

MAURER Lead Rubber Bearings



MAURER Lead Rubber Bearing

MAURER Lead Rubber Bearing, MLRB

MAURER Lead Rubber Bearings (MLRB) are devices for seismic isolation, see brochure "MAURER Earthquake Protection Systems", pages 10 and 11. They consist of a steel reinforced elastomer bearing (chloroprene caoutchouc or natural caoutchouc) with additional lead core.

The elastomer bearings, also referred to as deformation bearings, respond to displacements with elastic recentering forces. These will increase depending on displacement respectively torsion. The bearings can be used as vibrations and structure-borne noise insulation, in case further calculations were performed.

All bearing verifications are based on the EN 1337-3 (Structural bearings – Elastomeric bearings) and EN 15129 (Anti-seismic devices). The calculations can be also according to AASTHO or other requirements. According to the EN 1337-3, table 2 the bearing complies with type C. The below tables show the shear modulus G_g 0.40 MPa, 0.65 MPa and 0.90 MPa and a horizontal rotation of $\alpha = 0.003$ rad was considered.

The dimensions of the bearings were optimized with a part of critical damping up to 30 % and a minimum period of two seconds. The design force will be the maximum axial force under the design seismic action $N_d/1.35$ according to EN 15129. The design displacement d_{bd} will be multiplied with partial safety factor γ_x 1.2 according to EN 1998-2 for building structures. In case of other structures e.g. bridges, the effective damping and period should be adjusted.

An up-lift force or alternating stresses (tension – compression) are not taken into account for the calculation and must be separately verified.

The following tables are reference values for the first design approach. All bearings can be optimized depending on the local conditions of the structure. Following parameter must be available:

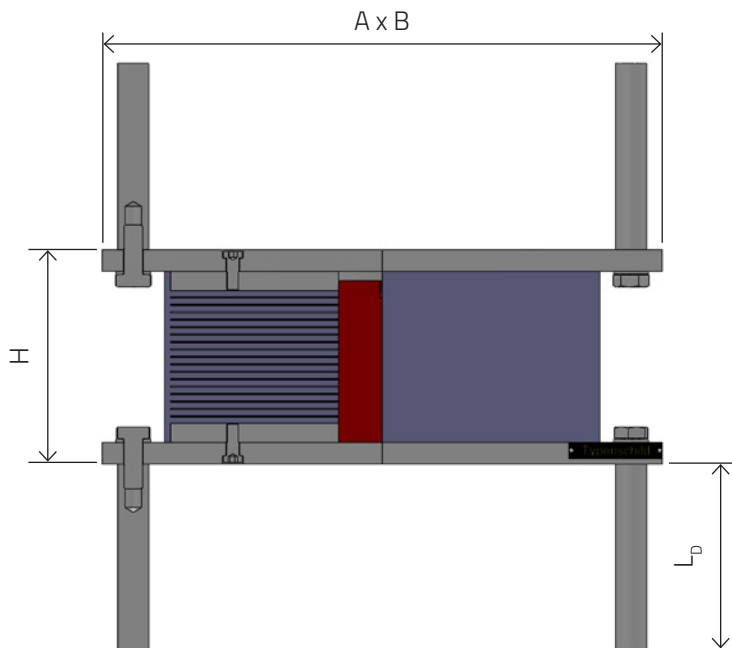
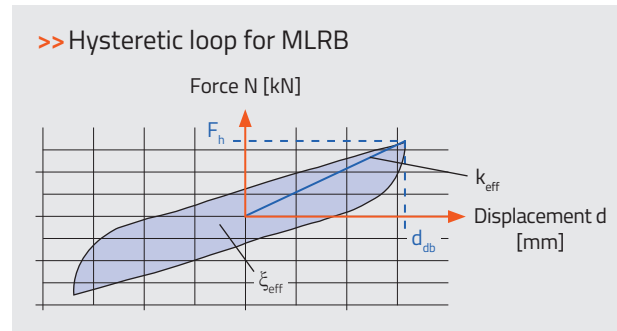
- Load of each bearing: min. $N_{d'}$, max. N_d and $N_{Ed,max}$
- Shear modulus G_g
- damping capacity ξ_{eff} respectively period T_{eff}
- displacement d_{bd}
- Dimensions of the installation area

On request MAURER can be performed dynamic building analysis to achieve the optimum bearing design. It can be applied linear analysis (modal analysis) or non-linear analysis (time history analysis), which requires the FE-model, ground specifications and an earthquake spectrum.

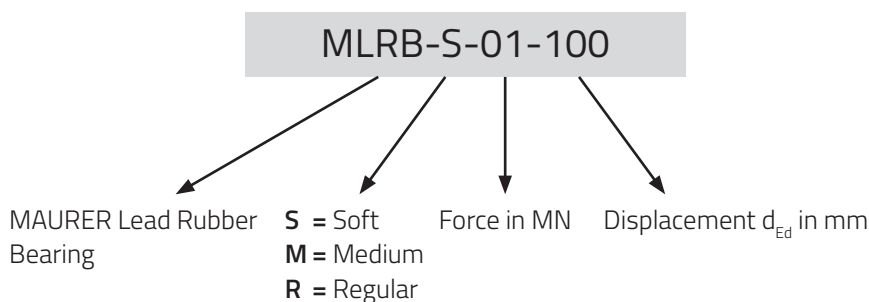
>> **LEGEND:**  Road bridges  Railway bridges  Building constructions  Lead Rubber Bearings

Explanations of the abbreviations

- N_d = maximum axial design force
- $N_{Ed,max}$ = maximum axial force under the design seismic action
- k_{eff} = effective dynamic stiffness
- F_h = resultant horizontal force
- ξ_{eff} = effective damping
- T_{eff} = effective period
- $A \times B$ = width and length
- H = height
- L_D = length of dowels
- G_g = shear modulus
- d_{bd} = design displacement (for earthquakes)



Designation:



Relevant characteristics and dimensions of MAURER Lead Rubber Bearings

>> Horizontal displacement $d_{bd} = 83 \text{ mm}$ ($d_{Ed} = \gamma_x \times d_{bd}$)

Shear modulus $G_g = 0,40 \text{ N/mm}^2$

N_d	$N_{Ed,max}$	k_{eff}	F_h	ξ_{eff}	T_{eff}	A, B	H	L_D	Designation
[MN]	[MN]	[kN/mm]	[kN]	[%]	[sec]	[mm]	[mm]	[mm]	
1	0,74	0,64	59	30,5	2,2	420	295	180	SOFT
3	2,22	1,78	163	30,4	2,2	470	185	180	
5	3,70	2,34	214	30,6	2,5	570	200	180	
7	5,19	3,07	281	30,1	2,6	670	210	240	
9	6,67	3,05	279	30,2	3,0	720	240	240	
11	8,15	3,28	300	30,3	3,2	770	250	240	
13	9,63	3,21	293	30,7	3,5	820	275	240	
15	11,11	3,53	323	30,3	3,6	870	275	240	
20	14,81	3,77	345	30,3	4,0	970	325	240	
25	18,52	4,60	421	30,3	4,0	1070	325	240	
30	22,22	8,28	724	30,3	3,3	1120	365	360	
35	25,93	8,53	744	29,7	3,5	1170	390	360	
40	29,63	8,53	744	29,7	3,7	1220	420	360	

>> Horizontal displacement $d_{bd} = 83 \text{ mm}$ ($d_{Ed} = \gamma_x \times d_{bd}$)

Shear modulus $G_g = 0,65 \text{ N/mm}^2$

N_d	$N_{Ed,max}$	k_{eff}	F_h	ξ_{eff}	T_{eff}	A, B	H	L_D	Designation
[MN]	[MN]	[kN/mm]	[kN]	[%]	[sec]	[mm]	[mm]	[mm]	
1	0,74	0,75	69	27,3	2,0	420	320	180	MEDIUM
3	2,22	1,88	173	29,3	2,2	470	220	180	
5	3,70	2,48	228	29,4	2,4	570	230	180	
7	5,19	3,20	294	29,2	2,6	620	230	240	
9	6,67	4,19	385	29,6	2,5	670	240	240	
11	8,15	4,76	435	30,8	2,6	720	250	240	
13	9,63	4,61	422	30,2	2,9	720	250	240	
15	11,11	5,25	481	30,1	2,9	770	250	300	
20	14,81	6,41	585	30,5	3,1	870	275	300	
25	18,52	6,90	628	31,1	3,3	920	300	300	
30	22,22	7,41	673	31,5	3,5	970	315	300	
35	25,93	7,14	653	30,4	3,8	1020	330	300	
40	29,63	8,07	732	31,6	3,8	1070	340	360	

>> Horizontal displacement $d_{bd} = 83 \text{ mm}$ ($d_{Ed} = \gamma_x \times d_{bd}$)

Shear modulus $G_g = 0,90 \text{ N/mm}^2$

N_d	$N_{Ed,max}$	k_{eff}	F_h	ξ_{eff}	T_{eff}	A, B	H	L_D	Designation
[MN]	[MN]	[kN/mm]	[kN]	[%]	[sec]	[mm]	[mm]	[mm]	
1	0,74	1,31	130	7,6	1,5	on request			REGULAR
3	2,22	2,23	214	17,3	2,0	420	170	180	
5	3,70	3,48	318	30,5	2,1	520	230	240	
7	5,19	3,94	360	30,8	2,3	570	240	240	
9	6,67	4,95	453	30,1	2,3	620	240	300	
11	8,15	6,14	562	30,3	2,3	620	220	300	
13	9,63	6,49	593	30,3	2,4	670	235	300	
15	11,11	6,21	569	30,1	2,7	720	260	300	
20	14,81	7,53	692	29,4	2,8	770	260	300	
25	18,52	7,57	693	30,2	3,1	820	285	300	
30	22,22	7,94	727	30,2	3,4	870	310	360	
35	25,93	8,81	808	30,0	3,4	920	310	360	
40	29,63	9,20	842	30,1	3,6	970	325	360	

The bearing stability is for deformation d_{Ed} combined with max. axial force under the design seismic action $N_{Ed,max}$ performed.

Relevant characteristics and dimensions of MAURER Lead Rubber Bearings

>> Horizontal displacement $d_{bd} = 125 \text{ mm}$ ($d_{Ed} = \gamma_x \times d_{bd}$)

Shear modulus $G_g = 0,40 \text{ N/mm}^2$

N_d	$N_{Ed,max}$	k_{eff}	F_h	ξ_{eff}	T_{eff}	A, B	H	L_D	Designation
[MN]	[MN]	[kN/mm]	[kN]	[%]	[sec]	[mm]	[mm]	[mm]	
1	0,74	0,68	97	20,9	2,1	420	210	180	SOFT
3	2,22	1,90	261	29,9	2,2	520	200	240	
5	3,70	2,70	365	32,4	2,3	620	220	240	
7	5,19	2,91	396	31,3	2,7	670	225	240	
9	6,67	3,07	415	32,3	3,0	720	260	240	
11	8,15	3,80	506	33,0	2,9	770	280	300	
13	9,63	4,24	566	33,1	3,0	820	280	300	
15	11,11	4,32	584	32,1	3,2	920	290	300	
20	14,81	5,31	704	32,8	3,4	970	345	360	
25	18,52	6,22	824	32,8	3,5	1070	355	360	
30	22,22	6,83	897	31,5	3,6	1120	390	360	
35	25,93	8,62	1128	29,8	3,5	1220	400	300	
40	29,63	9,81	1272	25,2	3,5	1220	455	300	

>> Horizontal displacement $d_{bd} = 125 \text{ mm}$ ($d_{Ed} = \gamma_x \times d_{bd}$)

Shear modulus $G_g = 0,65 \text{ N/mm}^2$

N_d	$N_{Ed,max}$	k_{eff}	F_h	ξ_{eff}	T_{eff}	A, B	H	L_D	Designation
[MN]	[MN]	[kN/mm]	[kN]	[%]	[sec]	[mm]	[mm]	[mm]	
1	0,74	1,11	164	9,3	1,6	on request			MEDIUM
3	2,22	2,14	297	27,5	2,0	470	200	240	
5	3,70	3,56	495	27,2	2,0	570	190	300	
7	5,19	3,81	523	29,5	2,3	620	210	300	
9	6,67	4,18	574	29,9	2,5	670	230	300	
11	8,15	4,87	668	29,9	2,6	720	240	300	
13	9,63	5,49	755	29,5	2,7	770	240	360	
15	11,11	5,72	785	29,6	2,8	820	250	360	
20	14,81	7,30	1005	29,1	2,9	970	275	300	
25	18,52	7,66	1051	29,8	3,1	1020	285	300	
30	22,22	7,49	1025	30,3	3,5	1070	330	300	
35	25,93	8,78	1202	30,2	3,4	1120	315	300	
40	29,63	8,81	1207	30,1	3,7	1170	325	300	

>> Horizontal displacement $d_{bd} = 125 \text{ mm}$ ($d_{Ed} = \gamma_x \times d_{bd}$)

Shear modulus $G_g = 0,90 \text{ N/mm}^2$

N_d	$N_{Ed,max}$	k_{eff}	F_h	ξ_{eff}	T_{eff}	A, B	H	L_D	Designation
[MN]	[MN]	[kN/mm]	[kN]	[%]	[sec]	[mm]	[mm]	[mm]	
1	0,74	1,63	236	15,8	1,4	on request			REGULAR
3	2,22	2,21	318	18,1	2,0	420	180	240	
5	3,70	3,75	533	20,7	2,0	520	185	300	
7	5,19	5,09	701	29,1	2,0	570	200	360	
9	6,67	4,81	666	28,1	2,4	620	225	300	
11	8,15	6,14	842	30,0	2,3	670	225	360	
13	9,63	6,63	908	30,2	2,4	720	240	360	
15	11,11	7,57	1037	30,1	2,4	770	240	300	
20	14,81	8,52	1163	30,8	2,6	870	275	300	
25	18,52	9,32	1275	30,4	2,8	920	285	300	
30	22,22	10,24	1404	30,0	3,0	970	285	360	
35	25,93	10,50	1439	30,1	3,2	1020	310	360	
40	29,63	10,82	1482	30,2	3,3	1070	325	360	

The bearing stability is for deformation d_{Ed} combined with max. axial force under the design seismic action $N_{Ed,max}$ performed.

Relevant characteristics and dimensions of MAURER Lead Rubber Bearings

>> Horizontal displacement $d_{bd} = 167 \text{ mm}$ ($d_{Ed} = \gamma_x \times d_{bd}$)

Shear modulus $G_g = 0,40 \text{ N/mm}^2$

N_d	$N_{Ed,max}$	k_{eff}	F_h	ξ_{eff}	T_{eff}	A, B	H	L_D	Designation
[MN]	[MN]	[kN/mm]	[kN]	[%]	[sec]	[mm]	[mm]	[mm]	
1	0,74	0,75	178	18,1	2,0	470	220	180	SOFT
3	2,22	1,50	276	28,9	2,4	520	230	240	
5	3,70	2,37	434	29,7	2,5	620	215	240	
7	5,19	2,34	427	30,0	3,0	670	245	240	
9	6,67	2,48	450	31,2	3,3	720	280	300	
11	8,15	4,17	733	32,2	2,8	770	290	360	
13	9,63	4,21	757	32,3	3,0	870	270	360	
15	11,11	3,96	707	33,0	3,4	870	300	360	
20	14,81	5,28	938	33,1	3,4	1020	340	360	
25	18,52	5,41	973	32,3	3,7	1120	340	360	
30	22,22	6,17	1089	32,7	3,8	1170	400	300	
35	25,93	6,94	1221	32,5	3,9	1220	405	300	
40	29,63	7,81	1362	30,4	3,9	1220	465	360	

>> Horizontal displacement $d_{bd} = 167 \text{ mm}$ ($d_{Ed} = \gamma_x \times d_{bd}$)

Shear modulus $G_g = 0,65 \text{ N/mm}^2$

N_d	$N_{Ed,max}$	k_{eff}	F_h	ξ_{eff}	T_{eff}	A, B	H	L_D	Designation
[MN]	[MN]	[kN/mm]	[kN]	[%]	[sec]	[mm]	[mm]	[mm]	
1	0,74	1,09	256	21,7	1,7	on request			MEDIUM
3	2,22	2,14	393	29,1	2,0	470	210	240	
5	3,70	3,57	651	30,4	2,0	570	200	300	
7	5,19	3,42	633	26,9	2,5	620	210	300	
9	6,67	3,76	695	27,2	2,7	670	230	300	
11	8,15	4,48	819	29,7	2,7	720	240	360	
13	9,63	5,52	1021	27,2	2,7	820	240	300	
15	11,11	6,36	1174	27,7	2,7	870	240	300	
20	14,81	7,35	1356	27,9	2,8	970	260	300	
25	18,52	7,28	1336	28,9	3,2	1020	290	360	
30	22,22	8,15	1508	27,2	3,3	1120	285	360	
35	25,93	8,45	1559	28,0	3,5	1170	310	360	
40	29,63	7,84	1435	29,5	3,9	1170	340	360	

>> Horizontal displacement $d_{bd} = 167 \text{ mm}$ ($d_{Ed} = \gamma_x \times d_{bd}$)

Shear modulus $G_g = 0,90 \text{ N/mm}^2$

N_d	$N_{Ed,max}$	k_{eff}	F_h	ξ_{eff}	T_{eff}	A, B	H	L_D	Designation
[MN]	[MN]	[kN/mm]	[kN]	[%]	[sec]	[mm]	[mm]	[mm]	
1	0,74	1,25	301	15,7	1,5	on request			REGULAR
3	2,22	2,36	437	27,1	1,9	on request			
5	3,70	3,40	629	27,1	2,1	520	205	300	
7	5,19	3,78	699	27,1	2,4	570	220	360	
9	6,67	4,23	779	28,0	2,5	620	240	360	
11	8,15	5,12	941	28,8	2,5	670	240	360	
13	9,63	5,73	1047	29,9	2,6	720	260	300	
15	11,11	6,64	1212	30,0	2,1	770	250	300	
20	14,81	7,08	1291	30,2	2,9	820	285	300	
25	18,52	7,40	1350	30,0	3,2	870	300	300	
30	22,22	7,14	1303	30,0	3,5	920	340	300	
35	25,93	8,08	1473	30,3	3,6	970	340	360	
40	29,63	7,66	1399	30,0	3,9	1020	370	360	

The bearing stability is for deformation d_{Ed} combined with max. axial force under the design seismic action $N_{Ed,max}$ performed.

Relevant characteristics and dimensions of MAURER Lead Rubber Bearings

>> Horizontal displacement $d_{bd} = 208 \text{ mm}$ ($d_{Ed} = \gamma_x \times d_{bd}$)

Shear modulus $G_g = 0,40 \text{ N/mm}^2$

N_d	$N_{Ed,max}$	k_{eff}	F_h	ξ_{eff}	T_{eff}	A, B	H	L_D	Designation
[MN]	[MN]	[kN/mm]	[kN]	[%]	[sec]	[mm]	[mm]	[mm]	
1	0,74	0,64	152	20,7	2,2	420	225	180	SOFT
3	2,22	1,31	308	21,8	2,6	570	235	240	
5	3,70	1,91	437	29,5	2,8	620	245	240	
7	5,19	2,12	488	28,6	3,1	670	250	300	
9	6,67	2,41	557	27,2	3,3	770	270	300	
11	8,15	2,66	601	31,7	3,5	770	300	300	
13	9,63	3,51	793	31,7	3,3	870	290	360	
15	11,11	4,07	909	32,9	3,3	920	310	360	
20	14,81	4,28	979	29,6	3,7	1070	325	360	
25	18,52	5,68	1253	32,8	3,6	1120	385	300	
30	22,22	6,52	1431	32,1	3,7	1170	405	360	
35	25,93	7,48	1636	31,2	3,7	1220	420	360	
40	29,63	6,20	1350	29,9	4,4	on request			

>> Horizontal displacement $d_{bd} = 208 \text{ mm}$ ($d_{Ed} = \gamma_x \times d_{bd}$)

Shear modulus $G_g = 0,65 \text{ N/mm}^2$

N_d	$N_{Ed,max}$	k_{eff}	F_h	ξ_{eff}	T_{eff}	A, B	H	L_D	Designation
[MN]	[MN]	[kN/mm]	[kN]	[%]	[sec]	[mm]	[mm]	[mm]	
1	0,74	0,90	219	13,3	1,8	on request			MEDIUM
3	2,22	1,95	452	26,4	2,1	520	230	300	
5	3,70	2,42	560	27,1	2,5	570	230	300	
7	5,19	2,95	680	27,6	2,7	620	230	300	
9	6,67	3,26	751	27,7	2,9	670	265	360	
11	8,15	3,34	771	27,2	3,1	720	275	360	
13	9,63	4,89	1133	26,8	2,8	820	250	300	
15	11,11	5,38	1237	28,2	2,9	870	265	300	
20	14,81	6,25	1438	28,1	3,1	970	290	360	
25	18,52	6,73	1538	29,5	3,3	1020	300	360	
30	22,22	7,69	1769	28,1	3,4	1120	300	360	
35	25,93	7,78	1792	27,8	3,7	1170	330	360	
40	29,63	6,98	1602	28,7	4,1	1170	360	360	

>> Horizontal displacement $d_{bd} = 208 \text{ mm}$ ($d_{Ed} = \gamma_x \times d_{bd}$)

Shear modulus $G_g = 0,90 \text{ N/mm}^2$

N_d	$N_{Ed,max}$	k_{eff}	F_h	ξ_{eff}	T_{eff}	A, B	H	L_D	Designation
[MN]	[MN]	[kN/mm]	[kN]	[%]	[sec]	[mm]	[mm]	[mm]	
1	0,74	1,22	291	19,5	1,6	on request			REGULAR
3	2,22	2,16	505	24,2	2,0	520	245	300	
5	3,70	3,48	800	28,4	2,1	570	230	360	
7	5,19	3,38	783	26,9	2,5	620	255	360	
9	6,67	4,22	979	26,2	2,5	670	250	360	
11	8,15	4,23	980	26,2	2,8	720	280	360	
13	9,63	4,73	1091	27,5	2,9	720	275	300	
15	11,11	5,68	1314	27,0	2,8	820	280	300	
20	14,81	6,00	1384	27,5	3,2	870	315	300	
25	18,52	7,02	1611	28,6	3,3	920	315	360	
30	22,22	7,47	1724	27,3	3,5	970	315	360	
35	25,93	7,94	1844	26,0	3,6	1020	325	360	
40	29,63	8,25	1911	26,6	3,8	1070	340	360	

The bearing stability is for deformation d_{Ed} combined with max. axial force under the design seismic action $N_{Ed,max}$ performed.

Relevant characteristics and dimensions of MAURER Lead Rubber Bearings

>> Horizontal displacement $d_{bd} = 250 \text{ mm}$ ($d_{Ed} = \gamma_x \times d_{bd}$)

Shear modulus $G_g = 0,40 \text{ N/mm}^2$

N_d	$N_{Ed,max}$	k_{eff}	F_h	ξ_{eff}	T_{eff}	A, B	H	L_D	Designation
[MN]	[MN]	[kN/mm]	[kN]	[%]	[sec]	[mm]	[mm]	[mm]	
1	0,74	0,68	192	21,0	2,1	470	255	180	SOFT
3	2,22	1,23	345	24,5	2,7	570	260	240	
5	3,70	1,89	515	30,8	2,8	620	260	300	
7	5,19	1,80	498	27,0	3,4	670	270	300	
9	6,67	2,35	652	26,3	3,4	770	270	300	
11	8,15	2,59	712	28,7	3,6	820	290	360	
13	9,63	3,09	841	30,8	3,5	870	300	360	
15	11,11	3,55	957	32,5	3,5	920	320	360	
20	14,81	4,44	1186	33,0	3,7	1020	370	300	
25	18,52	5,00	1332	33,1	3,9	1120	390	300	
30	22,22	4,32	1170	31,8	4,5	1170	405	300	
35	25,93	4,32	1173	31,8	4,9	1220	430	300	
40	29,63	4,64	1247	32,7	5,1	1220	460	300	

>> Horizontal displacement $d_{bd} = 250 \text{ mm}$ ($d_{Ed} = \gamma_x \times d_{bd}$)

Shear modulus $G_g = 0,65 \text{ N/mm}^2$

N_d	$N_{Ed,max}$	k_{eff}	F_h	ξ_{eff}	T_{eff}	A, B	H	L_D	Designation
[MN]	[MN]	[kN/mm]	[kN]	[%]	[sec]	[mm]	[mm]	[mm]	
1	0,74	0,89	263	5,8	1,8	on request			MEDIUM
3	2,22	2,16	597	28,0	2,0	570	250	300	
5	3,70	2,62	722	28,4	2,4	620	250	360	
7	5,19	3,12	859	28,8	2,6	670	250	360	
9	6,67	3,71	1036	25,1	2,7	770	260	300	
11	8,15	3,87	1070	27,9	2,9	770	265	300	
13	9,63	4,95	1370	27,7	2,8	870	265	300	
15	11,11	5,20	1428	28,9	2,9	870	275	360	
20	14,81	5,85	1611	28,6	3,2	970	300	360	
25	18,52	5,71	1569	29,1	3,6	1020	330	360	
30	22,22	6,96	1925	27,7	3,6	1120	315	360	
35	25,93	7,00	1937	27,5	3,9	1170	340	360	
40	29,63	6,17	1697	28,9	4,4	1170	390	360	

>> Horizontal displacement $d_{bd} = 250 \text{ mm}$ ($d_{Ed} = \gamma_x \times d_{bd}$)

Shear modulus $G_g = 0,90 \text{ N/mm}^2$

N_d	$N_{Ed,max}$	k_{eff}	F_h	ξ_{eff}	T_{eff}	A, B	H	L_D	Designation
[MN]	[MN]	[kN/mm]	[kN]	[%]	[sec]	[mm]	[mm]	[mm]	
1	0,74	1,30	382	10,1	1,5	on request			REGULAR
3	2,22	2,23	624	24,9	2,0	570	270	300	
5	3,70	3,12	873	24,7	2,2	620	245	360	
7	5,19	3,71	1036	25,1	2,4	670	250	300	
9	6,67	4,10	1154	23,0	2,6	720	255	300	
11	8,15	4,16	1157	26,4	2,8	720	280	300	
13	9,63	5,24	1465	24,9	2,7	820	280	360	
15	11,11	5,54	1536	26,8	2,8	820	280	360	
20	14,81	6,30	1746	27,0	3,1	870	300	360	
25	18,52	6,42	1783	26,6	3,4	920	315	360	
30	22,22	6,59	1835	26,1	3,7	970	330	360	
35	25,93	6,70	1866	25,7	3,9	1020	355	360	
40	29,63	7,12	1995	24,4	4,1	1070	355	360	

The bearing stability is for deformation d_{Ed} combined with max. axial force under the design seismic action $N_{Ed,max}$ performed.

Relevant characteristics and dimensions of MAURER Lead Rubber Bearings

>> Horizontal displacement $d_{bd} = 292 \text{ mm}$ ($d_{Ed} = \gamma_x \times d_{bd}$)

Shear modulus $G_g = 0,40 \text{ N/mm}^2$

N_d	$N_{Ed,max}$	k_{eff}	F_h	ξ_{eff}	T_{eff}	A, B	H	L_D	Designation	
[MN]	[MN]	[kN/mm]	[kN]	[%]	[sec]	[mm]	[mm]	[mm]		
1	0,74	0,79	262	21,3	1,9	on request			SOFT	
3	2,22	1,12	368	21,8	2,8	620	290	240		MLRB-S-03-350
5	3,70	1,73	554	29,5	2,9	670	290	300		MLRB-S-05-350
7	5,19	1,73	564	24,5	3,5	720	280	300		MLRB-S-07-350
9	6,67	2,07	671	25,7	3,6	770	290	300		MLRB-S-09-350
11	8,15	2,79	901	27,8	3,4	870	290	360		MLRB-S-11-350
13	9,63	2,71	863	30,3	3,8	870	320	360		MLRB-S-13-350
15	11,11	3,49	1111	30,2	3,6	970	310	300		MLRB-S-15-350
20	14,81	3,49	1105	31,6	4,1	1020	385	300		MLRB-S-20-350
25	18,52	3,65	1159	30,8	4,5	1120	405	300		MLRB-S-25-350
30	22,22	4,12	1316	29,8	4,7	1220	400	300		MLRB-S-30-350
35	25,93	4,96	1537	33,0	4,6	on request				
40	29,63	2,73	891	24,3	6,6	on request				

>> Horizontal displacement $d_{bd} = 292 \text{ mm}$ ($d_{Ed} = \gamma_x \times d_{bd}$)

Shear modulus $G_g = 0,65 \text{ N/mm}^2$

N_d	$N_{Ed,max}$	k_{eff}	F_h	ξ_{eff}	T_{eff}	A, B	H	L_D	Designation	
[MN]	[MN]	[kN/mm]	[kN]	[%]	[sec]	[mm]	[mm]	[mm]		
1	0,74	1,20	411	10,5	1,6	on request			MEDIUM	
3	2,22	1,78	588	21,3	2,2	620	275	300		MLRB-M-03-350
5	3,70	2,43	787	26,7	2,5	670	275	300		MLRB-M-05-350
7	5,19	2,20	722	23,2	3,1	670	280	360		MLRB-M-07-350
9	6,67	2,48	817	22,0	3,3	720	285	360		MLRB-M-09-350
11	8,15	3,40	1113	23,7	3,1	820	285	300		MLRB-M-11-350
13	9,63	3,75	1211	27,0	3,2	820	285	300		MLRB-M-13-350
15	11,11	4,47	1456	25,0	3,2	920	285	360		MLRB-M-15-350
20	14,81	4,81	1567	25,0	3,5	970	315	360		MLRB-M-20-350
25	18,52	5,39	1772	22,7	3,7	1070	315	360		MLRB-M-25-350
30	22,22	5,64	1849	23,2	4,0	1120	330	360		MLRB-M-30-350
35	25,93	5,67	1859	23,1	4,3	1170	360	360		MLRB-M-35-350
40	29,63	5,24	1700	26,2	4,8	1170	405	360		MLRB-M-40-350

>> Horizontal displacement $d_{bd} = 292 \text{ mm}$ ($d_{Ed} = \gamma_x \times d_{bd}$)

Shear modulus $G_g = 0,90 \text{ N/mm}^2$

N_d	$N_{Ed,max}$	k_{eff}	F_h	ξ_{eff}	T_{eff}	A, B	H	L_D	Designation	
[MN]	[MN]	[kN/mm]	[kN]	[%]	[sec]	[mm]	[mm]	[mm]		
1	0,74	1,63	560	7,9	1,4	on request			REGULAR	
3	2,22	2,16	721	17,9	2,0	620	280	360		MLRB-R-03-350
5	3,70	2,67	872	24,7	2,4	620	270	360		MLRB-R-05-350
7	5,19	3,08	1008	23,8	2,6	670	280	300		MLRB-R-07-350
9	6,67	3,32	1099	20,4	2,8	720	290	300		MLRB-R-09-350
11	8,15	3,87	1280	21,1	2,9	770	290	300		MLRB-R-11-350
13	9,63	4,59	1506	22,8	2,9	820	290	360		MLRB-R-13-350
15	11,11	5,12	1684	22,2	3,0	870	290	360		MLRB-R-15-350
20	14,81	5,67	1871	21,7	3,2	920	300	360		MLRB-R-20-350
25	18,52	6,05	2003	20,4	3,5	970	315	360		MLRB-R-25-350
30	22,22	6,65	2206	20,0	3,7	1020	315	360		MLRB-R-30-350
35	25,93	6,80	2258	19,6	3,9	1070	330	360		MLRB-R-35-350
40	29,63	7,23	2389	21,1	4,1	1120	345	360		MLRB-R-40-350

The bearing stability is for deformation d_{Ed} combined with max. axial force under the design seismic action $N_{Ed,max}$ performed.

Relevant characteristics and dimensions of MAURER Lead Rubber Bearings

>> Horizontal displacement $d_{bd} = 333 \text{ mm}$ ($d_{Ed} = \gamma_x \times d_{bd}$)

Shear modulus $G_g = 0,40 \text{ N/mm}^2$

N_d	$N_{Ed,max}$	k_{eff}	F_h	ξ_{eff}	T_{eff}	A, B	H	L_D	Designation	
[MN]	[MN]	[kN/mm]	[kN]	[%]	[sec]	[mm]	[mm]	[mm]		
1	0,74	1,01	380	21,2	1,7	on request			SOFT	
3	2,22	1,00	377	21,3	3,0	620	315	240		MLRB-S-03-400
5	3,70	1,66	613	27,5	3,0	720	305	300		MLRB-S-05-400
7	5,19	1,60	601	23,3	3,6	770	310	300		MLRB-S-07-400
9	6,67	1,96	731	24,1	3,7	820	330	360		MLRB-S-09-400
11	8,15	2,48	915	27,5	3,6	870	330	360		MLRB-S-11-400
13	9,63	2,59	952	28,5	3,9	920	350	360		MLRB-S-13-400
15	11,11	2,65	982	26,1	4,1	970	345	360		MLRB-S-15-400
20	14,81	3,78	1365	31,5	4,0	1070	380	300		MLRB-S-20-400
25	18,52	4,03	1466	30,4	4,3	1170	390	360		MLRB-S-25-400
30	22,22	3,50	1291	27,3	5,1	1220	415	300		MLRB-S-30-400
35	25,93	3,12	1146	28,1	5,8	on request				
40	29,63	3,41	1218	32,9	5,9	on request				

>> Horizontal displacement $d_{bd} = 333 \text{ mm}$ ($d_{Ed} = \gamma_x \times d_{bd}$)

Shear modulus $G_g = 0,65 \text{ N/mm}^2$

N_d	$N_{Ed,max}$	k_{eff}	F_h	ξ_{eff}	T_{eff}	A, B	H	L_D	Designation	
[MN]	[MN]	[kN/mm]	[kN]	[%]	[sec]	[mm]	[mm]	[mm]		
1	0,74	1,23	471	17,6	1,6	on request			MEDIUM	
3	2,22	1,59	600	21,0	2,4	620	300	300		MLRB-M-03-400
5	3,70	1,85	700	20,5	2,8	670	300	360		MLRB-M-05-400
7	5,19	2,33	801	20,3	3,1	720	300	360		MLRB-M-07-400
9	6,67	3,00	881	20,6	3,4	770	320	360		MLRB-M-09-400
11	8,15	3,38	1124	23,5	3,3	820	310	300		MLRB-M-11-400
13	9,63	3,97	1268	22,9	3,4	870	300	300		MLRB-M-13-400
15	11,11	3,97	1481	24,6	3,4	920	300	360		MLRB-M-15-400
20	14,81	4,69	1758	22,8	3,6	1020	325	360		MLRB-M-20-400
25	18,52	5,03	1888	22,8	3,8	1070	330	360		MLRB-M-25-400
30	22,22	5,49	2030	26,6	4,0	1120	355	360		MLRB-M-30-400
35	25,93	5,52	2043	26,5	4,3	1170	390	360		MLRB-M-35-400
40	29,63	5,30	1956	27,3	4,7	1170	420	360		MLRB-M-40-400

>> Horizontal displacement $d_{bd} = 333 \text{ mm}$ ($d_{Ed} = \gamma_x \times d_{bd}$)

Shear modulus $G_g = 0,90 \text{ N/mm}^2$

N_d	$N_{Ed,max}$	k_{eff}	F_h	ξ_{eff}	T_{eff}	A, B	H	L_D	Designation	
[MN]	[MN]	[kN/mm]	[kN]	[%]	[sec]	[mm]	[mm]	[mm]		
1	0,74	1,73	678	8,9	1,3	on request			REGULAR	
3	2,22	1,98	759	17,1	2,1	620	290	360		MLRB-R-03-400
5	3,70	2,32	888	16,7	2,5	670	290	360		MLRB-R-05-400
7	5,19	2,68	1027	16,3	2,8	720	290	300		MLRB-R-07-400
9	6,67	3,06	1176	16,0	3,0	770	300	300		MLRB-R-09-400
11	8,15	3,39	1279	21,1	3,1	770	315	300		MLRB-R-11-400
13	9,63	3,82	1444	20,6	3,2	820	315	360		MLRB-R-13-400
15	11,11	4,12	1539	23,9	3,3	820	315	360		MLRB-R-15-400
20	14,81	4,58	1717	23,2	3,6	870	325	360		MLRB-R-20-400
25	18,52	4,87	1832	22,0	3,9	920	345	360		MLRB-R-25-400
30	22,22	5,77	2142	25,5	3,9	970	355	360		MLRB-R-30-400
35	25,93	5,58	2087	23,5	4,3	1020	390	360		MLRB-R-35-400
40	29,63	6,01	2242	24,6	4,5	1070	405	360		MLRB-R-40-400

The bearing stability is for deformation d_{Ed} combined with max. axial force under the design seismic action $N_{Ed,max}$ performed.