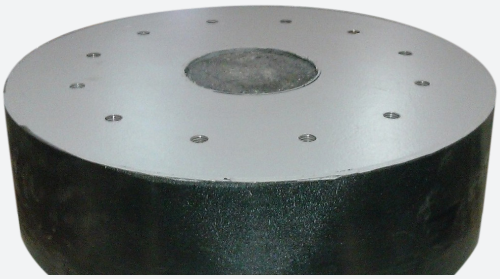
LRB

ISOSISM® Technical data sheet reference no.: FT En C V 5 1 3

General description

The ISOSISM® LRB (Lead Rubber Bearing) is an isolator designed using an elastomeric block (natural rubber or neoprene) reinforced with metal bands bonded by vulcanising. It has one or more cylindrical lead cores.
The damping provided by the ISOSISM® LRB results from the nature of the elastomeric mixture and the lead cylinder, and reduces the acceleration (through the distortion of the lead cylinder) and displacement of structures during a seismic event. It is designed and manufactured in accordance with EN 15129.
It is usually a type C isolator (fitted with outer plates) manufactured to the dimensions required for the project. It is available in square or round formats.



ISOSISM® LRB with a lead core

Applications

The ISOSISM® LRB has numerous applications in buildings, nuclear power plants, civil engineering structures, etc. It isolates the structure from the movement of the ground by forming flexible connections that increase the fundamental period of vibration of the structure to be protected and reduce its acceleration by a ratio of up to 3 to 5.

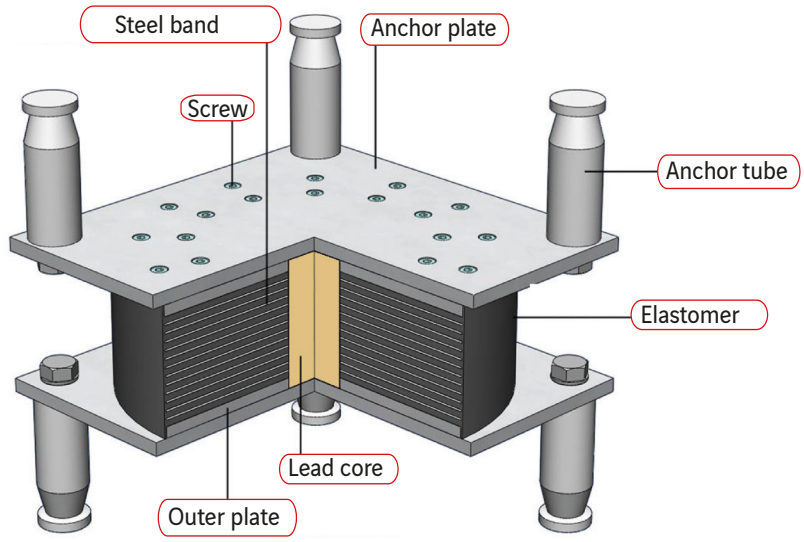
Main properties

- High recentring capability;
- High damping capacity ($\xi \leq 30\%$);
- Moderate maximum displacement;
- Zero maintenance.

Arch Bridge - Basarab - Bucharest

Design

In addition to their isolating qualities, these isolators bear the vertical loads of the structure and recentre it after dynamic stress.



Behaviour

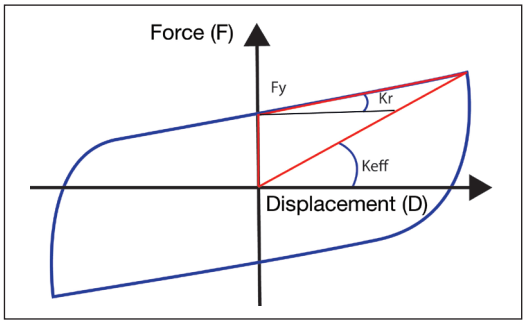
Behaviour law

The behaviour law of the ISOSISM® LRB can be modeled as follows:
There are two possible structural design approaches:

Linear calculation: $F=K_{eff}.D$

Non-linear calculation: $F=F_y+K_r.D$

F: Horizontal force
K_{eff}: Effective stiffness
D: Displacement
F_y: Shear force of the lead
K_r: Stiffness of the elastomer



The damping is obtained by the properties of the lead core and the nature of the elastomer.

Graphic representation

The device can be shown using the following graphic representation in accordance with EN 15129.

Graphic representation of an ISOSISM® LRB plan view

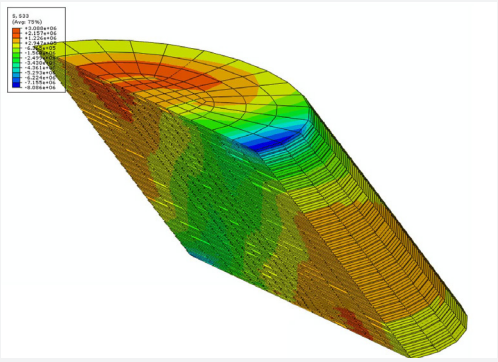
Graphic representation of an ISOSISM® LRB elevation

LRB isolators are shown in their deformed position in order to emphasise their lateral flexibility.

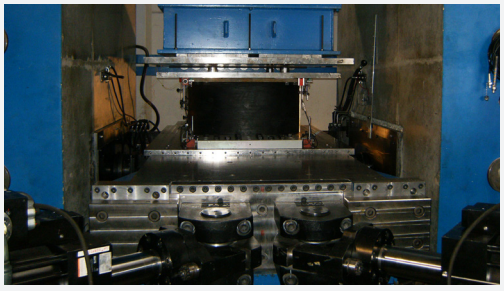
LRB

Tests

ISOSISM® LRBs have undergone numerous dynamic tests to guide and validate Freyssinet's technical development process.



3D modeling of an ISOSISM® LRB



Testing an ISOSISM® LRB

CE marking

ISOSISM® LRB isolators can be supplied with CE marking.

Standard dynamic test curve

Freyssinet Services

Freyssinet can produce structural designs with earthquake protection devices, including LRB isolators.

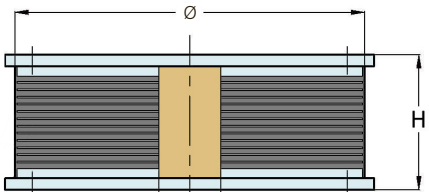
Local sales contact

Range

Two types of mixture are available for different shear modulus G values:

- Model LRB 0.4 - 10: Modulus G=0.4 MPa
- Model LRB 0.8 - 10: Modulus G=0.8 MPa

Ø: Isolator diameter
T_r: Total thickness of elastomer
H: Total height of isolator
Δ_{max}: Maximum horizontal displacement
V_{max}: Maximum vertical load under zero displacement
V_{seism}: Maximum vertical load under seismic displacement
K_r: Horizontal stiffness of the elastomer
K_{lp}: Stiffness of the lead
F_y: Elastic force of the lead
K_{eff}: Effective stiffness of the isolator
ξ_{eff}: Effective damping



Ø	T_r	LRB 0.4 - 10									LRB 0.8 - 10								
mm	mm	H mm	Δ_{max} mm	V_{max} kN	V_{seism} kN	K_r kN/mm	K_{lp} kN/mm	F_y kN	K_{eff} kN/mm	ξ_{eff} %	H mm	Δ_{max} mm	V_{max} kN	V_{seism} kN	K_r kN/mm	K_{lp} kN/mm	F_y kN	K_{eff} kN/mm	ξ_{eff} %
Ø300	45	129	110	1430	820	0.59	5.89	34	0.87	26	129	95	2380	1550	1.12	11.17	60	1.70	27
Ø300	70	169	170	920	290	0.38	3.79	34	0.56	26	169	150	1640	680	0.72	7.18	60	1.08	27
Ø350	55	145	135	2200	1230	0.65	6.53	49	0.98	27	165	115	3290	2390	1.25	12.48	80	1.88	27
Ø350	75	177	185	1610	600	0.48	4.79	49	0.72	27	197	160	2920	1350	0.92	9.15	80	1.37	27
Ø400	60	147	150	2870	1670	0.79	7.85	60	1.15	26	167	130	3620	3200	1.50	14.99	102	2.21	26
Ø400	90	192	225	1950	630	0.52	5.24	60	0.77	26	212	195	3540	1490	1.00	9.99	102	1.48	26
Ø450	72	165	180	3940	2180	0.83	8.26	80	1.23	27	185	155	4580	4190	1.57	15.71	136	2.37	27
Ø450	108	219	260	2620	770	0.55	5.51	80	0.83	27	239	230	4580	1740	1.05	10.47	136	1.59	27
Ø500	84	197	210	4380	2360	0.87	8.67	110	1.34	28	217	180	4890	4680	1.67	16.66	165	2.50	27
Ø500	126	257	290	2920	870	0.58	5.78	110	0.92	29	277	270	4890	1780	1.11	11.11	165	1.67	27
Ø550	88	198	220	5460	3050	1.01	10.10	119	1.50	27	228	190	6940	5900	1.93	19.29	196	2.87	27
Ø550	144	275	320	3360	1000	0.62	6.17	119	0.95	28	312	310	6100	1840	1.18	11.79	196	1.75	27
Ø600	96	209	240	6540	4010	1.10	11.04	136	1.62	26	260	205	8250	7690	2.09	20.94	242	3.17	27
Ø600	144	275	350	4810	1390	0.74	7.36	136	1.09	26	332	310	8250	3120	1.40	13.96	242	2.11	27
Ø650	108	252	270	7870	4290	1.15	11.50	165	1.70	26	272	230	8650	8340	2.19	21.89	280	3.29	27
Ø650	162	330	380	5250	1530	0.77	7.67	165	1.16	27	350	350	8650	3180	1.46	14.59	280	2.19	27
Ø700	120	264	300	8590	4600	1.20	11.98	196	1.79	27	315	260	11340	8980	2.29	22.89	320	3.41	27
Ø700	170	334	410	6060	1780	0.85	8.46	196	1.28	27	390	365	11030	4040	1.62	16.16	320	2.41	27
Ø750	130	298	325	10370	5530	1.26	12.63	242	1.94	28	350	280	13000	10870	2.42	24.17	378	3.64	27
Ø750	170	354	425	7930	2540	0.97	9.66	242	1.48	28	410	365	13000	5950	1.85	18.48	378	2.79	27
Ø800	132	296	330	11220	6540	1.41	14.08	293	2.21	28	358	285	16190	12950	2.71	27.12	425	4.07	27
Ø800	176	356	440	8960	3150	1.06	10.56	293	1.66	28	426	380	16190	7220	2.03	20.34	425	3.05	27

Range given for guidance: ISOSISM® LRB isolators can be produced for larger vertical loads and displacements and for lower horizontal stiffnesses.

Structural connections

The isolators are connected to steel structures using bolts.
They are connected to concrete structures using anchor tubes or studs.

Sakarya Viaduct - Turkey