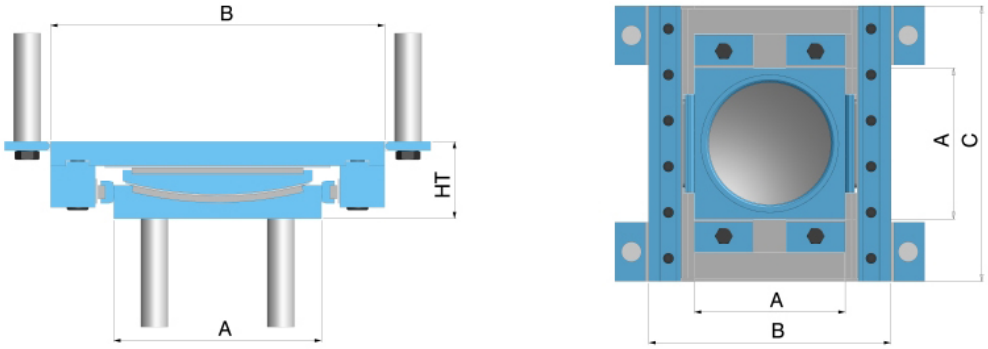
◎DIMENSIONS TABLE: HIFLOW GS

They are identified by the following Mark:

GS V_k (kN)/X (mm)−H_d(kN)

EXAMPLE:

GS 20000/400−4000: Sliding Guided Spherical Bearing with 20000 kN Characteristic vertical load, 400 mm longitudinal displacement (± 200 mm) and 4000 kN transversal design load



HIFLOW GS SLIDING GUIDED SPHERICAL BEARINGS

V_k	V_d	H_d	X	A	B	C	HT
kN	kN	kN	mm	mm	mm	mm	mm
3000	4200	600	± 100	430	430	630	89
4000	5600	800	± 100	490	490	590	95
5000	7000	1000	± 100	540	540	690	101
6000	8400	1200	± 150	590	590	740	107
7000	9800	1400	± 150	620	620	890	112
8000	11200	1600	± 150	670	670	970	117
9000	12600	1800	± 150	700	700	1000	120
10000	14000	2000	± 150	730	730	1030	135
11000	15400	2200	± 150	770	770	1070	139
12000	16800	2400	± 150	800	800	1100	143
13000	18200	2600	± 150	830	830	1130	146
15000	21000	3000	± 150	900	900	1200	153
17500	24500	3500	± 150	970	970	1270	160
20000	28000	4000	± 200	1030	1030	1430	168
25000	35000	5000	± 200	1150	1150	1550	181
30000	42000	6000	± 200	1260	1260	1660	194
40000	56000	8000	± 200	1460	1460	1860	215
50000	70000	10000	± 200	1630	1630	2030	233
60000	84000	12000	± 200	1790	1790	2190	251

V_k = Characteristic vertical load (SLS)

V_d = Design vertical load (ULS)

H_d = Design horizontal load (ULS)

X = Longitudinal displacement

A =Bottom plate dimension

B, C = Top plate dimensions

HT = Total height

◎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 spherical 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 shown here below.

HIFLOW spherical bearings CE certificate

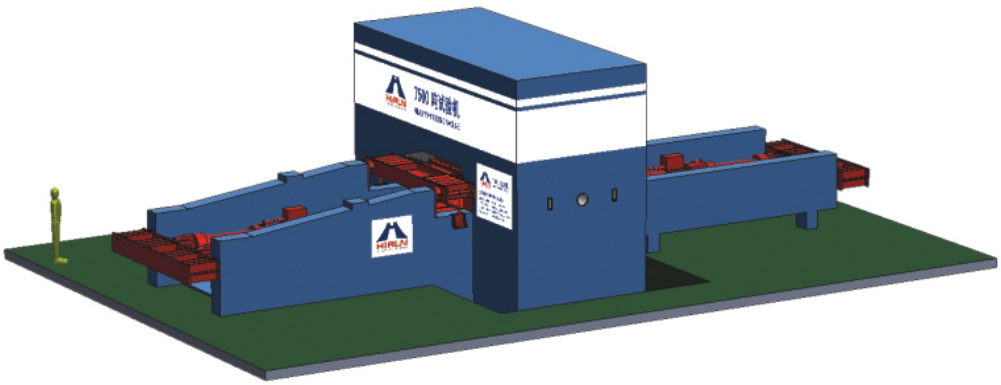
ISO 9001 certificates

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

HIFLOW FOR WUHU YANGTZE RIVER BRIDGE, A

HIFLOW BEARINGS FOR NANJING DASHENGGUAN

Divisione HIRUN® ENGINEERING

G&P intech s.r.l
via Retrone 39 - 36077 Altavilla Vic. (VI) - ITALY
Tel. +39 0444 522797 - Fax +39 0444 348692
E mail: info@gpintech.com

www.gpintech.com