



**BRIDGE BEARINGS
BRIDGE EXPANSION JOINTS
POST-TENSIONING SYSTEMS**



ARFEN GROUP



Arfen Aluminium

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Arfen Bridge

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Arfen Construction

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Arfen has started to operation from 1999 for create trust as a company that finds solutions to the customer's technical needs and requirements.

Arfen made agreements with international partners, so that brings international experiences to our country about bridge bearings, bridge expansion joints, seismic isolators and post-tensioning etc.

Arfen as a construction material manufacturers, is exporting product to 25 countries internationally as well as nationally.

Arfen makes technical meetings with the customer to find solutions and most economical design for their needs in the subject of Arfen. It also makes required applications and maintenances in the construction site if client requests.

Arfen is a technical manufacturer uses more than 18 years of engineering experience, which is a company in Turkey with name and patent rights of self-developed products. Arfen exports, Arfen products to 30 different countries.


Arfen makes design and production to meet the requirements of international standards under ISO-9001 Quality Management System.

Arfen provides more economical alternatives for customers with experienced engineers and high technical knowledge.

We will keep to serve to our customers with high quality and economic solutions that they need.

Best Regards,
Arfen Bridge and Construction Technologies Ind.
Trade. Co. Ltd.





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"We Build Solutions"





BRIDGE BEARINGS

Elastomeric Bearings



Arfen elastomeric (neoprene) bearings, consisting of a waterproof rubber and steel plates which transfers the loads rightly from superstructure to the bridge piers and abutments .

This system produces in factory under high temperature and pressure with natural rubber (NR) or chloroprene (CR) plates (in some cases only rubber) and steel plates .

Steel plates vulcanized with rubber material therefore composite and strong system has been obtained for loads. This production system provides corrosion-guaranteed long-lasting solution to ARFEN bridge bearings.

Rubber is strong against to surface oil, grease, oil, chemicals, resistant to uv rays, snow and salt. All of these bearings designed and manufactured accordance with recent technology to transfer every kind of loads (traffic load, seismic load, wind load, etc.) from the upper structure to the piers of the bridges.

The outer surfaces of the type B elastomeric bearings are entirely covered with rubber. They are used between concrete and steel construction elements and these bearings can be placed between the structural members easily. C type bearings have lower and upper steel plates. These plates are fixed to the structure with bolts to ensure the safety of the system against shear forces. The inner steel plates in the bearings must be at least 2 mm.

If sliding bearing requested, it can be designed according to standards using PTFE and stainless steel by our professional engineers. Outer steel plates are used in these bearings. The thickness of the outer steel plate varies according to the design loads and displacements.

Our production is manufactured in accordance with BS 5400, DIN 4141, EN 1337-3 and AS 5100-4. All the tests required from the beginning to the end of the manufacturing are done in our own laboratory. Bearing selection can be done from tables in pages or related design needs can be sent to our company to produce special sizes for your need.

Elastomeric Bearings



Physical and Mechanical Properties of Elastomer (EN 1337-3)

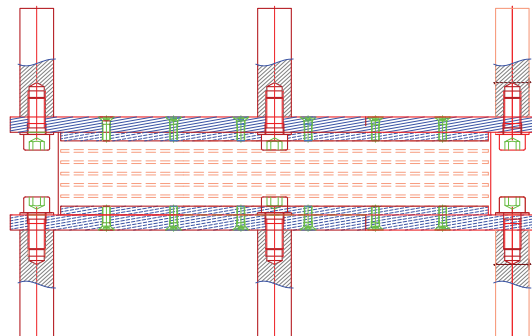
Test Name	Test Method	Standard	Required Values	Unit
Hardness	TS ISO 48	ASTM D2240	60±5	ShrA
Tensile Strength	TS 1967 ISO 37	ASTM D412	≥16	MPa
Elongation At Break	TS 1967 ISO 37	ASTM D412	425	%
Compression Set / 70 °C, 24 saat	TS 4595 ISO 815	ASTM D395	CR≤15 NR≤30	%
Tear Strength	TS 4698 ISO 34-1	ASTM D624	CR≥10 CR≥8	kN/m
Rubber Metall Bond Strength		ASTM D429	≥7	N/mm ²
Ozon Resistance (40 °C, 48HOURS, %20 elongation)	TS 2680 ISO 1431-1	ASTM D1149	No crack	
Ageing -Increase In Hardness -Change In Tensile Strength - Change In Elongation	TS 4595 ISO 815	ASTM D412	-5/+10 ±15 ±25	Shr A % %



B Type



C Type



Elastomeric Bearings

For B-type bearings standard measures according to EN 1337-3

Dimensions axb (mm) or D	Thickness (mm)						Layer Number (n)	
	Unloaded Bearing		Elastomer (Total a)		Elastomer Layers	Steel Layers	Min	Max
	Min	Max	Min	Max				
100x150	30	41	16	24	8	3	2	3
100x200	30	41	16	24	8	3	2	3
150x200	30	52	16	32	8	3	2	4
∅ 200	30	52	16	32	8	3	2	4
150x250	30	52	16	32	8	3	2	4
150x300	30	52	16	32	8	3	2	4
∅ 250	30	52	16	32	8	3	2	4
200x250	41	74	24	48	8	3	3	6
200x300	41	74	24	48	8	3	3	6
200x350	41	74	24	48	8	3	3	6
∅ 300	41	74	24	48	8	3	3	6
200x400	41	74	24	48	8	3	3	6
250x300	41	85	24	56	8	3	3	7
∅ 350	41	85	24	56	8	3	3	7
250x400	41	85	24	56	8	3	3	7
300x400	57	105	36	72	12	4	3	6
∅ 400	57	105	36	72	12	4	3	6
300x500	57	105	36	72	12	4	3	6
∅ 450	57	105	36	72	12	4	3	6
300x600	57	105	36	72	12	4	3	6
350x450	57	121	36	84	12	4	3	7
∅ 500	57	121	36	84	12	4	3	7
400x500	73	137	48	96	12	4	3	8
∅ 550	73	137	48	96	12	4	3	8
400x600	73	137	48	96	12	4	4	8
450x600	73	153	48	108	12	4	4	9
∅ 600	73	153	48	108	12	4	4	9
500x600	73	169	48	120	12	4	4	10
∅ 650	73	169	48	120	12	4	4	10
600x600	94	199	64	144	16	4	4	9
∅ 700	94	199	64	144	16	5	4	9
600x700	94	199	64	144	16	5	4	9
∅ 750	94	199	64	144	16	5	4	9
700x700	94	220	64	160	16	5	4	10
∅ 800	94	220	64	160	16	5	4	10
700x800	94	220	64	160	16	5	4	10
∅ 850	94	220	64	160	16	5	4	10
800x800	110	285	80	220	20	5	4	10
∅ 900	110	285	80	220	20	5	4	10
900x900	110	285	80	220	20	5	4	11

* Total thickness excluding bottom and top coating

Elastomeric Bearings

According to AASHTO and according to the load applied elastomeric support values

Applied Load (kN)	Bearing Dimensions W*L*T (mm)	Rubber Layer		Horizontal Load (kN)		Displacement	
		Elastomer Layer Number	Total Elastomer Thickness	Service Load State (50%)	Ultimate Load State (150%)	Service Load State(50%)	Ultimate Load State (150%)
500	210x300x77	6	56	42,2	102	±28	±84
	210x300x88	7	64			±32	±96
	210x300x99	8	72			±36	±108
	210x300x110	9	80			±40	±120
	210x300x121	10	88			±44	±132
	210x300x132	11	96			±48	±144
	210x300x143	12	104			±52	±156
	210x300x154	13	112			±56	±168
750	220x400x77	6	56	62,8	142,4	±28	±84
	220x400x88	7	64			±32	±96
	220x400x99	8	72			±36	±108
	220x400x110	9	80			±40	±120
	220x400x121	10	88			±44	±132
	220x400x132	11	96			±48	±144
	220x400x143	12	104			±52	±156
	220x400x154	13	112			±56	±168
1000	290x400x80	4	60	84,3	187,7	±30	±90
	290x400x96	5	72			±36	±108
	290x400x112	6	84			±42	±126
	290x400x128	7	96			±48	±144
	290x400x144	8	108			±54	±162
	290x400x160	9	120			±60	±180
	290x400x176	10	132			±66	±198
	1350	350x550x96	5			72	84,3
350x550x112		6	84	±42	±126		
350x450x128		7	96	±48	±144		
350x450x144		8	108	±54	±162		
350x450x160		9	120	±60	±180		
350x450x176		10	132	±66	±198		
1750	350x550x112	4	60	84,3	187,7	±30	±90
	350x550x128	5	72			±36	±108
	350x550x144	6	84			±42	±126
	350x550x160	7	96			±48	±144
	350x550x176	8	108			±54	±162
	350x550x192	9	120			±60	±180
	350x550x208	10	132			±66	±198
2000	550x400x144	8	108	147,1	356	±54	±162
	550x400x160	9	120			±60	±180
	550x400x176	10	132			±66	±198
	550x400x192	11	144			±72	±216
	550x400x208	12	156			±80	±234
2500	600x450x116	5	72	84,3	187,7	±46	±138
	600x450x136	6	84			±54	±156
	600x450x156	7	96			±62	±174
	600x450x176	8	108			±70	±192
	600x450x196	9	120			±78	±210
	600x450x216	10	132			±86	±228
3000	700x450x126	8	108	147,1	356	±48	±144
	700x450x147	9	120			±56	±162
	700x450x168	10	132			±64	±180
	700x450x189	11	144			±72	±198
	700x450x210	12	156			±80	±216

* Please contact with Arfen for special designs.

Pot Bearings



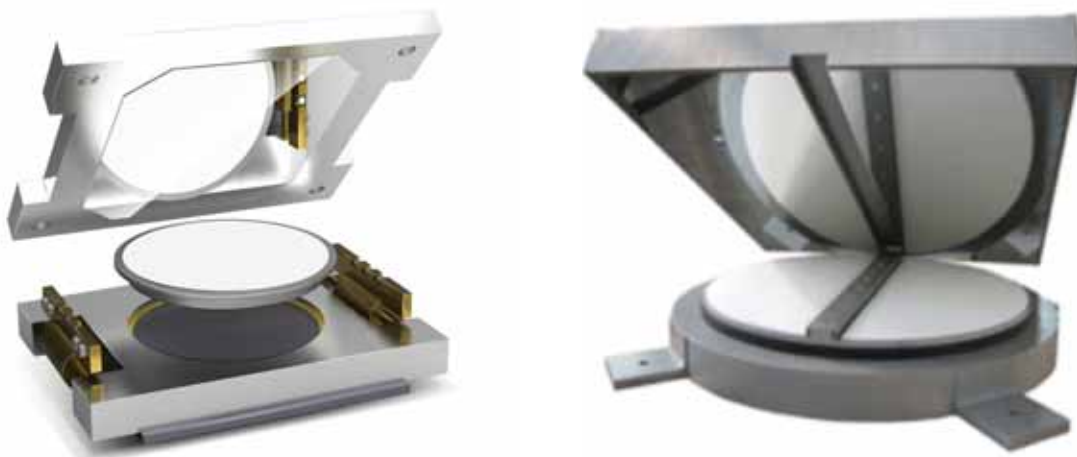
Pot bearings are designed to carry the vertical load combinations, horizontal loads, longitudinal and transversal movements and rotations. These bearings are used at highway and railway bridges. The fully covered rubber pad is placed in a steel pot. Under high pressure the pad behaves like a liquid material. The elasticity of the rubber allows tilting movement (rotation) of the piston in the horizontal axis. Pot bearings can carry very high loads which are over 100.000 kN.

There are three different types of pot bearings as fixed, free sliding, longitudinal or transverse sliding. The most accurate and economical bearing design is made when displacement, rotation, earthquake loads, minimum and maximum service loads are imported to us. Our pot bearings meet the requirements of many international standards (EN, BS, AASHTO, DIN, SETRA) and have CE certificate.

Fixed Type Pot Bearings : These bearings consist of a pot / piston assembly within which an elastomeric disc is encapsulated and fitted with an anti-extrusion sealing device. Under load this encapsulated elastomeric disc acts in a similar manner to a noncompressible confined fluid, enabling the pot and piston to rotate relative to each other. These bearings enable rotation in any direction while at the structure is constrained horizontally. The function of the pot and piston parts are for fixing and securing the bearings to the bridge structure.

Free Sliding Pot Bearings : Identical in construction to the fixed bearings, these multi-directional devices are fitted with a virgin PTFE sheet in contact with an austenitic steelplate, enabling the bearing to slide in all directions.

Guided Pot Bearings : Guided Sliding devices are identical in construction to free sliding bearings but are also fitted with one or more guides to limit the bearings movement to only one direction.



Pot Bearings

Pot Mesnet Aksesuarları

Comprehensive Labelling : All the bearings are provided with a red metal label detailing the proprieties of the bearing. Bearing type, maximum loads, rotation values, order number, manufacture date and CE mark are shown over label. The top face of the bearing gives information on the type of the bearing and the direction of the axis of the bridge.

Movement indicator : The movement indicator allows the monitoring of the sliding bearing displacement by using a reference arrow fixed to the bearing base and a graduate indicator moving with the sliding plate. The movement indicator allow to check the initial presetting of the bearing (if required) and to verify the bearing motion during the future inspections.

Reference surfaces : According to EN1337 code the bearing can be provided with "reference surfaces" to ensure the perfect horizontal position during bearing installation. The lower reference surface is parallel to the bearing base and the upper one to the upper plate.

Dust protection : The dust protection around the sliding plate ensure the cleaning of the sliding surfaces to minimize the friction duringsliding and guarantee the durability of the PTFE sliding material.

Corrosion protection : Provides high corrosion protection with the required filler and paint support as appropriate to EN 1337-9 standard.

Temporary Red Carriage Piece : Provides the system together until the assembly is finished. Removable after assembly is finished.



Installation and Maintenance of Pot Bearing

- Before installation, bearings should be stored in a suitable environment to protect from environmental conditions.
- Appropriate lifting equipment should be used for lifting and transporting bearings.
- Proper spacing should be left for the anchoring bars in the lower concrete.
- A steel or wooden formwork must be made on the base of the bearing so that the bearing and anchoring rods can be correctly positioned.
- The formwork must be supported at the design level during concrete pouring.
- When the concrete has reached adequate resistance the supports and formwork have to be removed.
- There are different assembly processes depending on whether the region where the bearing will be placed is a precast beam or cast-in situ.
- The red carriage piece must never be disassembled before the end of the bracket assembly.
- Care should be taken to maintain the bearings at regular intervals after installation.
- Please contact with Arfen for more detailed installation procedure..

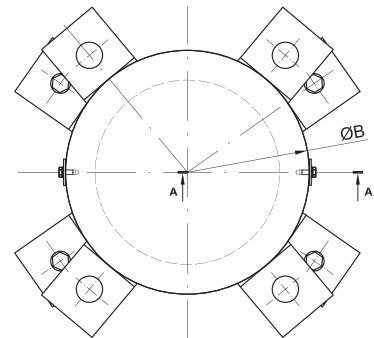
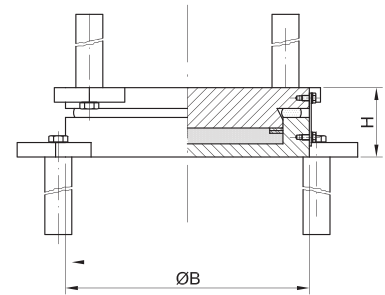


Pot Bearings

Fixed Pot Bearing

Technical values are shown for fixed bearing in the table. For example, AGPF 500-75-75 means vertical load is 500 kN, horizontal longitudinal load is 75 kN and horizontal transversal load is 75 kN.

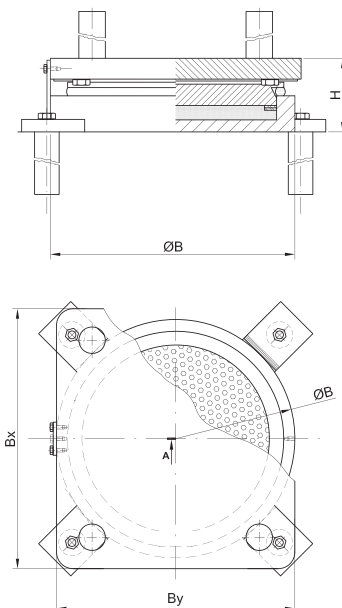
Bearing Code	N_{RD} (kN)	V_{xRD} (kN)	V_{yRD} (kN)	Φ_B (mm)	H (mm)	W (kg)
AGPF 500-75-75	500	75	75	170	46	8
AGPF 1000-150-150	1000	150	150	220	51	20
AGPF 1500-225-225	1500	225	225	270	55	25
AGPF 2000-300-300	2000	300	300	310	62	30
AGPF 2500-375-375	2500	375	375	350	64	39
AGPF 3000-450-450	3000	450	450	380	67	48
AGPF 4000-600-600	4000	600	600	440	73	70
AGPF 5000-750-750	5000	750	750	490	76	89
AGPF 6000-900-900	6000	900	900	540	80	113
AGPF 7000-1050-1050	7000	1050	1050	580	85	136
AGPF 8000-1200-1200	8000	1200	1200	620	90	164
AGPF 9000-1350-1350	9000	1350	1350	660	93	192
AGPF 10000-1500-1500	10000	1500	1500	690	101	229
AGPF 11000-1650-1650	11000	1650	1650	720	107	268
AGPF 12000-1800-1800	12000	1800	1800	760	110	306
AGPF 13000-1950-1950	13000	1950	1950	790	117	357
AGPF 14000-2100-2100	14000	2100	2100	820	118	381
AGPF 15000-2250-2250	15000	2250	2250	850	120	415
AGPF 16000-2400-2400	16000	2400	2400	880	126	472
AGPF 17000-2550-2550	17000	2550	2550	900	127	495
AGPF 18000-2700-2700	18000	2700	2700	940	129	548
AGPF 19000-2850-2850	19000	2850	2850	960	129	561
AGPF 20000-3000-3000	20000	3000	3000	980	131	599
AGPF 25000-3750-3750	25000	3750	3750	1110	151	894
AGPF 30000-4500-4500	30000	4500	4500	1200	159	1088
AGPF 40000-6000-6000	40000	6000	6000	1400	181	1688
AGPF 50000-7500-7500	50000	7500	7500	1560	200	2302
AGPF 60000-9000-9000	60000	9000	9000	1710	218	3013
AGPF 70000-10500-10500	70000	10500	10500	1850	235	3813
AGPF 80000-12000-12000	80000	12000	12000	2000	246	4682
AGPF 90000-13500-13500	90000	13500	13500	2130	257	5515
AGPF 100000-15000-15000	100000	15000	15000	2250	269	6432



Pot Bearings

Free Sliding Pot Bearing

Technical values are shown for free sliding bearing in the table. For example, AGPM 500/100/20 means vertical load is 500 kN, horizontal longitudinal displacement is 100 mm (± 50) and horizontal transversal displacement is 20 mm (± 10).



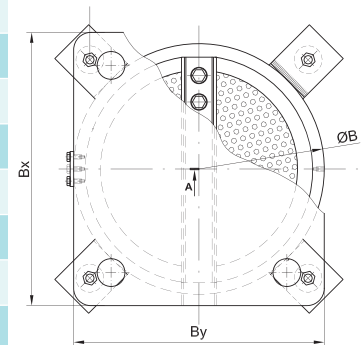
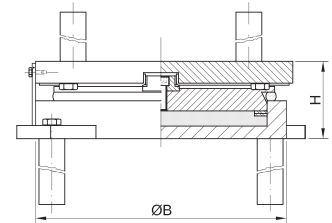
Bearing Code	N_{RD} (kN)	V_{xld} (kN)	V_{yld} (kN)	Φ_B (mm)	H (mm)	B_x (mm)	B_y (mm)	W (kg)
AGPM 500/100/20	500	100	20	160	60	260	160	11
AGPM 1000/100/20	1000	100	20	200	64	300	200	17
AGPM 1500/100/20	1500	100	20	260	73	360	260	31
AGPM 2000/100/20	2000	100	20	280	79	380	280	39
AGPM 2500/100/20	2500	100	20	330	81	430	330	53
AGPM 3000/100/20	3000	100	20	360	83	460	360	63
AGPM 4000/100/20	4000	100	20	400	93	500	400	87
AGPM 5000/100/20	5000	100	20	450	96	550	450	110
AGPM 6000/100/20	6000	100	20	490	100	590	490	132
AGPM 7000/100/20	7000	100	20	530	105	630	530	158
AGPM 8000/100/20	8000	100	20	570	113	670	570	199
AGPM 9000/100/20	9000	100	20	600	117	700	600	225
AGPM 10000/100/20	10000	100	20	630	120	730	630	251
AGPM 11000/100/20	11000	100	20	660	124	760	660	284
AGPM 12000/100/20	12000	100	20	700	128	800	700	325
AGPM 13000/100/20	13000	100	20	720	136	820	720	373
AGPM 14000/100/20	14000	100	20	750	137	850	750	399
AGPM 15000/100/20	15000	100	20	780	142	880	780	444
AGPM 16000/100/20	16000	100	20	800	144	900	800	472
AGPM 17000/100/20	17000	100	20	830	146	930	830	512
AGPM 18000/100/20	18000	100	20	850	151	950	850	552
AGPM 19000/100/20	19000	100	20	880	153	980	880	541
AGPM 20000/100/20	20000	100	20	900	154	1000	900	625
AGPM 25000/100/20	25000	100	20	1010	170	1110	1010	867
AGPM 30000/100/20	30000	100	20	1110	182	1210	1110	1109
AGPM 40000/100/20	40000	100	20	1270	205	1370	1270	1605
AGPM 50000/100/20	50000	100	20	1440	225	1540	1440	2252
AGPM 60000/100/20	60000	100	20	1600	233	1700	1600	2872
AGPM 70000/100/20	70000	100	20	1710	251	1810	1710	3521
AGPM 80000/100/20	80000	100	20	1820	265	1920	1820	4219
AGPM 90000/100/20	90000	100	20	1950	276	2050	1950	5013
AGPM 100000/100/20	100000	100	20	2050	286	2150	2050	5700

Pot Bearings

Guided Pot Bearing

Technical values are shown for guided bearing in the table. For example, AGPL 500/100-75 means vertical load is 500 kN, horizontal longitudinal displacement is 100 mm (± 50) and horizontal transversal load is 75 kN.

Bearing Code	N_{RD} (kN)	V_{xd} (kN)	V_{yd} (kN)	Φ_B (mm)	H (mm)	B_x (mm)	B_y (mm)	W (kg)
AGPL 500/100-75	500	100	75	170	68	270	170	12
AGPL 1000/100-150	1000	100	150	220	76	320	220	24
AGPL 1500/100-225	1500	100	225	270	79	370	270	35
AGPL 2000/100-300	2000	100	300	310	82	410	310	46
AGPL 2500/100-375	2500	100	375	350	84	450	350	60
AGPL 3000/100-450	3000	100	450	380	97	480	380	83
AGPL 4000/100-600	4000	100	600	440	102	540	440	110
AGPL 5000/100-750	5000	100	750	490	108	590	490	153
AGPL 6000/100-900	6000	100	900	540	118	640	540	198
AGPL 7000/100-1050	7000	100	1050	580	126	680	580	241
AGPL 8000/100-1200	8000	100	1200	620	130	720	620	280
AGPL 9000/100-1350	9000	100	1350	660	138	760	660	343
AGPL 10000/100-1500	10000	100	1500	690	148	790	690	388
AGPL 11000/100-1650	11000	100	1650	720	150	820	720	424
AGPL 12000/100-1800	12000	100	1800	760	161	860	760	492
AGPL 13000/100-1950	13000	100	1950	790	168	890	790	562
AGPL 14000/100-2100	14000	100	2100	820	171	920	820	601
AGPL 15000/100-2250	15000	100	2250	850	176	950	850	699
AGPL 16000/100-2400	16000	100	2400	880	182	980	880	787
AGPL 17000/100-2550	17000	100	2550	900	188	1000	900	813
AGPL 18000/100-2700	18000	100	2700	940	191	1040	940	891
AGPL 19000/100-2850	19000	100	2850	960	203	1060	960	988
AGPL 20000/100-3000	20000	100	3000	980	205	1080	980	1046
AGPL 25000/100-3750	25000	100	3750	1110	222	1210	1110	1456
AGPL 30000/100-4500	30000	100	4500	1200	242	1300	1200	1880
AGPL 40000/100-6000	40000	100	6000	1400	272	1500	1400	2835
AGPL 50000/100-7500	50000	100	7500	1560	304	1660	1560	3893
AGPL 60000/100-9000	60000	100	9000	1710	320	1810	1710	4889
AGPL 70000/100-10500	70000	100	10500	1850	337	1950	1850	6074
AGPL 80000/100-12000	80000	100	12000	2000	362	2100	2000	7607
AGPL 90000/100-13500	90000	100	13500	2130	382	2230	2130	9227
AGPL 100000/100-15000	100000	100	15000	2250	405	2350	2250	10899



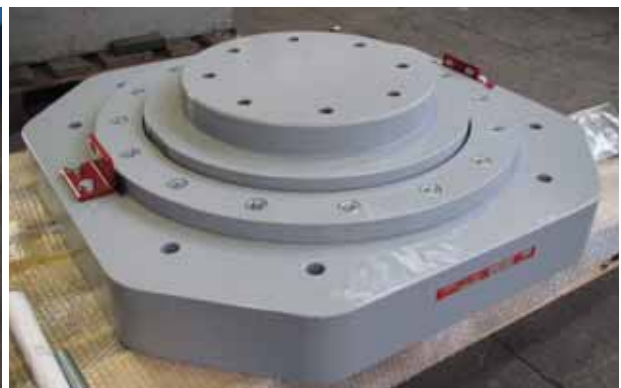
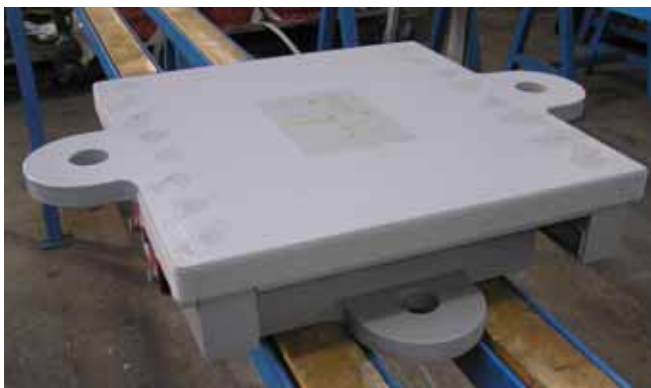
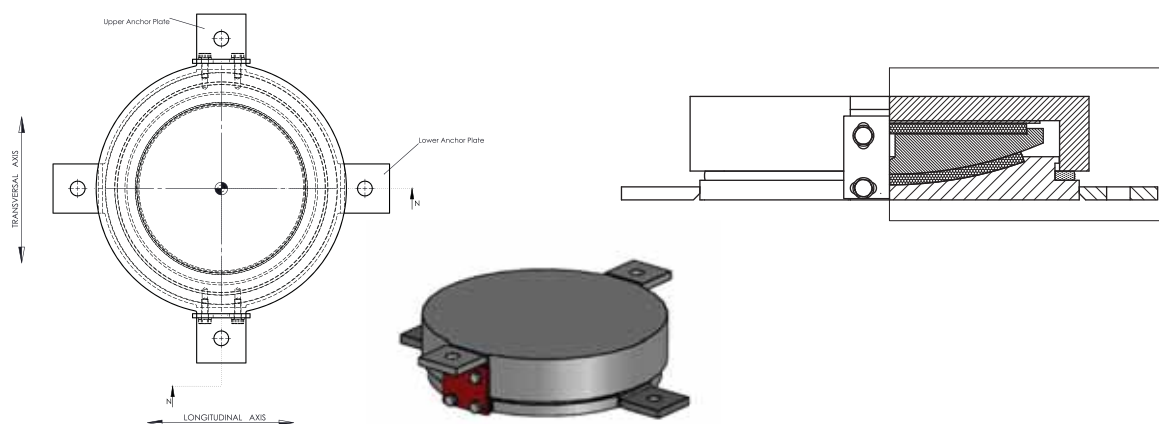
Spherical Bearings



Spherical bearings are designed to carry combinations of vertical loads, horizontal loads, longitudinal and transversal movements and rotations and they are used in steel and concrete road and railway bridges. The bearing is composed by steel elements coupled with PTFE surface to allow movement and rotations. One side of the internal steel plate is machined as a spherical surface to allow tilting movement (rotation) whilst on the other side a flat sliding surface is obtained to allow displacements.

Depending on whether the bearing is fixed, guided or a free sliding, spherical bearings accommodate vertical loads and corresponding horizontal forces, as well as movements in longitudinal or transversal directions. Spherical bearings are produced according to EN 1337-7 also to the clients request they can be produced according to other codes as well.

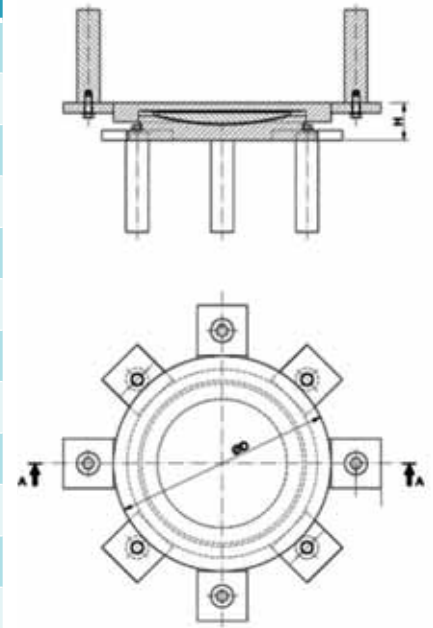
The spherical bearings can carry very high loads as pot bearings. Unlike pot support, it is necessary to use a spherical support when the rotation value is high. As a system and accessory spherical bearings are very similar to pot bearings. The installation method and steps are the same as the pot bearing.



Spherical Bearings

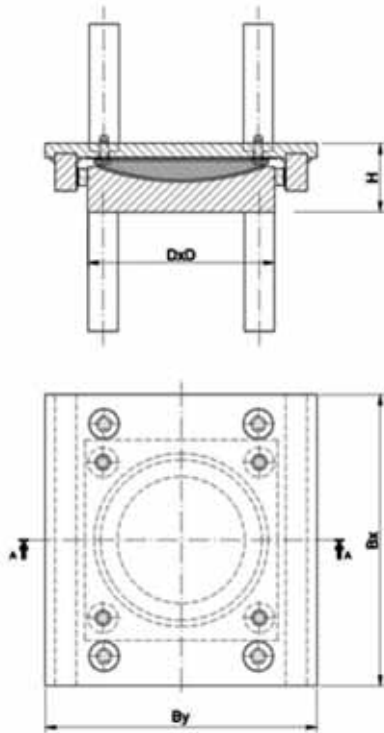
The technical specifications of fixed spherical bearings are shown below. As an example, the meaning of the bearing AGSF 500-75-75; The vertical load is 500 kN, the longitudinal load is 75 kN and the transverse horizontal load is 75 kN.

Bearing Code	NRD (kN)	V _x , RD (kN)	V _y , RD (kN)	ΦB (mm)	H (mm)
AGSF 500-75-75	500	75	75	180	80
AGSF 1000-150-150	1000	150	150	240	85
AGSF 1500-225-225	1500	225	225	280	95
AGSF 2000-300-300	2000	300	300	320	100
AGSF 2500-375-375	2500	375	375	360	105
AGSF 3000-450-450	3000	450	450	390	110
AGSF 4000-600-600	4000	600	600	450	115
AGSF 5000-750-750	5000	750	750	500	125
AGSF 6000-900-900	6000	900	900	550	130
AGSF 7000-1050-1050	7000	1050	1050	580	135
AGSF 8000-1200-1200	8000	1200	1200	620	145
AGSF 9000-1350-1350	9000	1350	1350	660	150
AGSF 10000-1500-1500	10000	1500	1500	690	160
AGSF 11000-1650-1650	11000	1650	1650	720	165
AGSF 12000-1800-1800	12000	1800	1800	760	175
AGSF 13000-1950-1950	13000	1950	1950	790	180
AGSF 14000-2100-2100	14000	2100	2100	820	185
AGSF 15000-2250-2250	15000	2250	2250	850	195
AGSF 16000-2400-2400	16000	2400	2400	880	195
AGSF 17000-2550-2550	17000	2550	2550	900	200
AGSF 18000-2700-2700	18000	2700	2700	940	205
AGSF 19000-2850-2850	19000	2850	2850	950	210
AGSF 20000-3000-3000	20000	3000	3000	980	215
AGSF 25000-3750-3750	25000	3750	3750	1100	270
AGSF 3000-4500-4500	30000	4500	4500	1190	300
AGSF 40000-6000-6000	40000	6000	6000	1380	320
AGSF 50000-7500-7500	50000	7500	7500	1540	345
AGSF 60000-9000-9000	60000	9000	9000	1680	360
AGSF 70000-10500-10500	70000	10500	10500	1830	375
AGSF 80000-12000-12000	80000	12000	12000	1970	390
AGSF 90000-13500-13500	90000	13500	13500	2090	430
AGSF 100000-15000-15000	100000	15000	15000	2210	445



Spherical Bearings

The technical specifications of the guided spherical bearings are shown below. As an example, the meaning of the bearing AGSL 500/100-75; Vertical load 500 kN, longitudinal transversal displacement 100 mm (± 50) and transversal (or longitudinal) lateral force 75 kN.

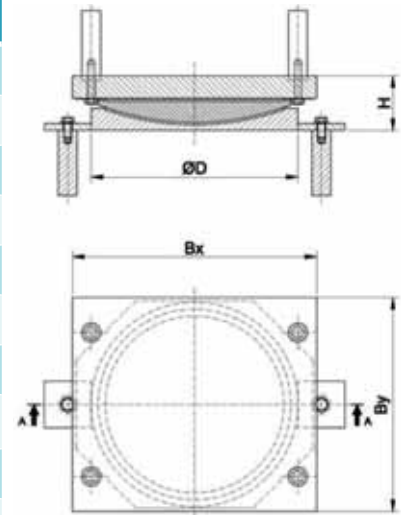


Bearing Code	NRD (kN)	V _{x,d} (kN)	V _{y, Rd} (kN)	B (mm)	H (mm)	BX (mm)	BY (mm)
AGSL 500/100-75	500	100	75	150	75	250	210
AGSL 1000/100-150	1000	100	150	200	80	300	260
AGSL 1500/100-225	1500	100	225	250	95	350	310
AGSL 2000/100-300	2000	100	300	290	100	390	350
AGSL 2500/100-375	2500	100	375	320	110	420	400
AGSL 3000/100-450	3000	100	450	350	120	450	430
AGSL 4000/100-600	4000	100	600	400	125	500	480
AGSL 5000/100-750	5000	100	750	450	140	550	530
AGSL 6000/100-900	6000	100	900	490	145	590	590
AGSL 7000/100-1050	7000	100	1050	530	160	630	630
AGSL 8000/100-1200	8000	100	1200	570	165	670	670
AGSL 9000/100-1350	9000	100	1350	600	170	700	710
AGSL 10000/100-1500	10000	100	1500	640	185	740	750
AGSL 11000/100-1650	11000	100	1650	670	190	770	780
AGSL 12000/100-1800	12000	100	1800	700	195	800	820
AGSL 13000/100-1950	13000	100	1950	720	205	820	840
AGSL 14000/100-2100	14000	100	2100	750	215	850	870
AGSL 15000/100-2250	15000	100	2250	780	220	880	910
AGSL 16000/100-2400	16000	100	2400	800	220	900	930
AGSL 17000/100-2550	17000	100	2550	830	225	930	970
AGSL 18000/100-2700	18000	100	2700	850	235	950	990
AGSL 19000/100-2850	19000	100	2850	870	245	970	1010
AGSL 20000/100-3000	20000	100	3000	900	245	1000	1060
AGSL 25000/100-3750	25000	100	3750	1000	265	1100	1160
AGSL 30000/100-4500	30000	100	4500	1100	280	1200	1260
AGSL 40000/100-6000	40000	100	6000	1270	310	1370	1450
AGSL 50000/100-7500	50000	100	7500	1420	340	1520	1600
AGSL 60000/100-9000	60000	100	9000	1550	330	1650	1730
AGSL 70000/100-10500	70000	100	10500	1670	385	1770	1870
AGSL 80000/100-12000	80000	100	12000	1790	400	1890	1990
AGSL 90000/100-13500	90000	100	13500	1900	430	2000	2120
AGSL 100000/100-15000	100000	100	15000	2000	445	2100	2220

Spherical Bearings

The technical specifications of the free sliding spherical bearings are shown below. As an example, the meaning of the bearing AGSM 500/100/20; The vertical load is 500 kN, the l movement in the longitudinal direction is 100 mm (± 50) and the lateral movement in the transverse direction is 20 mm (± 10).

Bearing Code	NRD (kN)	V _{x,d} (kN)	V _{y, Rd} (kN)	ΦB (mm)	H (mm)	BX (mm)	BY (mm)
AGSM 500/100/20	500	100	20	150	70	250	150
AGSM 1000/100/20	1000	100	20	200	75	300	200
AGSM 1500/100/20	1500	100	20	250	90	350	250
AGSM 2000/100/20	2000	100	20	290	95	390	290
AGSM 2500/100/20	2500	100	20	320	100	420	320
AGSM 3000/100/20	3000	100	20	350	105	450	350
AGSM 4000/100/20	4000	100	20	400	115	500	400
AGSM 5000/100/20	5000	100	20	450	125	550	450
AGSM 6000/100/20	6000	100	20	490	135	590	490
AGSM 7000/100/20	7000	100	20	530	140	630	530
AGSM 8000/100/20	8000	100	20	570	145	670	570
AGSM 9000/100/20	9000	100	20	600	150	700	640
AGSM 10000/100/20	10000	100	20	640	155	740	640
AGSM 11000/100/20	11000	100	20	670	165	770	670
AGSM 12000/100/20	12000	100	20	700	175	790	700
AGSM 13000/100/20	13000	100	20	720	180	820	720
AGSM 14000/100/20	14000	100	20	750	185	850	750
AGSM 15000/100/20	15000	100	20	780	190	880	780
AGSM 16000/100/20	16000	100	20	800	190	900	800
AGSM 17000/100/20	17000	100	20	830	195	930	830
AGSM 18000/100/20	18000	100	20	850	200	950	850
AGSM 19000/100/20	19000	100	20	870	205	970	870
AGSM 20000/100/20	20000	100	20	900	210	1000	900
AGSM 25000/100/20	25000	100	20	1000	230	1100	1000
AGSM 30000/100/20	30000	100	20	1100	245	1200	1100
AGSM 40000/100/20	40000	100	20	1270	275	1370	1270
AGSM 50000/100/20	50000	100	20	1420	300	1520	1420
AGSM 60000/100/20	60000	100	20	1550	330	1650	1550
AGSM 70000/100/200	70000	100	20	1670	350	1770	1670
AGSM 80000/100/20	80000	100	20	1790	370	1890	1790
AGSM 90000/100/20	90000	100	20	1900	385	2000	1900
AGSM 100000/100/20	100000	100	20	2000	400	2100	2000



Seismic Isolators



Based on the concept of reducing earthquake loads, " seismic isolation design " is considered as the most effective design technology to damp earthquake loads of a structure. With seismic isolation design it is possible to provide seismic isolation not only for the new structures but also for the old structures by installing special isolators between the foundation and upper conveyor system. Using seismic isolators; Instead of increasing the resistance of the structure against the earthquake loads, the period of the structures is extended and the earthquake force acting on the structure is reduced. In addition, with the using of isolators, displacements occur in the isolator, so the bearing system exhibits rigid motion and the earthquake resistance of the structure is increasing.

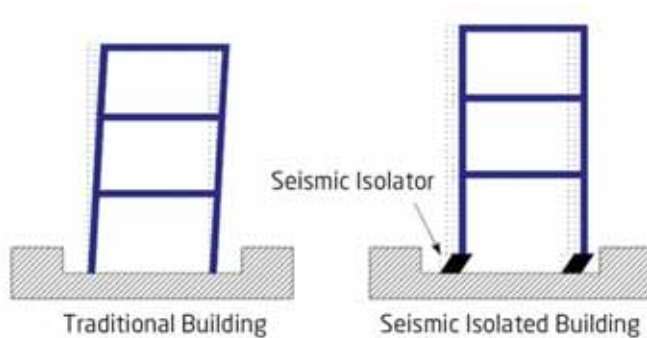
Seismic isolation should be used in all structures that need to function immediately after the earthquake, such as hospitals, fire stations, transportation stations, airports, bridges, power generation facilities, first aid centers, historical buildings.



Some of the benefits of seismic isolation design are as follows;

- Minimal structural damage occurs after the earthquake in the main bearing elements of the structure.
- The structure can be used immediately after severe earthquakes.
- There is no displacement difference between floors in seismic isolator used buildings.
- The damping capacity of the building increase and thus the structure exhibits a more elastic behavior.
- Time loss after the earthquake is prevented by immediate use.
- Provides the best protection of historical buildings without disturbing post-earthquake architecture.
- Seismic isolators can be easily replaced, so they do not shorten the useful life.

Seismic Isolators



There are different type isolators. According to the requirement of the project; high damping capacity, lead core and friction pendulum type seismic isolators. Performance demand, earthquake risk, architectural design, purpose of use of the building, geometry of the structure are important factors in determining the isolator type.

High Damping Rubber Isolator (HDRB)

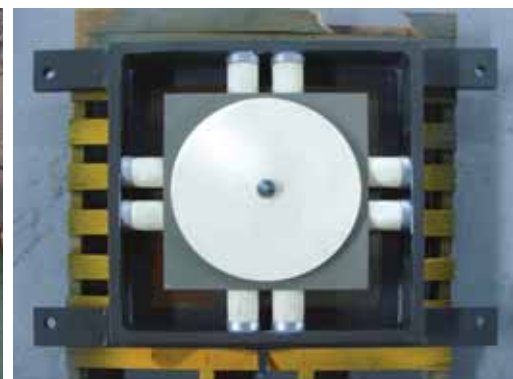
The damping capacity is increased by adding extra materials to the natural rubber. High damping rubber bearings consist of reinforced multilayers with steel plates between HDRB specially compounded damping rubber and rubber layers. Steel plates provide vertical rigidity and rubber horizontal flexibility. They can be made rectangular or circular accordance to client request.

Friction Pendulum Isolator

This type isolator works with the energy damping principle by friction. If the seismic forces acting on such isolators exceed the static frictional force limit, the steel sphere in the isolator begins to slip on the concave bottom plate. Then the isolator allows the structure to oscillate like a pendulum.

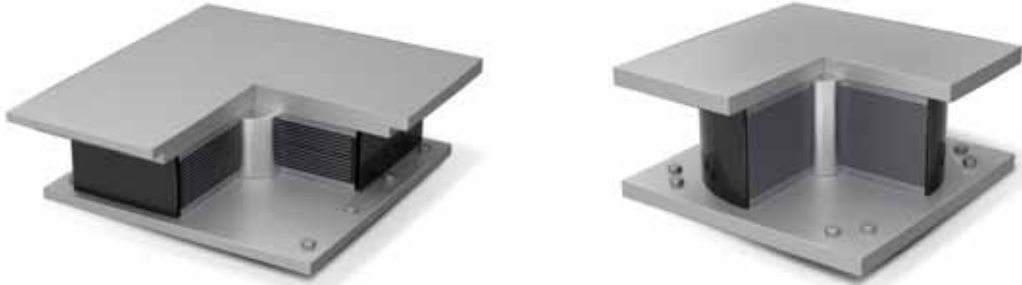
The pendulum isolators are designed with a single curved surface or multi curved surface for the need of the system.

Compared to other models, the dimensions are smaller. One of the most important advantages is that the torsional effects that are possible in the structure effect prevent.



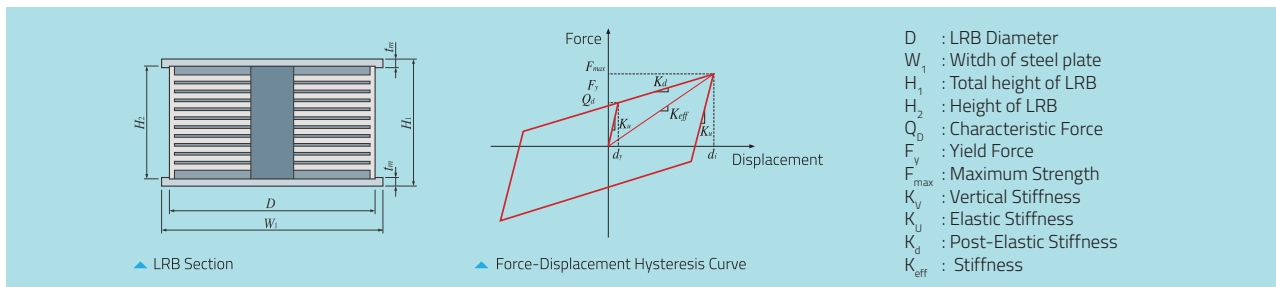
Seismic Isolators

Lead-Core Rubber Seismic Isolator (LRB)



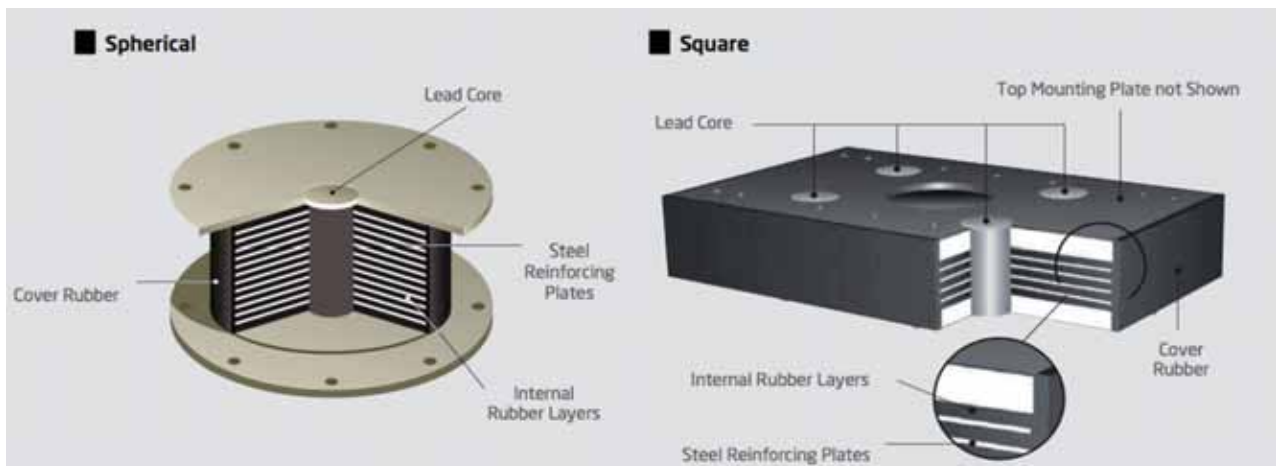
Lead-core seismic isolators (LRB) are long-term isolators that do not require maintenance and are used to reduce damages caused by earthquake energy.

The high energy damping capacity and the reduction of horizontal movements are the biggest advantages over simple elastomeric bearings. The lead core isolators are designed to have a horizontal movement capacity from 70% to 200% of the isolator height.



In this type of isolators; the lead core consumes energy and reduces the seismic forces and displacements that affect to the structure. In addition, the structures provide resistance to the wind.

If the seismic forces exceed the design loads, the rubber isolators meet their high shear forces while maintaining their stability due to their great elasticity. Thanks to the elasticity of the rubber, the structure returns to its original position after the earthquake.



Seismic Isolators

Technical values related to the design of lead-core seismic isolators in the table are shown. Please contact Arfen for special designs.

Vertical Load (kN)	Yield Ratio (%)	Product Code	Constant Displacement (mm)	Dimension (mm)					Bolt		Property (Earthquake displacement 60 mm)					Weight (kgf)
				D	W ₁	T _m	H ₁	H ₂	Çap	Adet	Q _d (kN)	K _y (kN/m)	K _d (kN/m)	K _y (kN/m)	K _{eff} (kN/m)	
3000	3	LRB300-L3-T10	100	650	730	40	287	217	30	8	64	17452	2030	11653	3089	624
		LRB300-L3-T15	150	650	730	40	367	297	30	8	64	11635	1353	7769	2412	718
		LRB300-L3-T20	200	650	730	40	447	377	30	8	64	8726	1015	5826	2074	812
	5	LRB300-L5-T10	100	650	730	40	287	217	30	8	107	20000	1992	11653	3780	631
		LRB300-L5-T15	150	650	730	40	367	297	30	8	107	13333	1328	7769	3117	729
		LRB300-L5-T20	200	650	730	40	447	377	30	8	107	10000	993	5826	2785	827
	7	LRB300-L7-T10	100	650	730	40	287	217	30	8	143	21985	1960	11653	4342	638
		LRB300-L7-T15	150	650	730	40	367	297	30	8	143	14657	1307	7769	3688	738
		LRB300-L7-T20	200	650	730	40	447	377	30	8	143	10993	980	5826	3362	839
4000	3	LRB400-L3-T10	100	750	830	40	287	217	30	8	91	23964	2746	21383	4270	824
		LRB400-L3-T15	150	750	830	40	367	297	30	8	91	15976	1830	14255	3355	951
		LRB400-L3-T20	200	750	830	40	447	377	30	8	91	11982	1373	10691	2897	1078
	5	LRB400-L5-T10	100	750	830	40	287	217	30	8	143	26952	2700	21383	5082	833
		LRB400-L5-T15	150	750	830	40	367	297	30	8	143	17968	1800	14255	4182	965
		LRB400-L5-T20	200	750	830	40	447	377	30	8	143	13476	1350	10691	3732	1096
	7	LRB400-L7-T10	100	750	830	40	287	217	30	8	206	30449	2645	21383	6074	844
		LRB400-L7-T15	150	750	830	40	367	297	30	8	206	20229	1763	14255	5193	971
		LRB400-L7-T20	200	750	830	40	447	377	30	8	206	15225	1322	10691	4752	1118
5000	3	LRB500-L3-T10	100	800	880	40	280	210	30	8	107	27067	3082	19115	4871	903
		LRB500-L3-T15	150	800	880	40	352	282	30	8	107	18406	2096	12998	3885	1025
		LRB500-L3-T20	200	800	880	40	433	363	30	8	107	13534	1541	9558	3330	1162
	5	LRB500-L5-T10	100	800	880	40	280	210	30	8	184	31375	3016	19115	6075	916
		LRB500-L5-T15	150	800	880	40	352	282	30	8	184	21335	2051	12998	5110	1044
		LRB500-L5-T20	200	800	880	40	433	363	30	8	184	15688	1508	9558	4567	1188
	7	LRB500-L7-T10	100	800	880	40	300	230	30	8	254	35170	2955	19115	7189	999
		LRB500-L7-T15	150	800	880	40	372	302	30	8	254	23916	2009	12998	6243	1133
		LRB500-L7-T20	200	800	880	40	453	283	30	8	254	17585	1478	9558	5712	1283
12000	3	LRB1200-L3-T10	100	1250	1330	40	290	200	36	12	254	66264	7677	67744	11911	2223
		LRB1200-L3-T15	150	1250	1330	40	356	286	36	12	254	45338	5253	46341	9487	2471
		LRB1200-L3-T20	200	1250	1330	40	422	352	36	12	254	34457	3992	35227	8226	2720
	5	LRB1200-L5-T10	100	1250	1330	40	302	232	36	12	429	76050	7529	67744	14684	2364
		LRB1200-L5-T15	150	1250	1330	40	374	304	36	12	429	52034	5151	46351	12307	2683
		LRB1200-L5-T20	200	1250	1330	40	446	376	36	12	429	39546	3915	35227	11070	3001
	7	LRB1200-L7-T10	100	1250	1330	40	314	244	36	12	572	83670	7408	67744	16934	2502
		LRB1200-L7-T15	150	1250	1330	40	392	322	36	12	572	57248	5069	46351	14595	2889
		LRB1200-L7-T20	200	1250	1330	40	470	400	36	12	572	43508	3850	35227	13379	3275

Disc Bearings



Disk bearings are used for large railway and highway bridges. The polyurethane material is a frequently used bearing in railway bridge projects due to its rotation, load carrying capability and long service life. The cohesion of the polyurethane material is typical and has a long service life, which makes it easy to transport large live loads of railways and motorways.

The disc bearings consist of the following materials:

Bright stainless steel

The polished stainless steel surface on PTFE (Teflon) produces low shear friction.

Horizontal Load Carrying Mechanism

The high-strength shear force pin transfers downward shear forces without reflecting the shear forces onto the polyurethane material.

Teflon

It has a very low coefficient of friction with stainless steel.

Polyurethane Disk

The polyurethane disc allows rotation in all directions (longitudinal and transverse) when carrying vertical loads of 1 kN - 100.000 kN.

There are three different types of disc bearings in terms of operating principle.

Fixed Disk Bearing: Fixed bearings allow to rotate in every direction while preventing lateral movements.

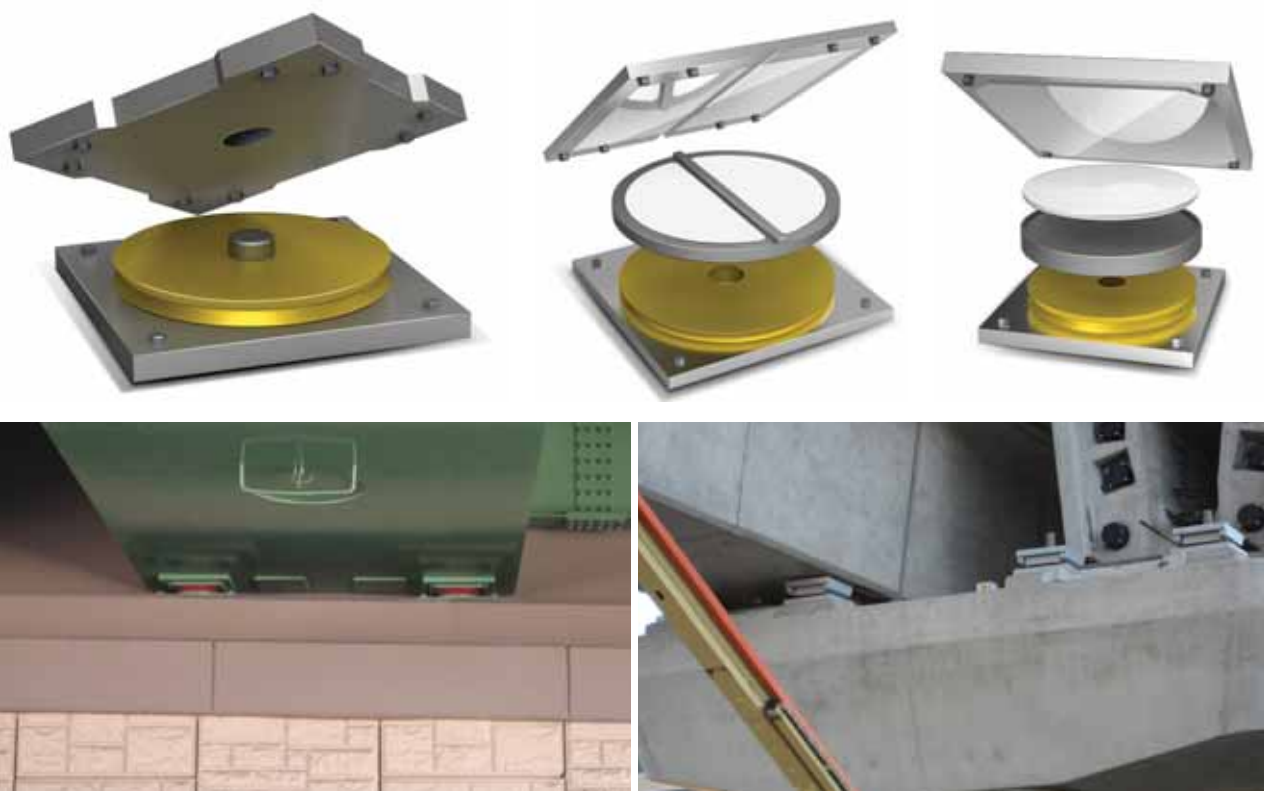
Unidirectional Disc Bearing: These bearings allow to be displaced in one direction and to rotate in every direction.



Disc Bearings

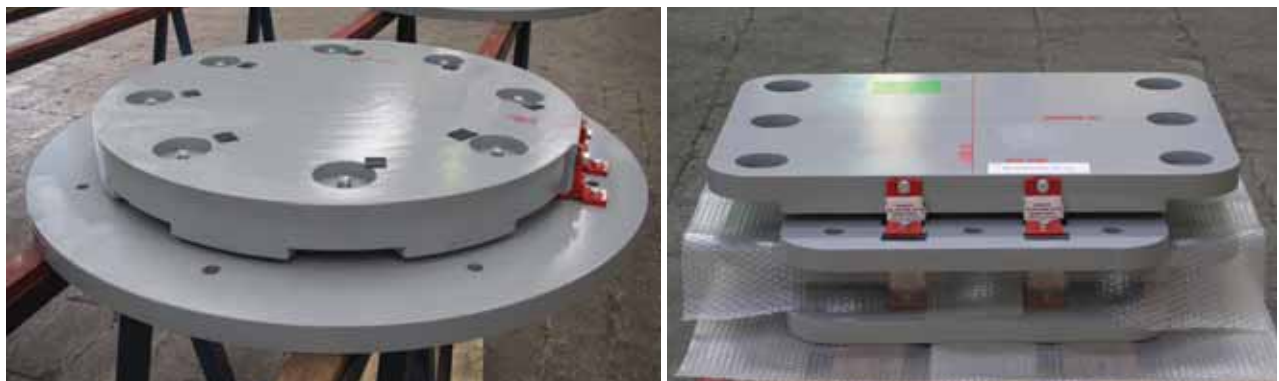
Multi-Directional Disk Bearing: Allows rotation and displacement in every direction.

According to the project, some features can be added to the disk bearings if desired. Special designs are made according to the earthquake effects that may occur according to the characteristics of the faults in the earthquake regions..



Horizontal Load Bearings

Horizontal load bearings are designed to accommodate horizontal loads in one or multi directions. These type bearings can be used with an elastomeric bearing or a free sliding bearing. The horizontal load bearings carry horizontal lateral loads while the elastomeric bearings or pot bearings carry vertical loads. Horizontal bearings can easily carry very high horizontal loads and allow them to rotate in any direction. They are designed in two different types, fixed and sliding.



Lock-Up Devices and Viscous Dampers



These tools are designed in two different types to provide displacement control or force (load) control according to the need of the structure. They are also very effective against the vibrations generated by wind loads without altering the stiffness of the structure. They are used in many buildings such as hospitals, schools, housing, bridges.

These systems create a temporary rigid connection between the structural elements of the structures under large loads, such as seismic loads, brake loads, etc. The hydraulic devices are placed between the bridge beams or piers to allow load transfer. In this way, the load is divided into the whole structure instead of a small area.

Under small and long-term loads such as thermal expansion, shrinkage and contraction, the seismic hydraulics remain passive and allow the structure to move.

The installation of seismic devices is easy and economically advantageous in repairing and strengthening existing structures.





 **ARFEN**[®]
"We Build Solutions"





BRIDGE EXPANSION JOINTS

Single Span Steel Expansion Joints

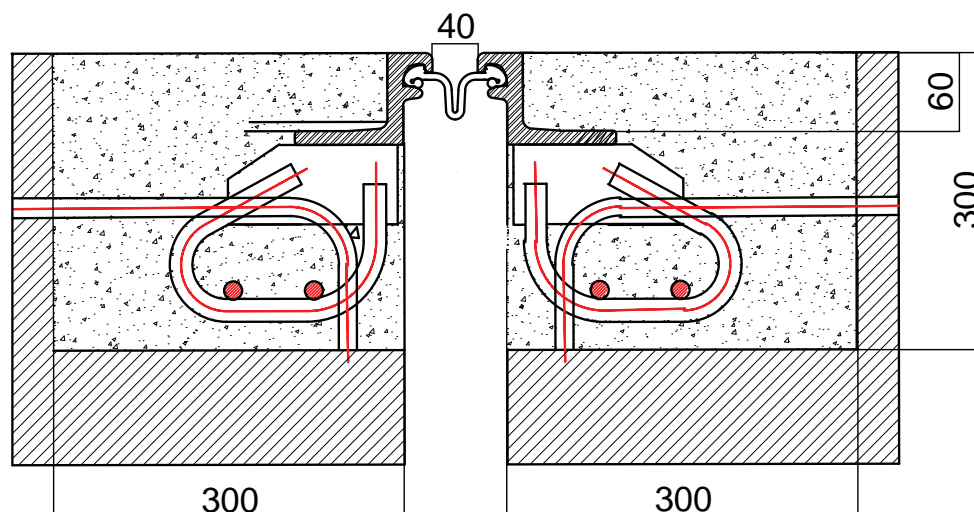


Arfen single-span steel expansion joints are used in transverse direction at the bridges, with a total movement capacity of 80 mm or 100 mm, the bearing assembly is connected to the structure by means of the ropes and the rubber strip sealing element for watertightness is used. The steel profiles in this system consist of extrusion profiles.

Our expansion joints are designed according to ISO 9001 quality standards, according to DIN 1072 and AASHTOH30-S24 load standards, the anchorage elements used in manufacturing are produced in accordance with EN 10025 standard and rubber waterproof seal EN standards.

Bridge expansion joint elements are specially produced according to the project details. The expansion joint is made in such a way that the piece consists of two parts, one piece or the one to be approved.

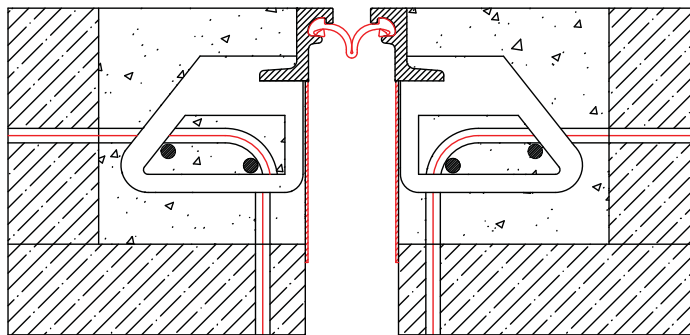
Unscrewed undercoats are applied unexpectedly after sanding in SA2 1/2 to prevent corrosion of steel profiles. At least 80 micron zinc based primer and at least 100 micron chlorine rubber or epoxy based paint will be coated against corrosion and external effects.



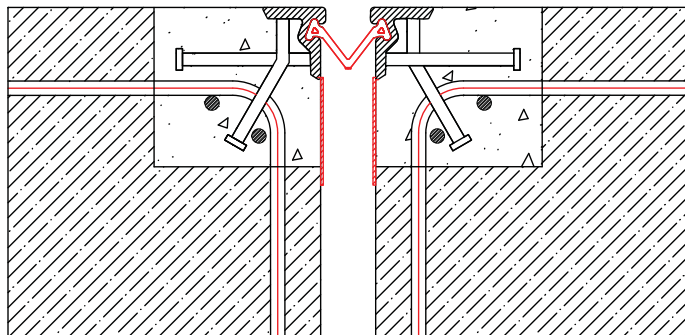
Single Span Steel Expansion Joints

All rubber (NR-CR) elements to be used in expansion joints are manufactured according to the relevant EN and DIN norms.

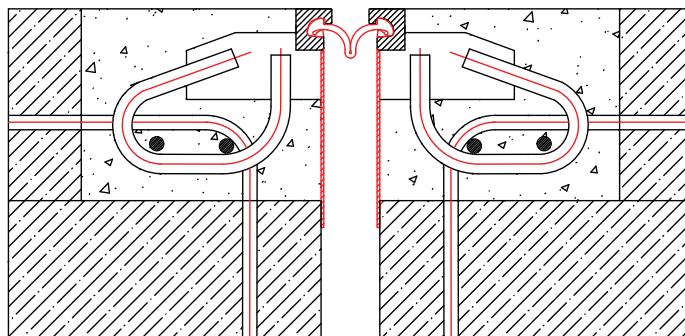
The waterproofing of the joint system is provided in one piece with the appropriate sealing element. The sealing element is manufactured so that it will fit into the housing which continues along an entire profile. They are planned and manufactured in such a way that they will not tear, break, stand out and touch the vehicle wheel surfaces due to dynamic movements (traffic, seismic loads), removable from the place where necessary (maintenance, repair, replacement) to prevent surface waters from flowing down or leaking.



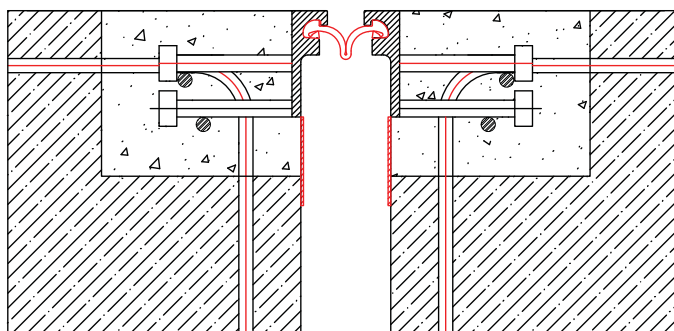
▶ BE 80 TM1



▶ BE 80-3



▶ BE 80-4



▶ BE 80-5

Single Span Steel Expansion Joints



Pay attention to the following points when installing expansion joints:

- The existing equipment on the table on which the expansion joint is to be placed should be checked and revised according to the project according to need.
- In the case of existing joints in the joint cavity, in the case of longitudinal distribution fittings, these assemblies will be dismantled and replaced after the joint assembly so that the joint element can be placed.
- The joint spacing should be cleaned very well.
- In the event of the cutting of an auxiliary fitting, additional auxiliary fittings shall be inserted.
- After the joint installation space has been properly prepared, the expansion joint element will be installed using a mobile crane or similar work machine.
- The upper elevations of the longitudinal profiles of the expansion joint should be 3 mm below the asphalt wear layer, according to the topographic measurements to be made.
- After the adjustment of the joints, the expansion joint will be fixed to the upper structure by making a spot weld between the anchorage grouts in the expansion joint and the equipment in the joint gap.
- Concrete casting will be done up to the level of the asphalt wear upper layer of the expansion joint. In this way, the expansion joint will be covered with concrete.
- The most important phase of the assembly process in terms of structural durability and longevity is the concrete casting process and it must be done very carefully.
- After the concrete has reached the required strength, the lifting plates on the expansion joint will be dismantled and the concrete will be cured and the road traffic will be opened at least 3 days later.

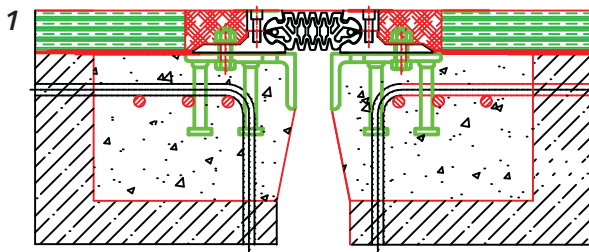
Railway Type Expansion Joints



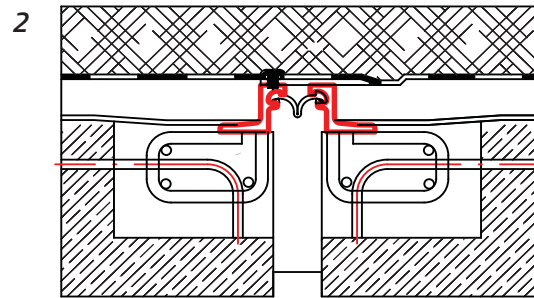
Such expansion joints developed by Arfen are used in railways. The expansion is similar to that of the single-span steel expansion. The product consists of steel edge profiles and rubber seals to provide impermeability. In addition, the joint gap is covered with a lid (ballast) to prevent gravel or foreign matter from entering. Also, if requested, higher production capacity ($> \pm 50$ mm) is produced specifically for projects that require it.

Our railway expansion joints are designed according to ISO 9001 quality standards, DIN 1072 and AASHTO. The anchorage elements used in manufacturing are manufactured in accordance with EN 10025 standard and rubber waterproofing gasket EN standards.

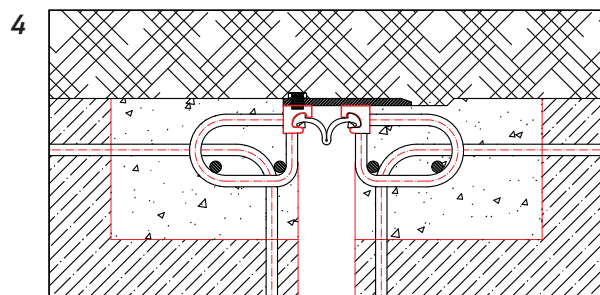
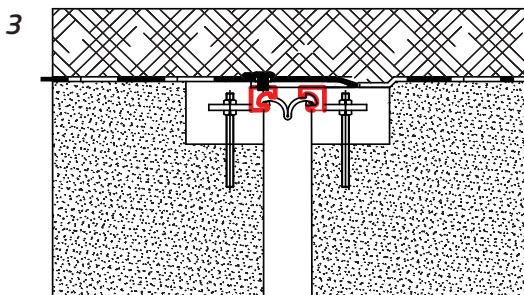
As Arfen, we have several types of expansion joints that we have developed for railways.



1) Railway Model – D BE 80-3
3) Railway Model – D BE 80-2



2) Railway Model – D BE 80-1
4) Railway Model – D BE 80-4



Sound Insulated Expansion Joints



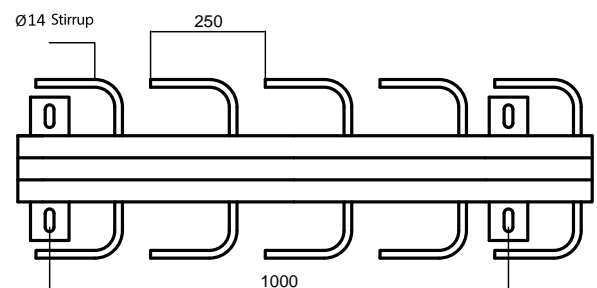
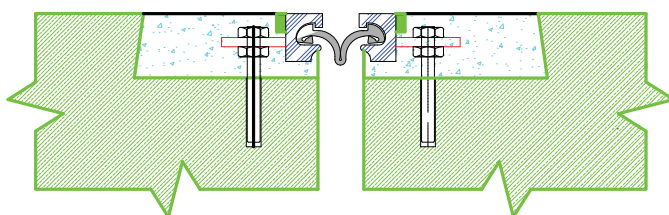
Arfen has developed a sound-insulation expansion joint model to reduce the noise generated as the vehicles pass over the expansion joint. In this model, it is aimed to reduce the traffic noise significantly by using sinus plates. The vehicle wheels do not fall into the gap as they pass over the sinus-plated expansion joints, so no wheel impact noise is generated. The sinus plates in this model are produced as welded or bolted to the customer's request.

Strip Seal Expansion Joints

This expansion joint can be used with elastomeric concrete in places where it is necessary to open the traffic immediately. Depending on the temperature of the environment, the vehicle can pass through the expansion joint after 1-5 hours. Optionally, it can be used with normal concrete. Expansion joint has long service life.

After only 15 years, the rubber seal may need to be replaced. The system has a movement capacity of up to 127 mm. Joint is assembled together with special anchors and epoxy.

BE 80-2 Strip Seal Expansion Joint



Modular Expansion Joints



The modular expansion joint consists of multiple pieces to provide greater than 80 mm movement. It has horizontal moving capacities which continue such as 160 mm, 240 mm, 320 mm, 400 mm, 480 mm, 560 mm, etc. for use in the transverse direction in the bridges, the carrier is fixed to the structure by means of structured ropes.

The modular expansion joints are designed taking into consideration the required movement capacity. This type of expansion joints is used in situations where the movements to take place on a bridge exceed the single-span joint capacity.

Sealing is provided by rubber gasket. Thus, water and chemicals are prevented from damaging infrastructure and superstructure.

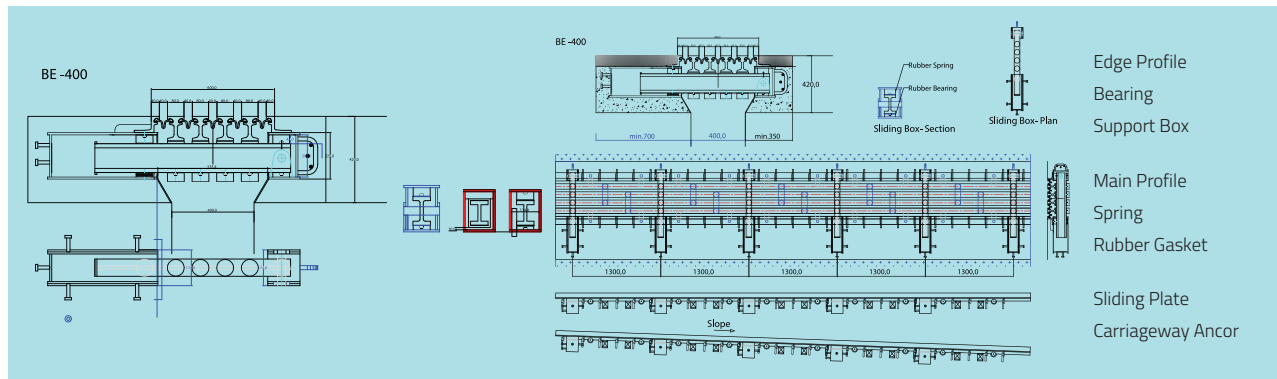
In addition, the steel elements are resistant to corrosion and have high fatigue strength. They radiate less noise.

Each of our expansion joints is subjected to static calculations based on the EN and AASHTO H30-S24 load standards. Also used steel and rubber material are produced according to EN standards. Modular joints are produced accordance to ISO 9001.



Modular Expansion Joints

The following elements are used in modular expansion joints.



The assembly phase of the modular expansion joints is very important for the joint life and in particular the following points should be taken seriously.

- Transverse and longitudinal equipment must never be cut in the application area. All longitudinal bars must be fixed to stirrups.
- Care will be taken to ensure that the expansion joint is positioned and fixed in accordance with the project plan cross-section.
- No matter how strong the system is, if the point of connection of the expansion joint is weak and it is not properly connected to the bridge system.
- The expansion joint should be fixed between 10-20 °C temperature.
- The asphalt wear layer (or concrete) on the side of the expansion joint must be at least 3 mm higher than the expansion joint.
- Box elements must be well supported with concrete.
- Particular attention should be paid so that there is no air gap at the bottom of the expansion joints.
- The boxes must be completely embedded in the concrete, the formwork must be made accordingly.
- The anchorage part of the joint element must be completely wrapped in concrete.
- The vehicle will never pass through the joint element before the concrete has reached adequate strength.



Finger Type Expansion Joints

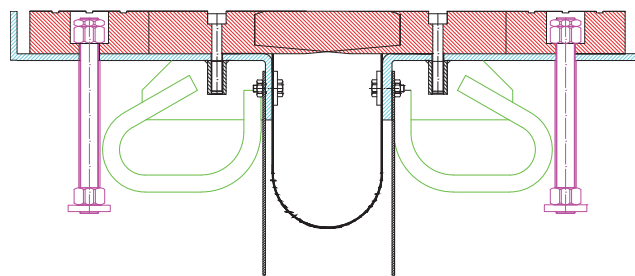


The finger-type bridge expansion joint is usually made of steel edge profile with thick steel finger plates anchored with high quality bolts. It is very unlikely to wear and damage the system surface, which consists of interlocking finger plates. As a result, there is little maintenance.

When using steel finger plates in the system, the damage that can occur in the expansion joint is very limited and the expansion joint has a long service life. The most important reason for this is the fact that there is very little impact between the vehicles through the expansion joint since the finger plates are continuous. Thus, the noise generated during the transition over the expansion joint is reduced and comfortable transition is provided.

A rubber gasket is installed to provide impermeability to the bottom of the expansion joint. Since the used seals are resistant to water, salt and other chemicals, damages to the infrastructures and the top layer can be prevented by foreign substances that may come from the outside.

Finger bridge expansion joints can be applied to all types of bridges. Models with different movement capacities are manufactured according to the desired expansion value. The following table features some of the models.



Type	Min. Expansion Joint Gap (mm)	Max. Expansion Joint Gap (mm)	Standard Movement Capacity (mm)	Bolt	Anchor Length (mm)
F-BE 50	25	75	50	M16	250
F-BE 80	40	120	80	M16	250
F-BE 100	50	150	100	M16	250
F-BE 150	75	225	150	M20	250
F-BE 200	100	300	200	M20	320
F-BE 250	125	375	250	M20	320
F-BE 300	150	450	300	M22	330
F-BE 400	200	600	450	M24	340
F-BE 500	250	750	500	M24	350
F-BE 600	300	900	600	M24	350

Rubber Expansion Joints



Arfen steel reinforced rubber bridge expansion joints (ARBRIDGE) is a joint system which consists of waterproof rubber and steel plates and can absorb expansion movements.

These systems are formed by joining rubber elements and steel plates under high temperature and pressure in our factory.

Strengthening plates made of steel are vulcanized with rubber material to form a composite and load-resistant system. As a result of this production system, ARFEN bridge expansion joints offer a long-lasting solution guaranteed against corrosion.

Natural rubber (NR) or neoprene (CR) rubber is used according to the requirement to be used as rubber material and according to the customer's request.

The rubber surface is resistant to oil, grease, oil, sun rays, snow and saline chemistry. This method of production ensures that the expansion joints are very resistant to corrosion.

The ARBRIDGE expansion joints are designed to absorb the deformation of the concrete and to damp the movements and expansion of the structure by changing its shape. The water ducts and proper drainage connections on these stems keep traffic safety at the top level. Thanks to their special design, the noise emitted during vehicle transitions remains at very low levels.

Expansion joints of different sizes are connected to the concrete by both sides by suitable corrosion-resistant galvanized anchor bolts and chemical dowels.

Expansion joints absorb loads, heat reactions and mechanical vibrations. Horizontal loads (loads generated by brake forces of vehicles, earthquake loads, elongation and shortening due to thermal expansion) are compensated by friction between the rubber and concrete and changing the shape of the rubber.

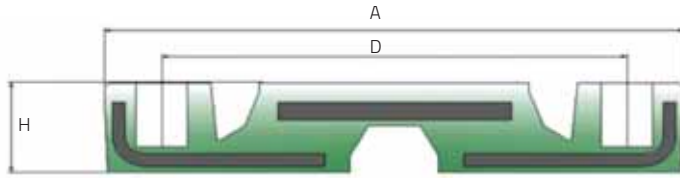
ARFEN rubber bridge expansion joints can also be applied on steel structures. There is less noise and vibration at the same time as the cause of the rubber surface.

Due to earthquake loads, wind, thermal changes and brake loads, the bridge beams move, and therefore they need movable bearings and expansion joints.

Rubber Expansion Joints

ARFEN rubber expansion joints also compensate for vertical displacements due to the rubber material. This characteristic is very important for movements and loads that cause vertical displacement. This type of bridge expansion joints can be combined with aluminum or rubber turning parts on the walkways.

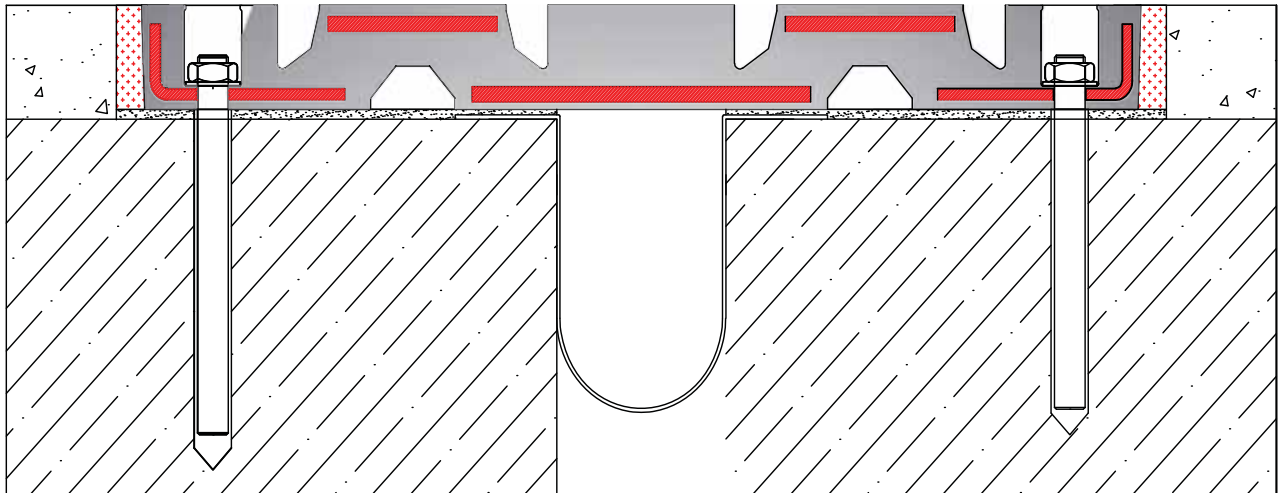
As the rubber expansion joint ARBRIDGE series, we have five types of models with different movement capacities. Our rubber expansion joints are manufactured as standard 2.00 meter modules.



- B:** 1 Modul Lenght
- C:** Distance Between Anchors
- E:** Diameter of Anchors Hole

PRODUCT CODE	MOVEMENT CAPACITY	A (mm)	B (mm)	H (mm)	D (mm)	ANCHOR	E (mm)	C (mm)	WEIGHT (kg/m)
ARBRIDGE-01	50 mm ±25	270	2000	32	220	M12	14	250	21
ARBRIDGE-02	60 mm ±30	270	2000	42	220	M12	14	250	24
ARBRIDGE-03	100 mm ±50	390	2000	53	300	M16	18	250	43
ARBRIDGE-04	160 mm ±80	590	2000	55	500	M18	20	250	65
ARBRIDGE-05	220 mm ±110	750	2000	75	650	M20	22	250	160

Tipik Kauçuk Genleşme Derzi Montajı



Rubber Expansion Joints



The following points should be observed for the installation of the expansion joint:

- The surface of the expansion joint should be cleaned.
- The anchor bolt locations should be marked using the expansion plate as a template and holes should be drilled after this process to match the depths that the bolts will seat.
- After drilling, the holes should be cleaned with compressed air or vacuum.
- Anchor bolts should be installed and fixed with epoxy to be compatible with the drilled holes.
- Care must be taken to tighten the bolts with torque values of the nuts.
- If waterproofing tape is applied, concrete should be cleaned with compressed air. According to the project, dilatation tapes must be glued to the concrete surface by applying epoxy adhesive mortar.
- The floor surface must be painted using a two component epoxy primer.
- The upper level of the mortar should be arranged according to the tile level and the correct finishing height for the rubber plates.
- The rubber plates should be fixed on the mortar with bolts.
- After the drainage pipe is installed, mastic asphalt filler material should be applied to the gap between the expansion plate and the road cover.
- Expansion bolt holes should be filled with mastic asphalt.



Special Alloy Aluminium Expansion Joints



Arfen aluminium expansion joints are manufactured from high quality aluminum frame and sealed rubber. The Arfen aluminum series allows the joint to be deformed and stretched. These expansion joints are equipped with surface gutters that allow for convenient water drainage.

With its special design, it provides little noise when passing over vehicles. The edge profiler is manufactured from specially drawn aluminum and carries heavy traffic loads. Profiles have a yield strength of 275 MPa and a tensile strength of 300 MPa.

The sealed rubber is strong against grease, oil, chemicals and resistant to UV rays, land and salt. In addition, two types of rubber seals can be selected as desired in these aluminium expansion joints.

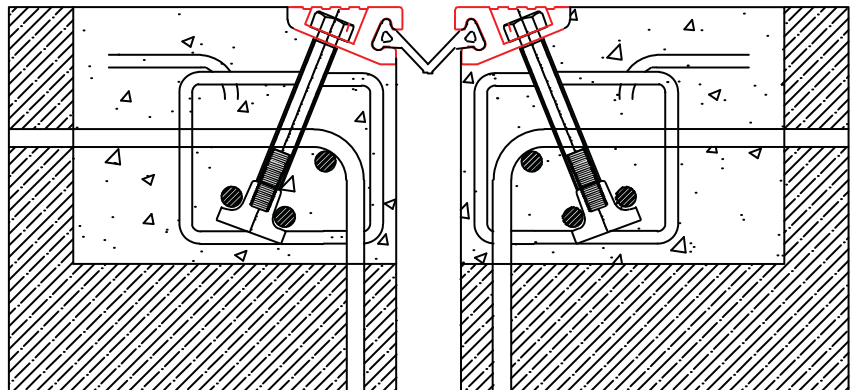
This system is manufactured under the control of our qualified engineers in high quality conditions in our factory. Arfen BE aluminum series bridge expansion joints guarantee a long-term solution to corrosion.

Expansion joints of different sizes are connected to the superstructure by mounting on both sides using corrosion-resistant galvanized anchor bolts and chemical anchors suitable for absorbing elastic reactions, mechanical vibrations and other movements of the structure.

M20 bolts are used in the anchorage process. Repairs and replacement of old expansion joints are very easy. Without breaking concrete you can change expansion joint.

A-BE Aluminium Expansion Joint

- Easy installation
- Movement capacity up to 120 mm
- High watertightness
- Long service life
- Comfortable transition from the top of the expansion joint
- Special seal option



Model	Movement Capacity	Installation Gap	Profile Length	M20 Bolt Range
A-BE 80	0-80 mm	40 mm	2000 mm	200 mm
A-BE 100	0-100 mm	50 mm	2000 mm	200 mm
A-BE 120	0-120 mm	60 mm	2000 mm	200 mm

Bituminous Expansion Joints



Bituminous (elastic type) bridge expansion joints are the type of joint that is used easily in situations where rapid opening of the traffic is required and in various climate regions. It is the most comfortable expansion joint since it provides smooth surface and reduces noises when passing over vehicles.

It has been applied in 50 different countries, ranging from Africa tropical temperatures in different weather conditions in the world to the coolness of northern countries. Thormajoint material is also used on the banter, including the edges of the bridge plate. There is no other elastic type expansion joint with better properties than Thormajoint. Thormajoint is a useful material that has proven to be economical and reliable.

The specially prepared elastomer material has strength elasticity in the form of specially selected gravel and capacity to accommodate horizontal movements up to ± 25 mm.

Features:

- Quick application and repair
- No mechanical movement required part
- Providing comfortable transition
- Ability to form an anti-slip surface
- Waterproofing by providing structural integrity
- Possibility to apply with pedestrian way
- Opportunity to repair without dismantling



Artcrete Elastomeric Concrete



Arcrete elastomeric concrete is a fast-setting, low-fluid, waterproof, nap-resistant and long-lasting product. It is a three component polyurethane based 100% elastomeric solid concrete. Especially in areas where traffic is intense in the city, it is used very quickly in places where the expansion joint needs to be opened to traffic and repair.

The product consists of three main components; resin, hardener and aggregate. The mixture should be prepared in accordance with the proportions indicated on the products.

ArCrete is a high-performance polyurethane elastomeric concrete with very fast setting, especially used for repairing and filling of the edges of expansion joints. Due to its high adhesion, it provides an elastic connection between the metal parts of the expansion joint and the concrete bridge surface.

This product is used as a flexible connection concrete in the edge concrete of the expansion joints, in the dismantling of the damaged old expansion joints, in repair and installation works. It is also used for repair work on surfaces that need to be repaired quickly, such as airport runways.

Some features of the product are as follows:

- It has very good adhesion with many building materials.
- It has high resistance to chemicals, UV, freeze-thaw, heat shock, impact and noise.
- Elasticity ability is high and elastic.
- Mixing is easy and the hardening time is short.
- The compatibility with the asphalt is very good.
- High quality and economical.



Artcrete Elastomeric Concrete

Technical Information of Elastomeric Concrete

BINDER		
PROPERTY	TEST METHOD	VALUE
Percent Elongation (%)	ASTM D638	min %175
Tensile Strength	ASTM D638	min 8,5 MPa
Tear Strength	ASTM D624	min 19 N/mm
Shore A Hardnes	ASTM D2240	60±5
BINDER + AGGREGATE		
Compressive Strength	ASTM C579 (Test Method B)	24 MPa
Brittleness	Ball Drop	min 9,5 N/m

Installation surface should be clean and dry. There should be no chemicals such as salt, oil on the surface. Ar-Crete should be applied on the carrier elements (reinforced concrete or steel surface). Prior to this procedure, primer should be applied to the areas which will come into contact with Ar-Crete. The primer provides makes elastomeric concrete better adherence with asphalt, steel and concrete and makes it more resistant to high temperatures.

The hardening time of this material depends on the temperature. The higher the air temperature, the harder it is. After application, curing should be applied. The minimum application temperature is 7°C. The time to open the path to traffic after the application of Arcrete:

- 7°C - 18°C, 3-5.5 hours
- 18°C - 25°C, 2-3.5 hours
- 25°C to 35°C, 1-2.5 hours

PRIMER		
PROPERTY	TEST METHOD	VALUE
Tensile Strength	TS EN 196-1	> 30 N/mm ²
Compressive Strength	TS EN 196-1	> 75 N/mm ²
Bonding Strength to Concrete	TS EN 4624	> 4 N/mm ²
Bonding Strength to Concrete	TS EN 4624	> 3 N/mm ²





ARFEN[®]

"We Build Solutions"



**OTHER
PRODUCTS**

Arfen Sound Insulation Walls



The sound insulation walls allow the sound effect to be reduced by the sound absorbing materials. Design of sound insulation walls is done by predicting sound damping coefficient, loss of sound and loss of sound. Sound insulation walls are divided two types, sound absorption type or sound reflection type according to the material used.

1) Sound Damping Type

This type is designed and manufactured for damping the sound.

Details

Product Measures

Length: 1.96-3.96 mm, Width: 500 mm, Thickness: 100 mm

Damping Material

Polyester (32-60K), $t = 40-66$ mm (with damper action)

Polyester ($> 100K$), $t = 10-30$ mm (with damper action)

Front and Back Plates

Front Plate: Galvanized Steel Plate, $t = 0,6-0,8$ mm polyester

Back Plate: Galvanized Steel Plate, $t = 1,6$ mm

2) Sound Reflecting Type

It is a model that stops and reflects the sound. Because they are transparent. They do not close the landscape. Sound isolating panels main body and the frame that connects them. Panellerin it is very easy to change.

Details

Product Measures

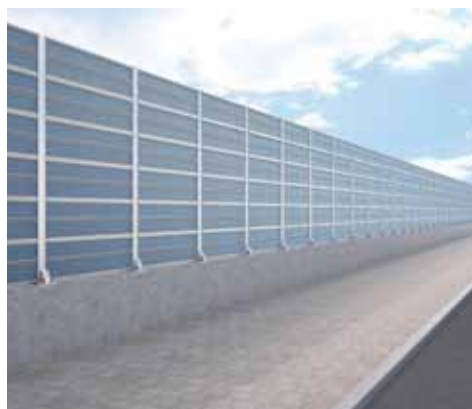
Length: 1.96-3.96 mm, Width: 500-1000 mm, Thickness: 60-95 mm

Transparent Plate

Lamine glass or polymethyl

Frame

Aluminum profile



Other Products



Prefabricated Pads

Arfen prefabricated pads made of rubber are used to transfer the load from the superstructure to the substructure in prefabricated structures.

Speed Breakers (Barriers)

Speedbreakers are used where high speed traffic can be dangerous, such as intersections, parking lots, school and hospital surroundings where traffic is intense. The speed cutters that Arfen produces using high quality rubber are resistant to weather conditions and heavy vehicle loads.

Railway Pads

Arfen railway pads which are made of elastomer and used for situations such as load transfer between rails and impact damping. According to customer demand, production can be done in different dimensions. By using these pads, the life of the railways can be extended. Arfen railway pads reduce vibration and noise.

Tunnel Segment Gasket

Tunnel segment gaskets provide isolation between the segments used during tunnel construction. These profiles, produced by Arfen, create a dry floor with high sealing properties, allowing the segments to be well clamped together and preventing the segments from damaging each other. Due to its chemical-resistant structure and high resistance to water pressure, it has long-lasting usage.

Other Products



Rubber Grade Crossing Coatings

Arfen rubber grade (level) crossing coatings provide the highest level of traffic safety in urban and non-urban areas and provide a comfortable transition for vehicles.

Grade crossing is a place where highway and railway cross each other at the same level. Arfen rubber grade crossing coatings are easy to assemble and replace, so they do not cause any adverse effects on traffic. It emits the wheel loads from the vehicles through the sleeper correctly to the ground and is long-lasting.

Rubber grade crossing coating is designed and produced differently from the type of rail in the project. UIC49 and UIC60 rail type and B58-70 crossmembers are generally used in railway projects. Rubber grade crossing coatings are produced according to these rail and traverse types. Special designs can be made for different rail types.



Replacing, Maintenance and Installation of Bridge Bearings and Bridge Expansion Joints



The bridge expansion joints and bridge bearings are being replaced by our expert field team and the replacements are being installed.

When the expansion joints change, the concrete is broken first and the old expansion joints are removed. After the circumference of the joint is cleaned, after the necessary repairs and adjustments, the new is assembled.

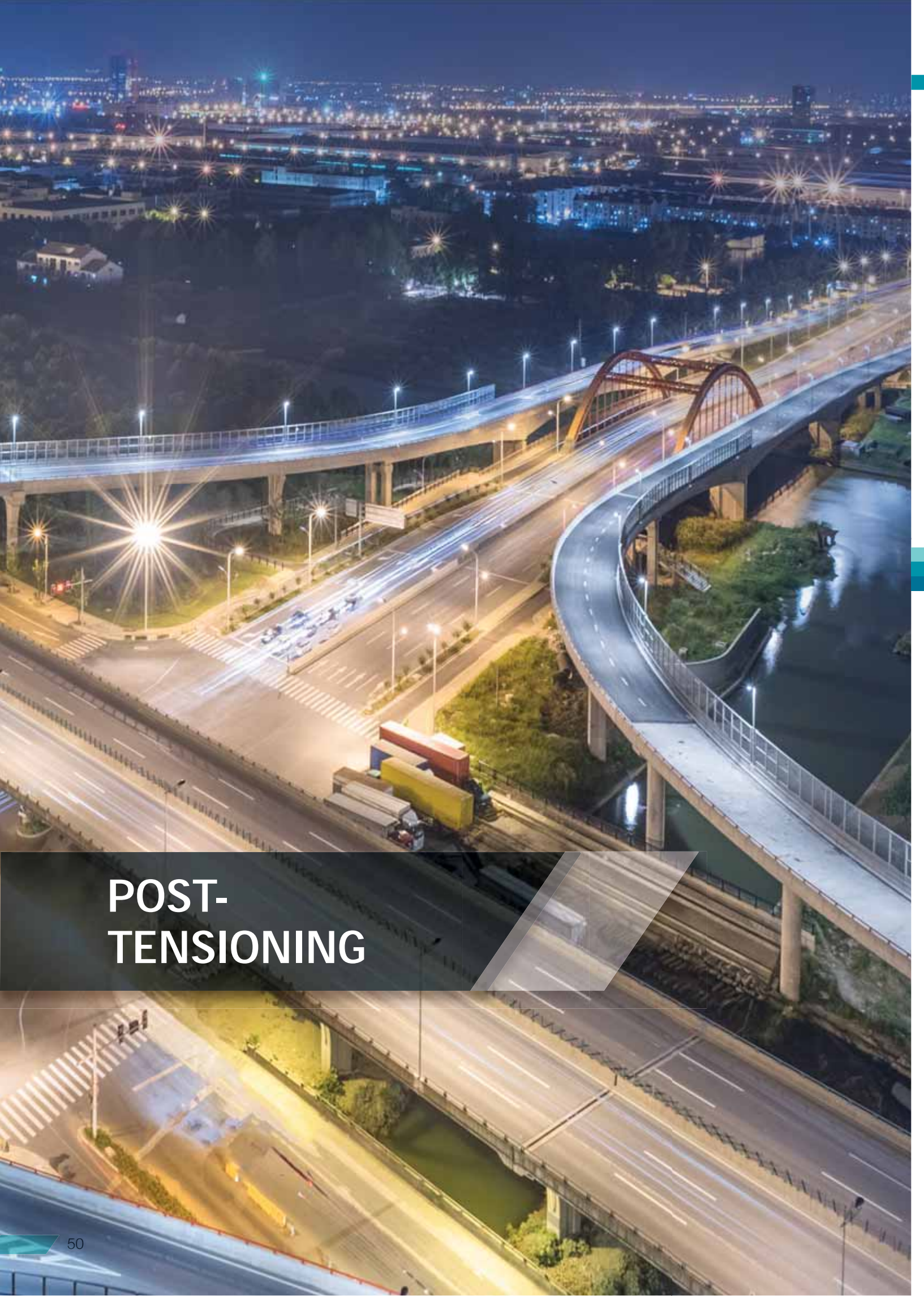
In the process of changing the bearings, the bridge beams are lifted with the help of hydraulic jacks, the old bearings are removed and the new one is installed.





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POST-TENSIONING

Post-Tensioning



Post-tensioning is a method of stressing the high strength steel strands used to strengthen the concrete against tensile forces after the concrete casting process. Post-tensioning applications are getting widespread nowadays. Ard stretching system allows to make very wide span structures. Post-tensioning is used in building slabs, bridges, car park, silos, stadiums, shopping malls, water tanks, nuclear buildings and many industrial buildings.

As Arfen, we provide services in every stage of post-tensioning operations, from project stage to installation and maintenance, at every stage of static calculations, material supply and installation processes.



Post-Tensioning

Post-tensioning applications have many advantages. Some of those;

- The reinforced concrete member dimensions decrease in the structures using post-tensioning system.
- The number of columns in the building and the floor thickness decrease. Thus, the total weight of the structure is reduced.
- As the weight of the structure decreases, the effects of the earthquake load on the structure decrease.
- Post-tensioning allows for a very wide span of structures. Buildings such as conference rooms, gymnasiums, cinemas can be constructed with a wide range of column spacings.
- Post-tensioning reduces the formation of cracks in concrete elements.
- Deflections are controlled.
- It allows the construction to finish faster.



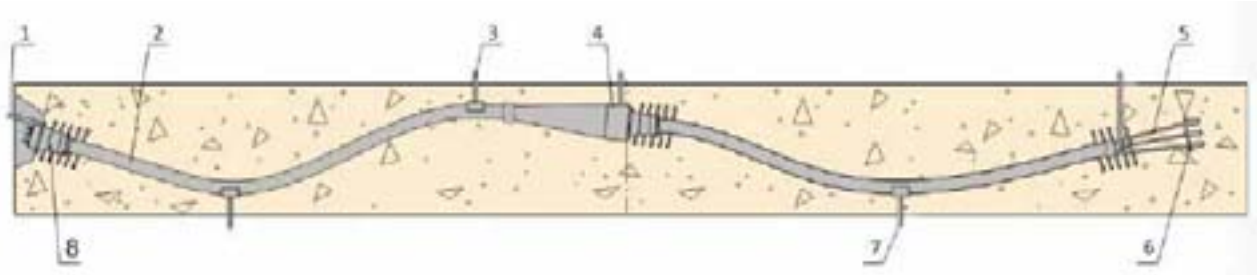
Posttensioning Process

Posttensioning applications are carried out with the following process sequence;

1. Duct locations determined
2. Mounting of stands that carriers ducts.
3. Placed all ducts on the stands.
4. Put Steel tendons of strands into the ducts.
5. Dead ends are created if not stretched from both sides.
6. Reinforcements installed to prevent cracking of the concrete.
7. Concrete Casting.
8. Insert Wedge Plates
9. Insert Grout Caps
10. The ropes are stretched with the aid of a hydraulic pump and a jack according to the strength and elongation values of the project.
11. When the desired amount of elongation is obtained, the stretching process ends and excess ropes has to be cutted.
12. In order to prevent corrosion, grout is injected in such a way that there ise no space in the ducts and this process continues until the observation of the grout came out.

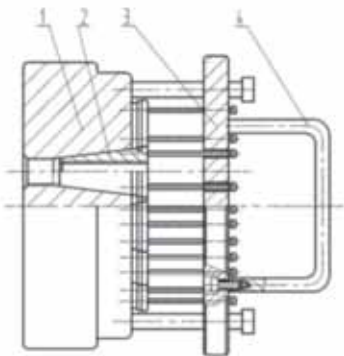
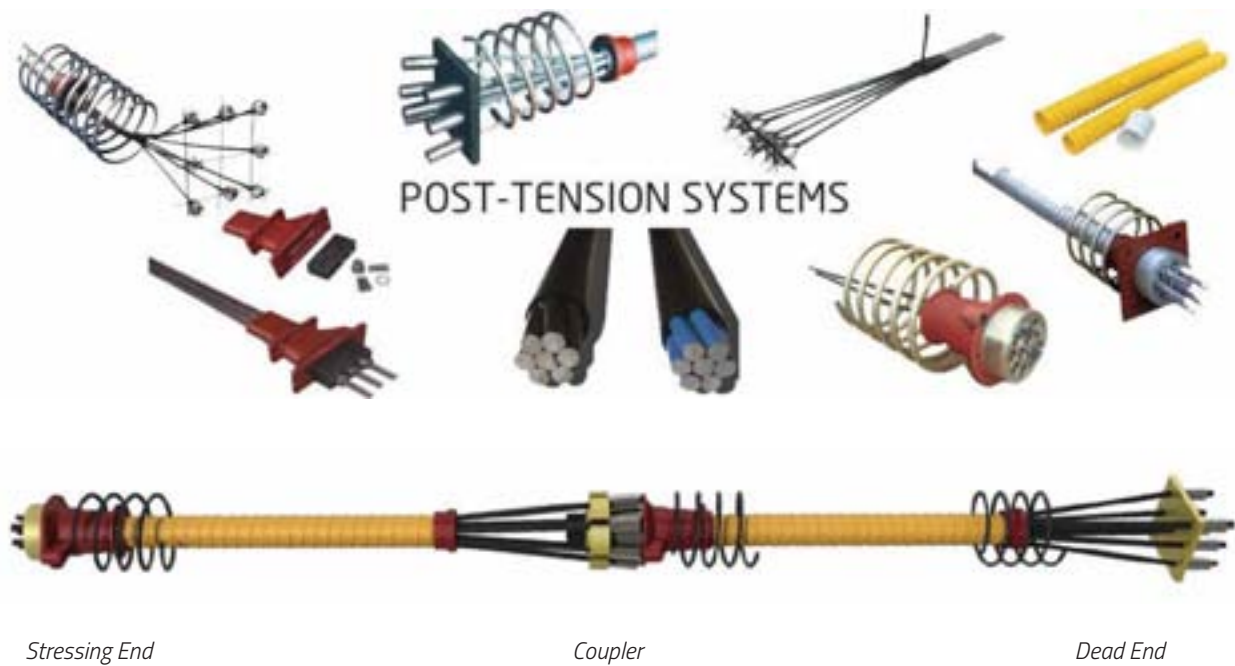
Post-Tensioning

Posttensioning



1. Grout Tube. 2. Duct, 3. Valva, 4. Coupler (Manşon) 5. Fixed Anchor 6. Anchor Plate, 7. Grout 8. Tension Anchor

The OVM post tensioning system was awarded with Utility Model Patent (Patent No:ZL90208622.7) in 1991. The system was developed with many later projects and now, considered one of the best post-tensioning systems in the World. OVM Posttensioning System features high anchorage efficiency and reliable anchorage performance. As useful anchor type, it is easily used in different types of applications and service interval is accepted up to 1-55 Steel tendons of strands. Especially designed and tested for Steel tendons of strands. All post-tensioning products have ETA and CE certificate.



Post-Tensioning

Posttensioning Equipments

Some equipment, such a hydraulic pump, hydraulic jack, rope pushing machine, grout machine is required to perform post-tensioning applications.



Certificates



Drawbridge Cable Systems

ARFEN, in partnership with OVM who has great experience with suspension bridge, balanced cantilever, inclined suspension systems, such as special bridge arch bridge system supplies in Turkey. The tests of the materials are made in the most important laboratories in the World and approved from many institution. The hanger system connection parts of the 3rd Bosphorus Bridge, which was opened in 2016, were provided by OVM.



Some of the services we provide in these matters;

- Suspended bridge main rope system and vertical suspension systems
- Cable System in Cable-stayed Bridge System
- Balanced console bridge rope systems
- Arched Bridge Cable System
- Connecting parts between cables
- Force monitoring systems in bridges
- Installation and supervision of cable systems

All necessary precautions have been taken in accordance with the CIP and FIB standards against corrosion in the rope systems. These systems have a high fatigue performance.



Some referances of Posttensioning and Cable-Stayed Bridge System



3. İstanbul Bosphorus Bridge



Beijing Shanghai Fast Train Way



Mekke Tavaf Way



Japain Kisogawa Bridge



Iranian Sadr Bridge



Jiaozhou Gulf Bridge



Egypt Giza Palace Hotel



Kuveyt Crown Plaza Hotel



Quality & Production Control

Some Quality Certificates & Test Reports



Production Control and Experimental Studies



Production Control and Experimental Studies



Some Reference Projects



Some Reference Projects

Bursa Buttım Intersection / Elastomeric Bearings



İzmir-Salihli Highway / Elastomeric Bearings



Bursa Fast Train / Pot Bearing



Marmaray Küçükçekmece / Sismic Isolators

Some Reference Projects

Istanbul-Ankara Fast Train Intersection / Pot Bearings



Ankara-Sivas Fast Train / Pot Bearings



Ortaköy Intersection / Bridge Expansion Joints



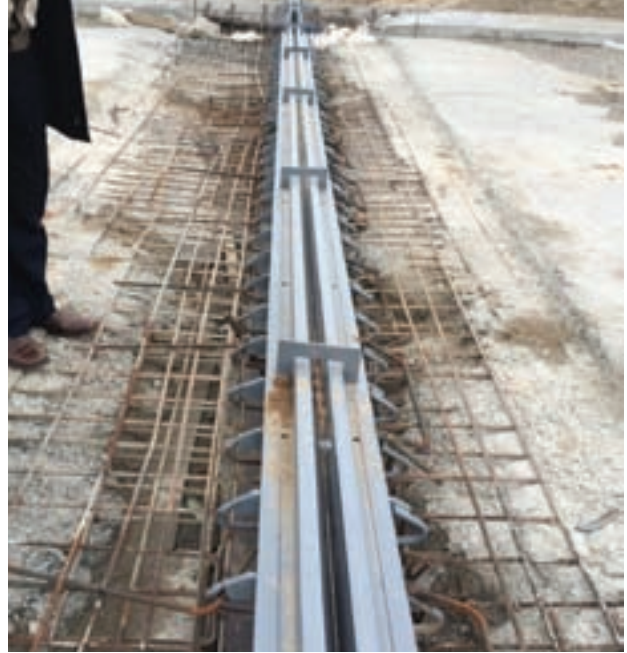
Erbil-Baharke Intersection / Elastomeric Bearings

D-100 Istanbul - Izmit Highway / Bridge Expansion Joints



Some Reference Projects

Hasankeyf Viaduct / Batman







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