



BRIDGE BEARINGS POST-TENSIONING BRIDGE EXPANSION JOINT

2021-22

bridge and construction technology

22 years of experience

www.arfen.com.tr





ARFEN GROUP





Arfen has started its operation from 1999 to create trust as a company that finds solutions to the customer's technical needs and requirements. Arfen made agreements with international partners to bring the international experiences to our country about bridge bearings, bridge expansion joints, seismic isolators and post-tensioning. Arfen as a bridge material manufacturers, is exporting product to more than 35 countries internationally as well as nationally. Arfen makes technical meetings with the customer to find solutions and most economical design to 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 21 years of engineering experience, which is a company in Turkey with name and patent rights of self-developed products. Arfen makes design and production to meet the requirements of international standards under ISO- 9001 Quality Management System. The elastomeric bearings are manufactured and designed under EN1337-3 and AASHTO while and seismic isolator under TBDY 2018 and EN15129. The steel expansion for bridge are manufactured under ETA Standard. Also, if the customer requires, the products can be manufactured under other standards. The other products are manufactured under TSE and international standards. 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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Arfen elastomeric (rubber) bearings consisting of waterproof rubber and steel shim are used to transfer the load from superstructure to the bridge pier accurately and directly. This system is made of natural rubber (NR) or chloroprene (CR) and steel plate (shim) (in F type only rubber is used.) They are formed by steel plates under high temperature and pressure. Strengthening plate (steel plate) are vulcanized with rubber material to create a composite and load-resistant system. As a result, Arfen bridge bearings offer long-lasting solution guarantee against corrosion to customers. Rubber surface is resistant to oil, grease, oil, sun rays, snow and salting chemicals. The fretted bearings are designed and manufactured in the light of the latest technology to properly transfer all kind of loads (traffic load, seismic load, wind loads etc.) which come from the superstructure to the bridge pier. If the customer requests sliding bearings, they are designed by our competent engineer using PTFE or stainless steel according to related standard. Our elastomeric bearings can be manufactured according to BS 5400, DIN 4141, TS EN 1337-3, AS 5100-4 and CE standards. To select bearings, you can have a look at the table given in EN 1337-3 standard or you can have it specially produced by sending the your project detail.



bridge
bearings



ELASTOMERIC BEARINGS

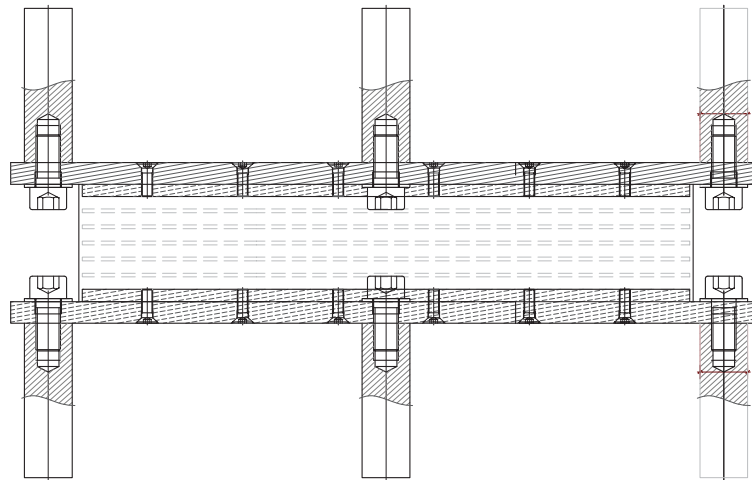
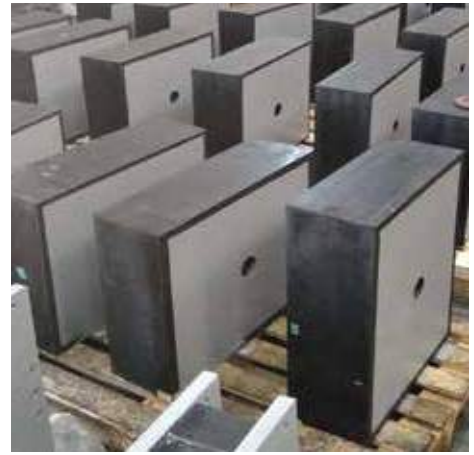
B Type



C Type



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. The rubber material with vulcanized steel plate is used to obtain composite and strong system against loads. The system provides corrosion-guaranteed and long-lasting solution to Arfen bridge bearings. Rubber has a resistance against surface oil, grease, oil, chemicals, resistant to UV-rays, snow and salt. All of these bearings are 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 in both concrete and steel construction elements and the type of bearing 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 type of bearing is 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 products are 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.



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 Metal Bond Strength		ASTM D429	≥7	N/mm2
Ozon Resistance (40 °C, 48 hours, %20 elongation)	TS 2680 ISO 1431-1	ASTM D1149	Should not be cracked	
Ageing -Increase in Hardness -Change in Tensile Strength -Change in Elongation	TS 4595 ISO 815	ASTM D412	-5/+10 ±15 ±25	Shr A % %

COMPARISON OF BEARING PERFORMANCES

Properties	Elastomeric Bearings	Pot Bearing	Spherical Bearing
Vertical Load Capacity	Middle	High	High
Horizontal Displacement Capacity	Middle	Unlimited	Unlimited
Rotational Capacity	Low - Middle	Middle	High
Size	Big	Small - Middle	Small - Middle

B Type Bearings Standard Dimensions according to EN 1337-3

Dimensions axb (mm) or D	THICKNESS (mm)						Layer Number (n)	
	Unloaded Bearing		Elastomer (total)		Elastomer Layer	Steel Layer	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
Ø 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
Ø 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
Ø 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
Ø 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
Ø 400	57	105	36	72	12	4	3	6
300x500	57	105	36	72	12	4	3	6
Ø 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
Ø 500	57	121	36	84	12	4	3	7
400x500	73	137	48	96	12	4	3	8
Ø 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
Ø 600	73	153	48	108	12	4	4	9
500x600	73	169	48	120	12	4	4	10
Ø 650	73	169	48	120	12	4	4	10
600x600	94	199	64	144	16	4	4	9
Ø 700	94	199	64	144	16	5	4	9
600x700	94	199	64	144	16	5	4	9
Ø 750	94	199	64	144	16	5	4	9
700x700	94	220	64	160	16	5	4	10
Ø 800	94	220	64	160	16	5	4	10
700x800	94	220	64	160	16	5	4	10
Ø 850	94	220	64	160	16	5	4	10
800x800	110	285	80	220	20	5	4	10
Ø 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

Standard Dimension according to AASHTO and Applied Load

Applied Load (kN)	Bearing Dimension W*L*T (mm)	Rubber Layer		Horizontal Load (kN)	Displacement
		Number of Elastomer Layer	Total Elastomer Thickness	Service Load State (50%)	Service Load State (50%)
500	210x300x77	6	56	42,2	±28
	210x300x88	7	64		±32
	210x300x99	8	72		±36
	210x300x110	9	80		±40
	210x300x121	10	88		±44
	210x300x132	11	96		±48
	210x300x143	12	104		±52
	210x300x154	13	112		±56
	210x300x165	14	120	±60	
750	220x400x77	6	56	62,8	±28
	220x400x88	7	64		±32
	220x400x99	8	72		±36
	220x400x110	9	80		±40
	220x400x121	10	88		±44
	220x400x132	11	96		±48
	220x400x143	12	104		±52
	220x400x154	13	112		±56
	220x400x165	14	120	±60	
1000	290x400x80	4	60	84,3	±30
	290x400x96	5	72		±36
	290x400x112	6	84		±42
	290x400x128	7	96		±48
	290x400x144	8	108		±54
	290x400x160	9	120		±60
	290x400x176	10	132		±66
1350	350x550x96	5	72	84,3	±36
	350x550x112	6	84		±42
	350x450x128	7	96		±48
	350x450x144	8	108		±54
	350x450x160	9	120		±60
	350x450x176	10	132		±66
1750	350x550x112	4	60	84,3	±30
	350x550x128	5	72		±36
	350x550x144	6	84		±42
	350x550x160	7	96		±48
	350x550x176	8	108		±54
	350x550x192	9	120		±60
	350x550x208	10	132		±66
2000	550x400x144	8	108	147,1	±54
	550x400x160	9	120		±60
	550x400x176	10	132		±66
	550x400x192	11	144		±72
	550x400x208	12	156		±80
2500	600x450x116	5	72	84,3	±46
	600x450x136	6	84		±54
	600x450x156	7	96		±62
	600x450x176	8	108		±70
	600x450x196	9	120		±78
	600x450x216	10	132		±86
3000	700x450x126	8	108	147,1	±48
	700x450x147	9	120		±56
	700x450x168	10	132		±64
	700x450x189	11	144		±72
	700x450x210	12	156		±80

- Please contact with Arfen for the special design.



POT BEARINGS

Pot bearings are designed to carry the vertical loads, 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.

1. Fixed Tyep Pot Bearings (AGPF): 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 non-compressible 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.

2. Free Sliding Pot Bearing (AGPM): Different from the fixed one, PTFE is fitted to provide slide in all direction.

3. Guided Pot Bearing (AGPL-AGPT): 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.



ACCESSORIES OF THE POT BEARINGS

Comprehensive Labelling: All the bearings are provided with a red metal label showing the properties of the bearing. Bearing type, maximum loads, rotation values, order number, manufacture date and CE mark are shown on the 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 which is fixed to the bearing base and a graduate indicator moving with the sliding plate. The movement indicator allows 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 during sliding 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 MAINTANANCE 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.

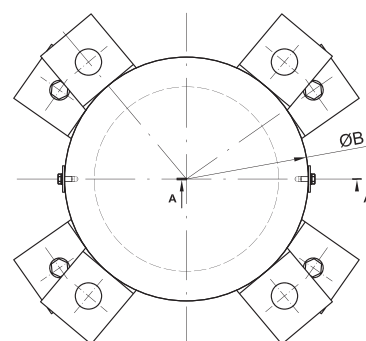
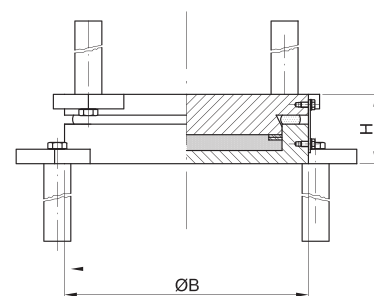
Care should be taken to maintain the bearings at regular intervals after installation.

Please contact with Arfen for the detailed installation procedure.

FIXED POT BEARING (AGPF)

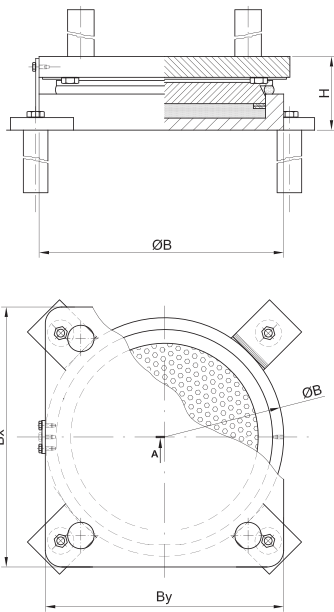
Technical data is given in the table for fixed pot bearing. To give an example, AGPF 500-75-75 means vertical load is 500 kN, horizontally longitudinal load is 75 kN and horizontally transversal load is 75 kN.

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



FREE SLIDING POT BEARING (AGPM)

Technical data is given in the table for free sliding pot bearing. For instance, AGPM 500/100/20 means vertical load is 500 kN, horizontally longitudinal displacement is 100 mm (±50) and horizontally transversal displacement is 20 mm (±10).

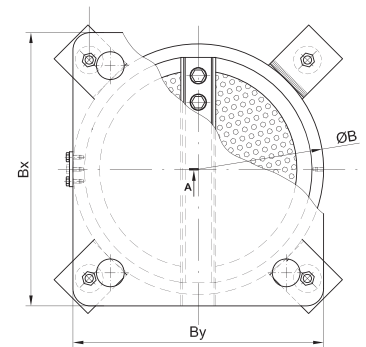
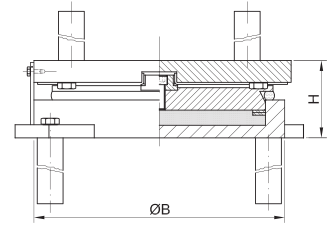


Bearing Code	N _{RD} (kN)	mm	mm	Φ _B (mm)	H (mm)	B _x (mm)	B _y (mm)	W (kg)
AGPM 500/100/20	500	100	20	160	60	260	160	11
AGPM 1000/100/20	1000	100	20	200	64	300	200	17
AGPM 1500/100/20	1500	100	20	260	73	360	260	31
AGPM 2000/100/20	2000	100	20	280	79	380	280	39
AGPM 2500/100/20	2500	100	20	330	81	430	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

GUIDED POT BEARING (AGPL-AGPT)

Technical data is given in the table for guided pot bearing. For instance, AGPL 500/100-75 means vertical load is 500 kN, horizontally longitudinal displacement is 100 mm (± 50) and horizontally transversal load is 75 kN.

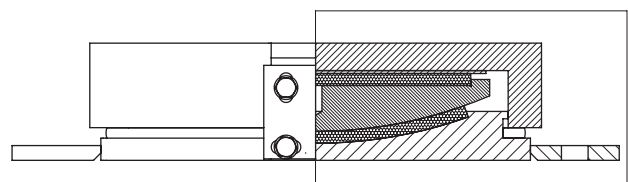
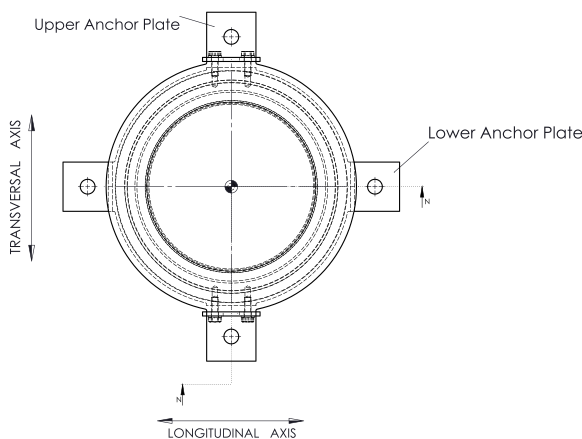
Bearing Code	N_{RD} (kN)	mm	V_{yd} (kN)	Φ_B (mm)	H (mm)	B_x (mm)	B_y (mm)	W (kg)
AGPL 500/100-75	500	100	75	170	68	270	170	12
AGPL 1000/100-150	1000	100	150	220	76	320	220	24
AGPL 1500/100-225	1500	100	225	270	79	370	270	35
AGPL 2000/100-300	2000	100	300	310	82	410	310	46
AGPL 2500/100-375	2500	100	375	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

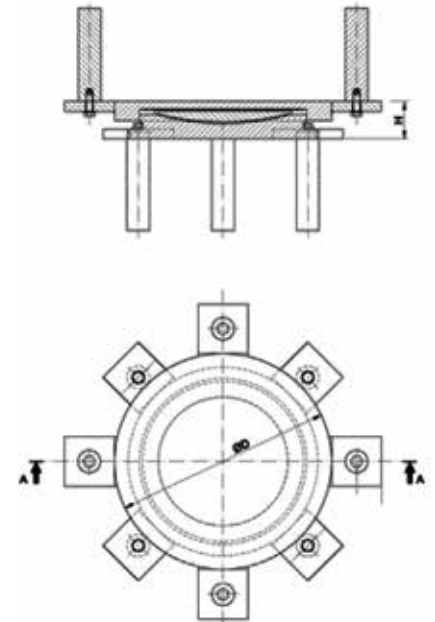
Spherical bearings are designed to carry combinations of vertical loads, horizontal loads, longitudinal and transversal movements and rotations. They are used in steel and concrete road and railway bridges. The bearing is composed by steel elements coupled with PTFE surface to allow movement and rotations. 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 allows 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 producing according to EN 1337-7 also if the client requests, they can be produced according 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

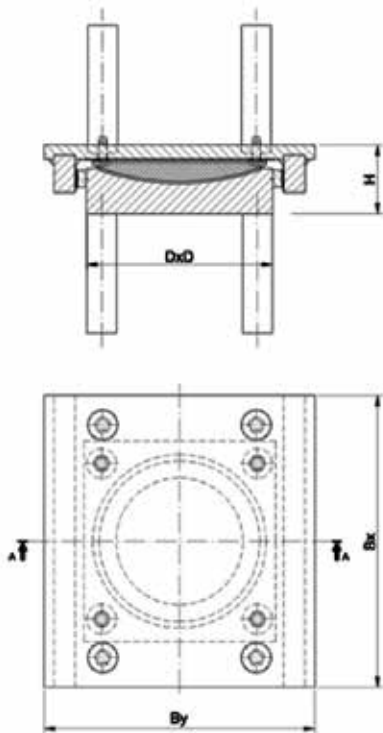
The technical data is shown in the table for fixed spherical bearings. For example, AGSF 500-75-75 means the vertical load is 500 kN, the longitudinal load is 75 kN and the transversally horizontal load is 75 kN.

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 data is shown in the table for guided spherical bearings. For example, AGSFL500/100-75 means the vertical load is 500 kN, the longitudinally transversal displacement is 100 mm (± 50), and transversal (or longitudinal) lateral load is 75 kN.

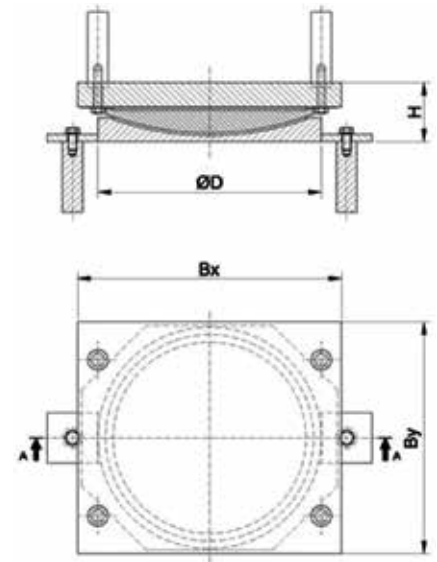


Bearing Code	NRD (kN)	mm	Vy, Rd (kN)	B (mm)	H (mm)	BX (mm)	BY (mm)
AGSL 500/100-75	500	100	75	150	75	250	210
AGSL 1000/100-150	1000	100	150	200	80	300	260
AGSL 1500/100-225	1500	100	225	250	95	350	310
AGSL 2000/100-300	2000	100	300	290	100	390	350
AGSL 2500/100-375	2500	100	375	320	110	420	400
AGSL 3000/100-450	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 data is shown in the table for free sliding spherical bearings. For example, AGSFL500/100/20 means the vertical load is 500 kN, the longitudinal displacement is 100 mm (± 50), and transversal displacement is 20 mm (± 10)

Bearing Code	NRD (kN)	mm	mm	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	190	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

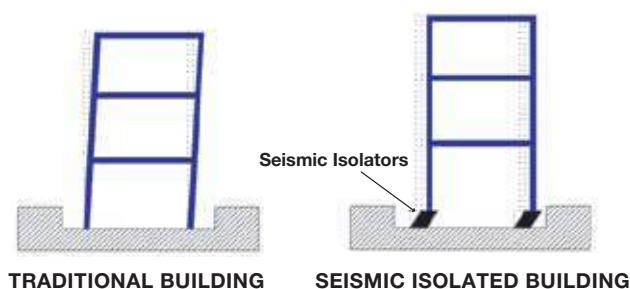




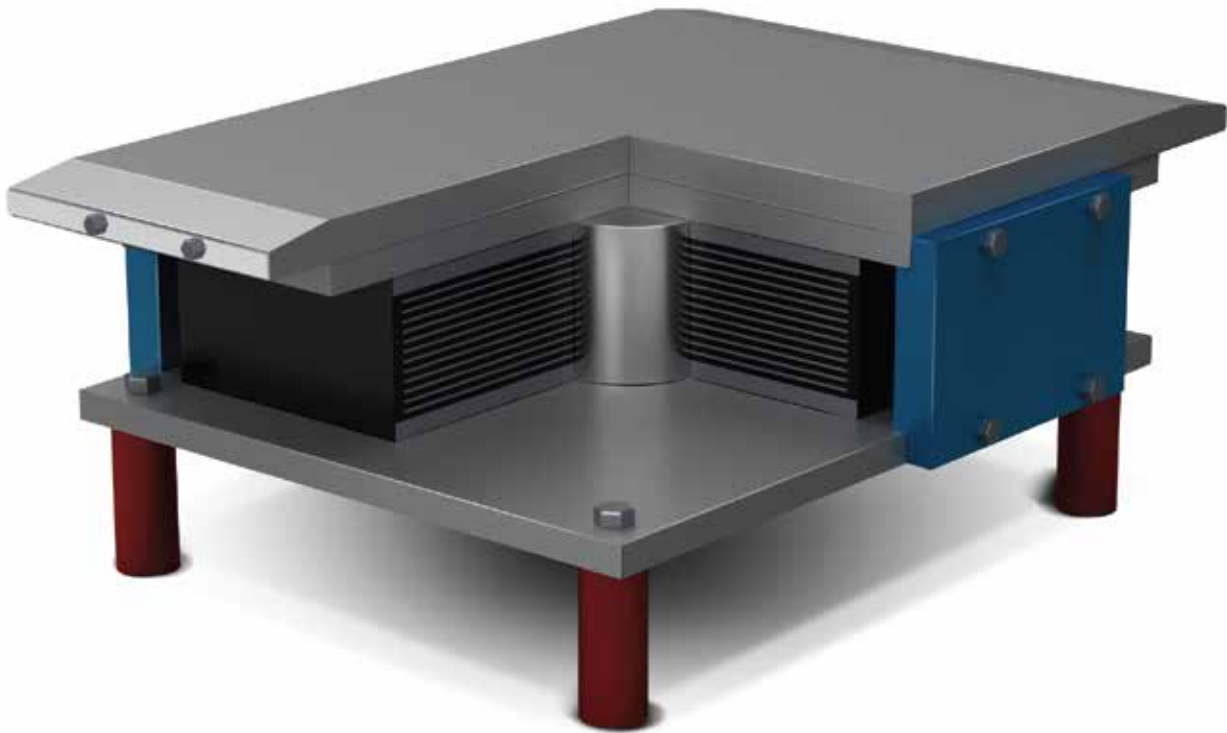
SEISMIC ISOLATORS

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 superstructure 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.

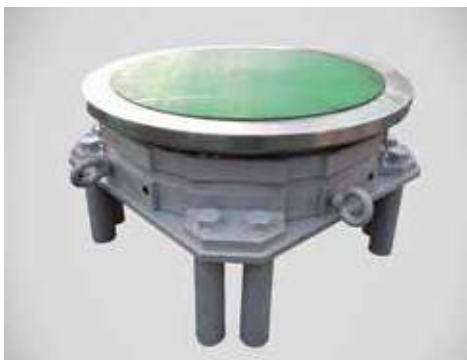


There are different types of isolator. According to the requirement of the project; high damping capacity, lead core and friction pendulum type seismic isolators. Performance demand, earthquake risk, architectural design, purpose of use of the building, geometry of the structure are important factors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



HIGH DAMPING RUBBER ISOLATOR (HDRB)

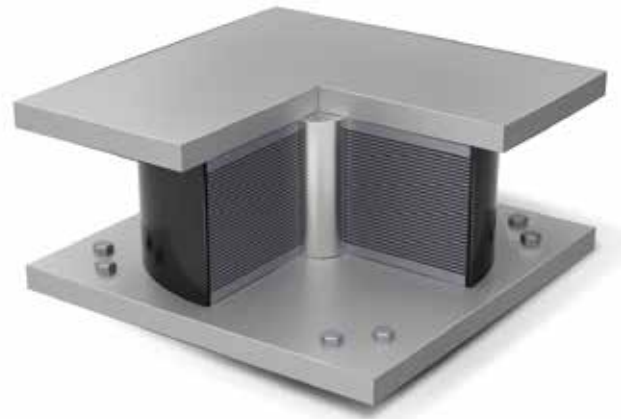
The damping capacity is increased by adding extra materials to the natural rubber. High damping rubber bearings consist of reinforced multilayers with steel plates between HDRB specially compounded damping rubber and rubber layers. Steel plates provide vertical rigidity and rubber horizontal flexibility.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



FRICITION 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.



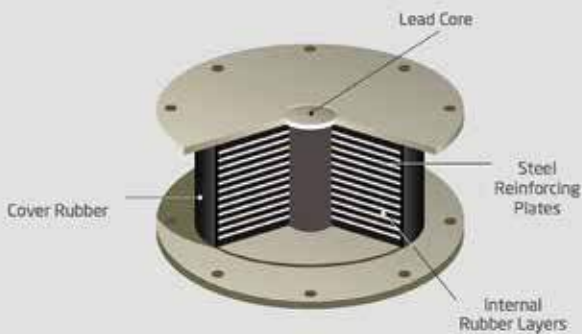
LEAD RUBBER BEARINGS

Lead rubber bearings (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 with respect to simple elastomeric bearings. The lead core isolators are designed to have a horizontal movement capacity from 70% to 200% of the isolator height.

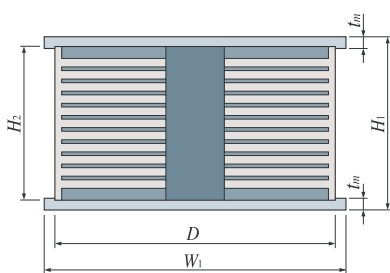
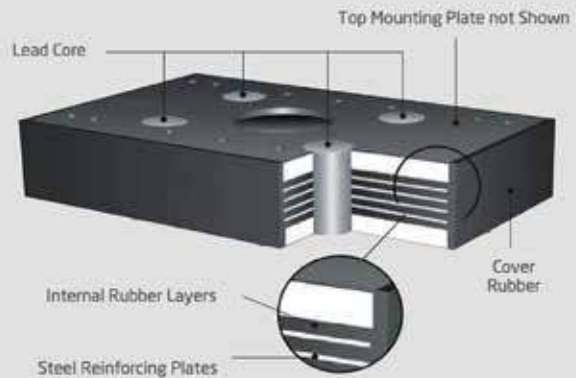
In this type of isolators; the lead core consumes energy and reduces the seismic forces and displacements that affect to the structure. In addition, the structures provide resistance to the wind.

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.

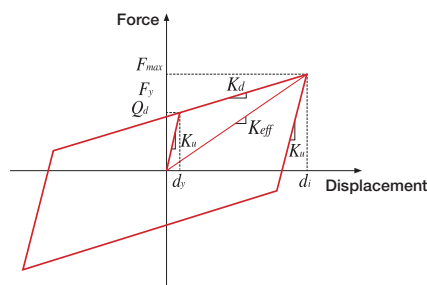
Spherical



Square



LRB Cross Section



Force-Displacement Hysteris Curve

- D : LRB Diameter
- W₁ : Width of the Steel Plate
- H₁ : Total Height of LRB
- H₂ : Height of Bearing
- Q_D : Characteristic Strength
- F_y : Yield Strength
- F_{max} : Maximum Strength
- K_y : Vertical Stiffness
- K_U : Post Yield Stiffness
- K_d : Initial Stiffness
- K_{eff} : Effective Stiffness

SEISMIC ISOLATORS

Technical values related to the design of lead rubber bearings in the table are shown. Please contact Arfen for special designs.

Vertical Load (kN)	Yield Ratio (%)	Product Code	Displacement (mm)	Size					Bolt		Property (Earthquake Displacement is 60 mm)					Weight (kgf)
				D	W ₁	T _m	H ₁	H ₂	Diameter (mm)	Pcs	Q _d (kN)	K ₁	K ₂	K _v (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.

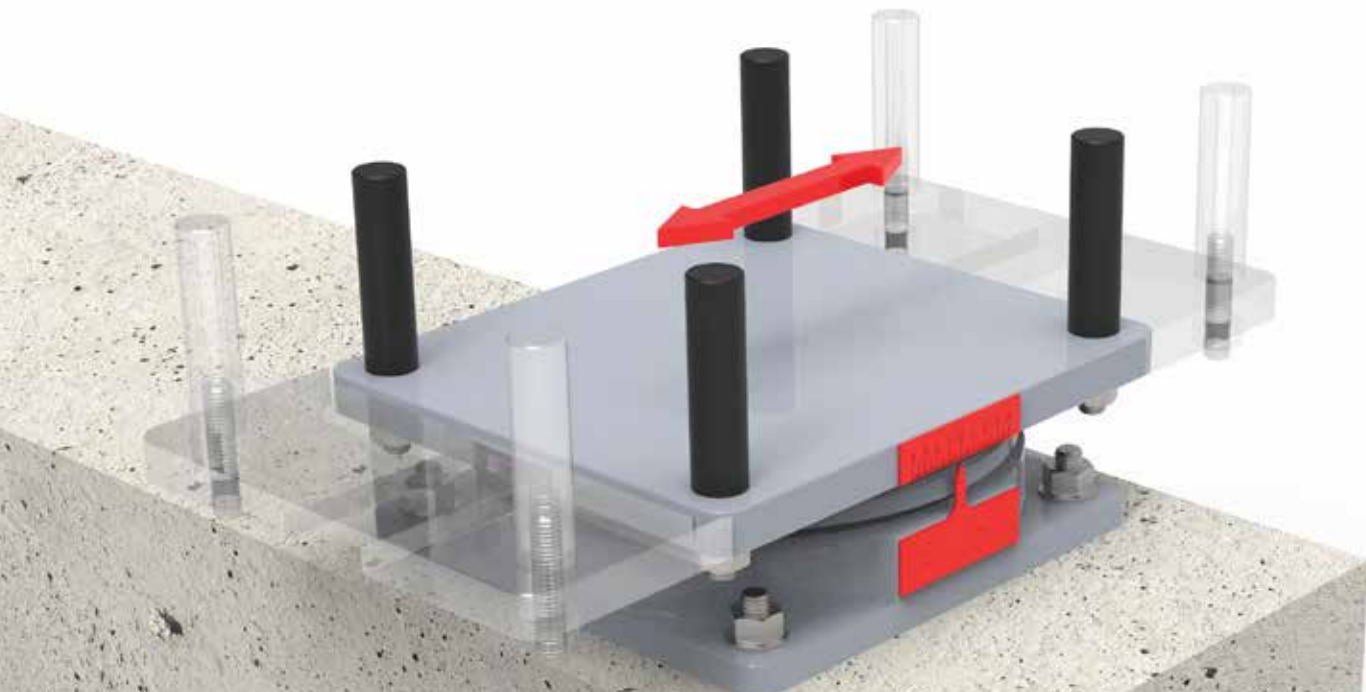
Teflon: It has a very low coefficient of friction with stainless steel.

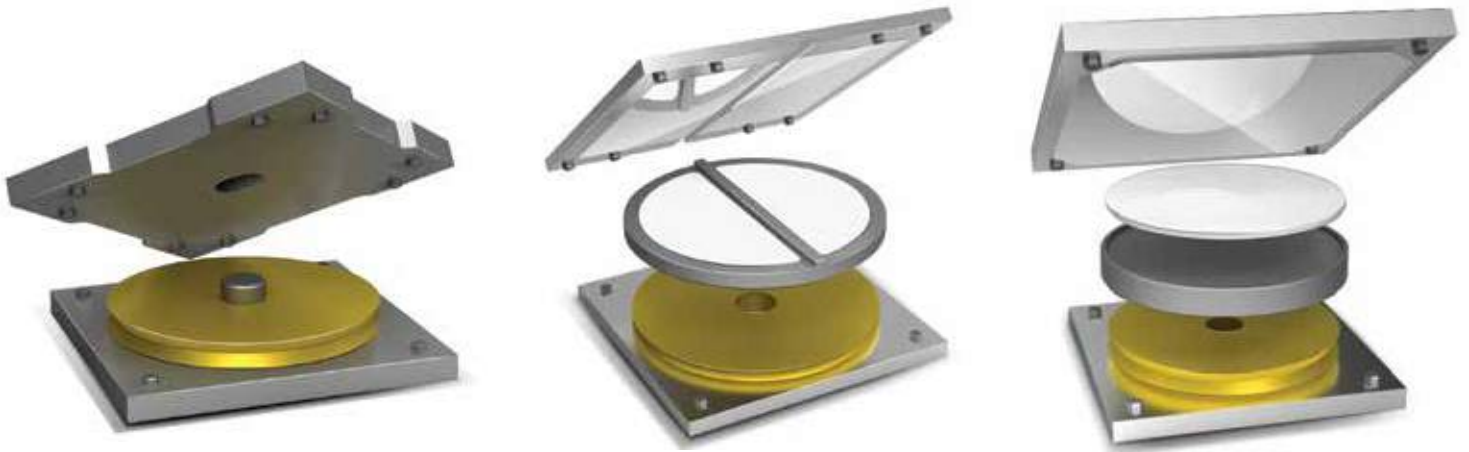
Polyurethane Disc: The polyurethane disc allows rotation in all directions (longitudinal and transverse) when carrying vertical loads of 1 kN - 100.000 kN.

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

Fixed Disc 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.





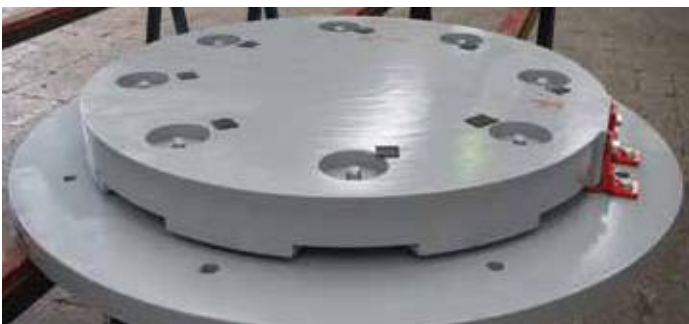
MULTIDIRECTIONAL DISC BEARING

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 of 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, and 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 sound insulation walls rubber expansion joints

single span steel expansion joints

special alloy aluminium expansion joints finger type expansion joints

railway type expansion joints modular expansion joints

arcrete elastomeric concrete bituminous expansion joints (thormajoint)



bridge expansion
joints

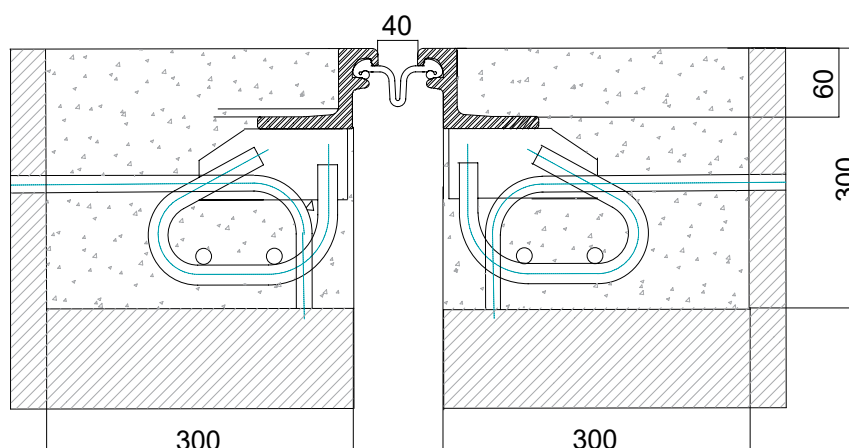


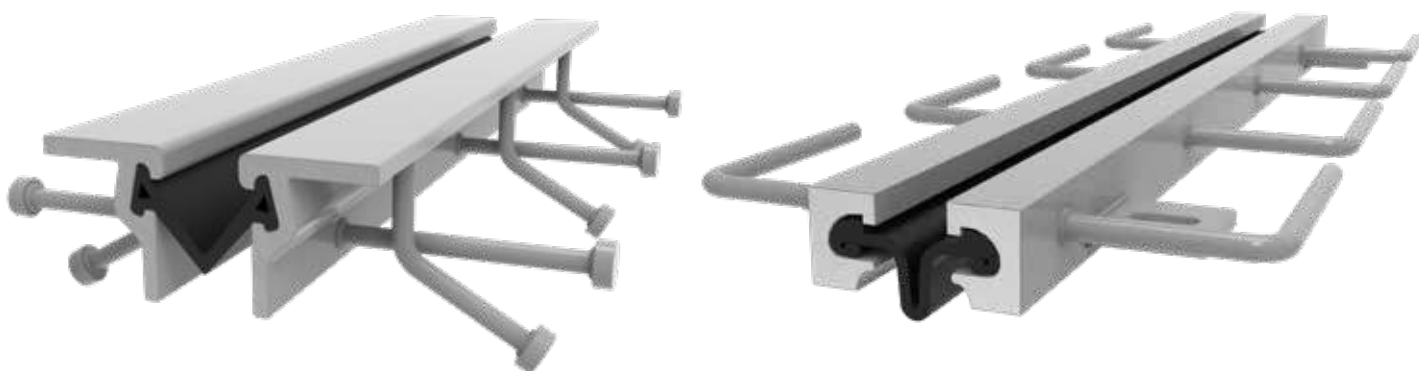
GD 80

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 water tightness is used. The steel profiles in this system can consist of extrusion profiles. Our expansion joints are designed according to ISO 9001 quality standards, DIN 1072 and AASHTOH30-S24 load standards and the anchorage elements used in the expansion joints are produced in accordance with EN 10025 standard and rubber waterproof seal EN standards.

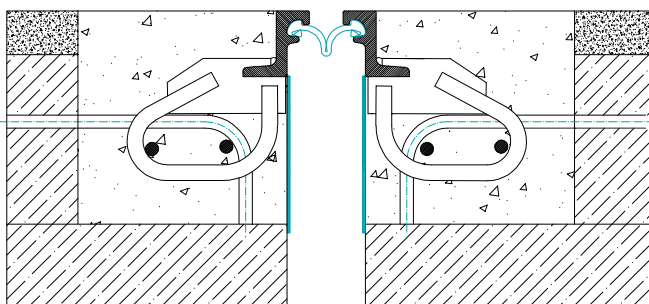
The expansion joint can be manufactured as one piece up to 12 m and after 12 m, the expansion joint can be divided into two pieces after approved by customer. In the cases where the join (connection part) of the expansion joint is outside of the walkway, the join must be at the place where the vehicle traffic is minimum. To protect the profile against corrosion, the surface of the profile must be cleaned, the primer paint is applied just after sandblasting is applied in the sa2 1/2 quality The profile is coated at least 80 micron zinc-based primer and on the top of the coat, at least 100 micron chlorine-rubber-based or epoxy-based paint is applied to protect against corrosion and external effect.



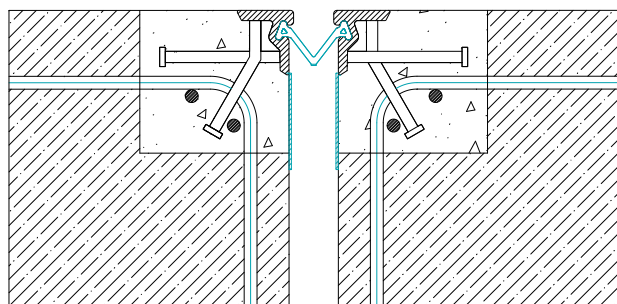


SINGLE SPAN STEEL EXPANSION JOINTS

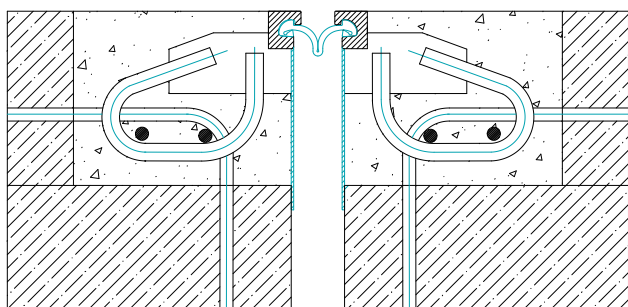
The rubber seal (EPDM) used in the expansion joint system is manufactured according to related EN and/or DIN and TSE. The watertightness capability of the system is provided in the only one piece seal. The seal is placed completely into the slot all over the profile length. The seal is planned and manufactured in such a way that it definitely prevent the flowing down or leakage of the surface water, and it can be removed when it is necessary for maintenance, repair and replacement and under the dynamic movement (traffic, seismic movement), it does not tear, break or dislocate and it does not contact to the wheel surface.



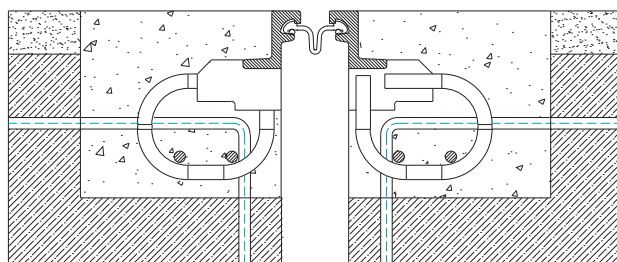
BE 80 TM



BE 80-3



BE 80-4



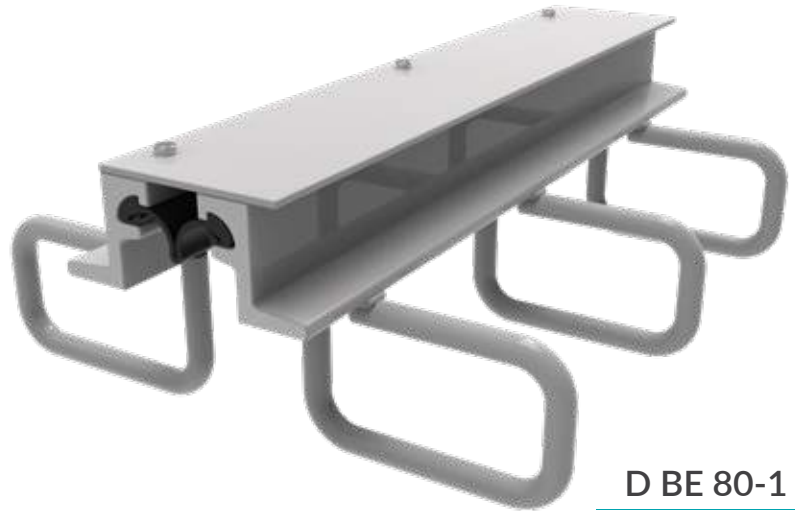
BE 80 TM2



STEPS TO BE CONSIDERED IN APPLICATION

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.

- The reinforcement which is at the place where the expansion joint is placed must be controlled. If necessary, adjustment should be applied.
- Transverse and longitudinal equipment must never be cut in the application area. All longitudinal bars must fixed to stirrups.
- The gap at which the expansion is placed should be cleaned.
- After the preparation of the joint gap, the expansion joint is placed by using mobile crane or similar machine.
- The upper elevation of the expansion joint must be 3 mm below the asphalt coat according to the topographic measurements.
- After the levelling of the joint, the expansion joint must be fixed to the superstructure by spot welding between the anchorage of the joint and the reinforcement of the bridge.
- The concrete must be poured up to the level of the upper layer of the asphalt wear. In this way, the expansion joint is covered with concrete.
- The most important phase of the assembling the joint is pouring concrete to structural strength and long life. Hence, it must be done carefully.
- After the concrete reaches the required strength, the lifting plates on the expansion joint is removed and the road can be opened to the traffic at least 3 days after concrete pouring.



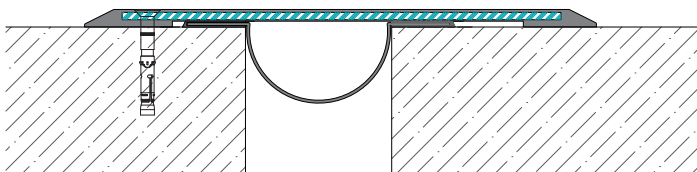
D BE 80-1

RAILWAY TYPE EXPANSION JOINTS

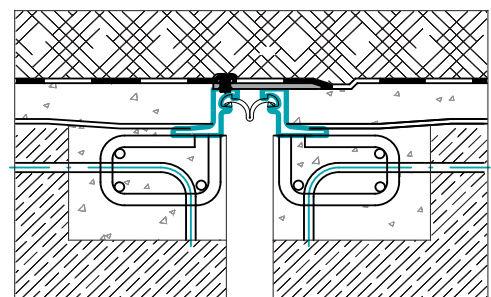
Such expansion joints developed by Arfen are used in railways. The expansion is similar to that of the single span steel expansion joints. The product consists of steel edge profiles and rubber seals to provide impermeability. In addition, the joint gap is covered with a lid (ballast) to prevent gravel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

Our railway expansion joints are designed according to ISO 9001 quality standards, DIN 1072 and AASHTO H30-S24 load combination. The anchorage elements used in the expansion joints are manufactured in accordance with EN 10025 standard and rubber waterproofing gasket is in EN standards.

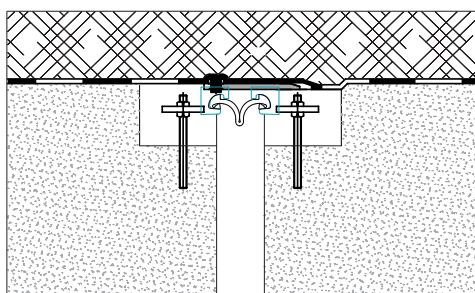
As Arfen, we have two types of expansion joints that we have developed for railways.



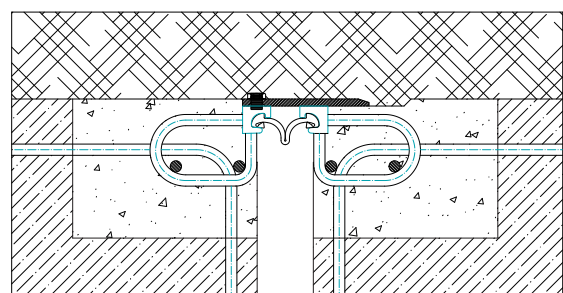
AR 951-100-01



Railway Type - D BE 80-1



Railway Type - D BE 80-2



Railway Type - D BE 80-4

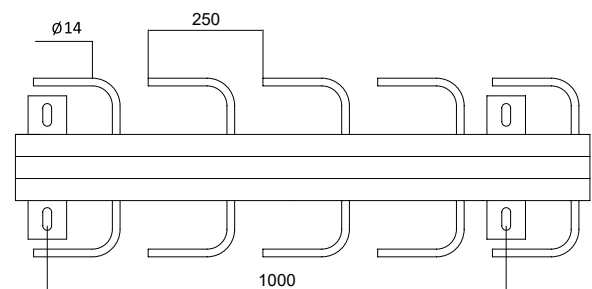
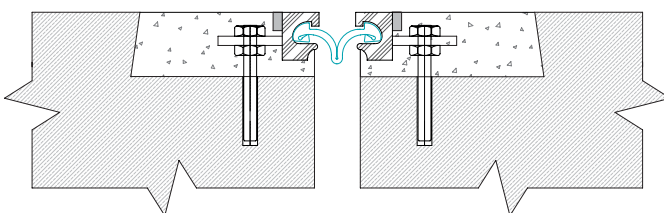


S BE 80

SOUND INSULATION EXPANSION JOINT

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 according to the customer's request.

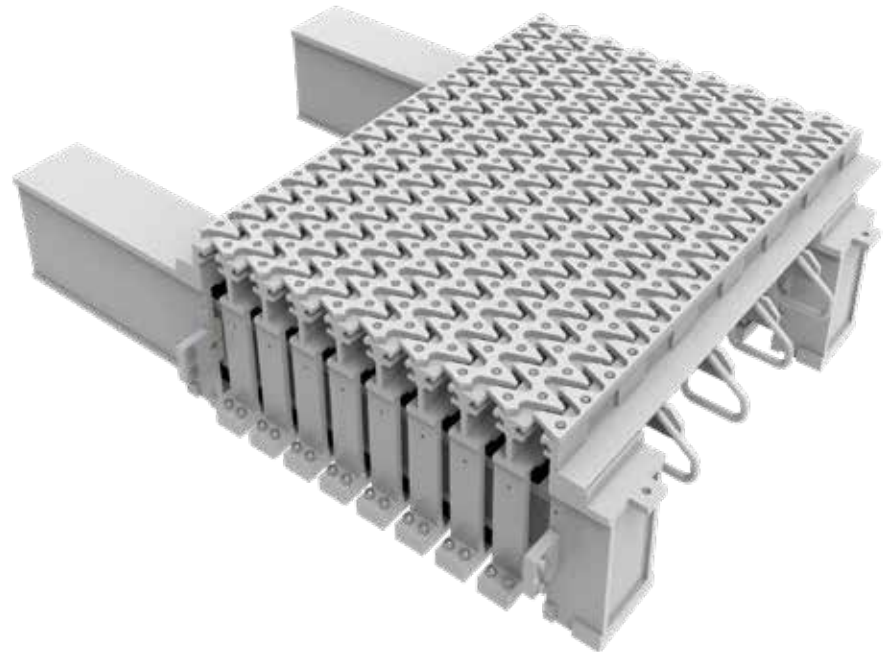
BE 80-2 STEEL BRIDGE EXPANSION JOINT



STRIP SEAL EXPANSION JOINTS

This type of 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 up to 127 mm. The joint is assembled together with special anchors and epoxy.

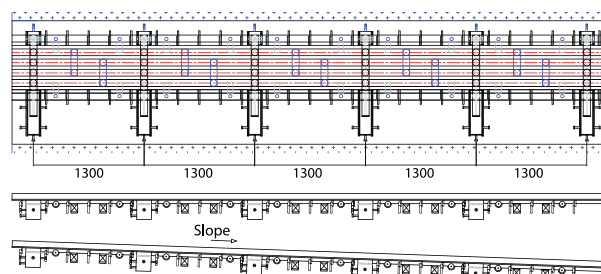
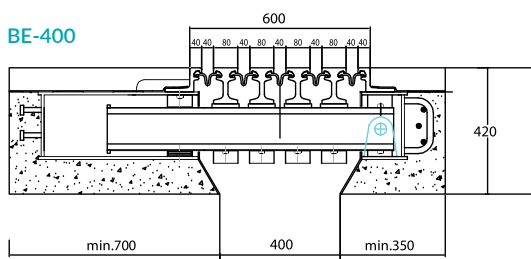


MODULAR EXPANSION JOINTS

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, and so on. 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 with rubber gasket. Thus, water and chemicals are prevented from damaging infrastructure and superstructure. Moreover, 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.

The following elements are used in modular expansion joints.



- Edge Profile
- Main Profile
- Support Profile
- Sliding Plate
- Bearing
- Spring
- Carriageway Anchor
- Anchor Pillar
- Support Box
- Rubber Seal



STEPS TO BE CONSIDERED IN APPLICATION

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.
- ▶ Pay attention 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 system undergo out of service.
- ▶ The expansion joint should be fixed between 10-20 °C.
- ▶ The expansion joint must be at least 5 mm below the asphalt wearing coat (or concrete).
- ▶ Box elements must be well supported with concrete. The box must be covered with concrete completely and the formwork is suitable for this situation.
- ▶ Pay attention to that there is no air gap at the bottom of the box.
- ▶ The anchorage of the expansion joint must be covered with concrete completely.
- ▶ Before the poured concrete gains its required strength, the road is not opened to the traffic.



FINGER TYPE EXPANSION JOINTS

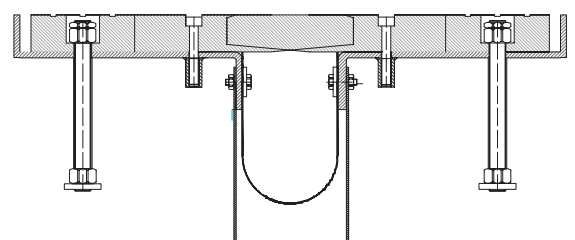
The finger type bridge expansion joint is usually made of steel edge profile with thick steel finger plates anchored with high quality bolts. It is very unlikely to wear and damage the system surface, which consists of interlocking finger plates. As a result, there is low maintenance cost.

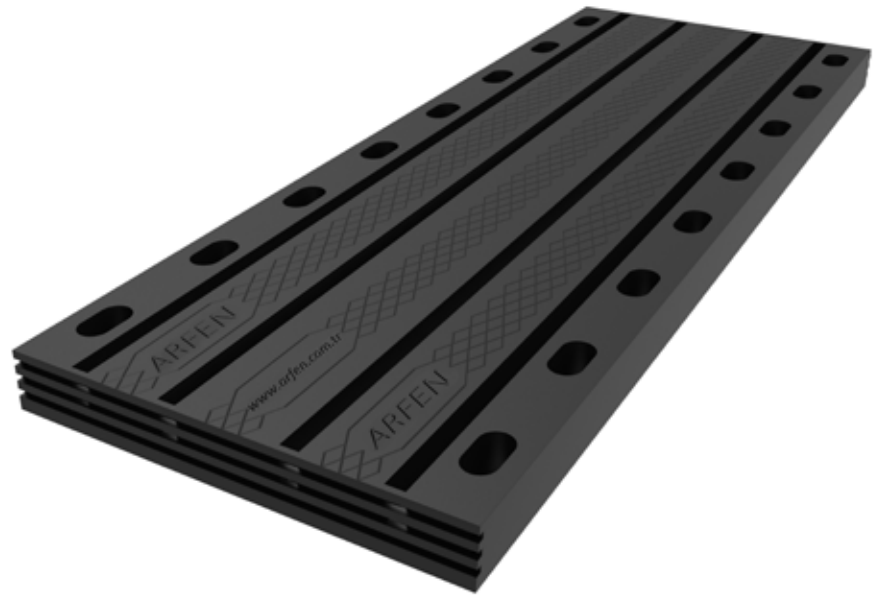
When using steel finger plates in the system, the damage that can occur in the expansion joint is very limited and the expansion joint has a long service life. The most important reason for this is the fact that there is very little impact between the vehicles through the expansion joint since the finger 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 table shown below presents 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.

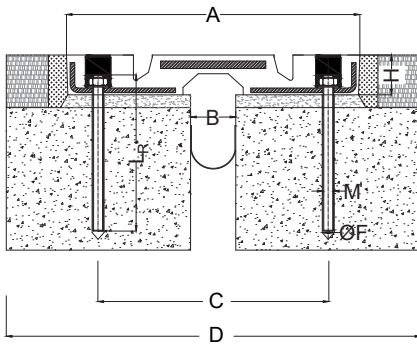
ARFEN rubber bridge expansion joints can also be applied on steel structures. There is less noise and vibration at the same time as the cause of the rubber surface.

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

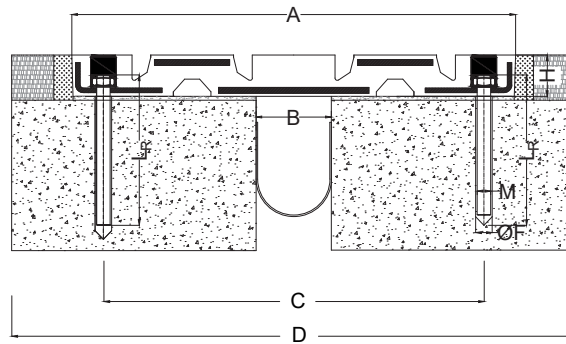


ARFEN rubber expansion joints also compensate for vertical displacements due to the rubber material. This characteristic is very important for movements and loads that cause vertical displacement. This type of bridge expansion joints can be combined with aluminium or rubber turning parts on the walkways.

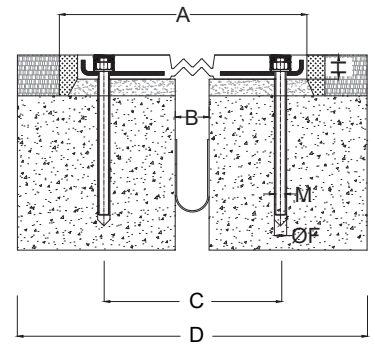
As the rubber expansion joint ARBRIDGE series, we have six types of models with different movement capacities. Our rubber expansion joints are manufactured as standard 2.00 meter modules.



ARBRIDGE 01 (0-50mm)
ARBRIDGE 02 (0-60mm)
ARBRIDGE 21 (0-80mm)
ARBRIDGE 03 (0-100mm)



ARBRIDGE 04 (0-140mm)
ARBRIDGE 05 (0-180mm)
ARBRIDGE 06 (0-270mm)



ARM 100 (0-70mm)

MODEL CODE	MOVEMENT CAPACITY	A (mm)	B (mm)	H (mm)	L (mm)	F (mm)	M (mm)	L _R (mm)	WEIGHT (kg/m)
ARBRIDGE-01	50 mm ±25	270	35	32	2000	14	12	200	21
ARBRIDGE-02	60 mm ±30	270	40	42	2000	14	12	200	24
ARBRIDGE-21	80 mm ±40	326	45	48	2000	18	16	200	26
ARBRIDGE-03	100 mm ±50	390	60	53	2000	18	16	200	43
ARBRIDGE-04	140 mm ±70	590	80	55	2000	22	18	200	65
ARBRIDGE-05	180 mm ±90	750	100	75	2000	24	20	200	160
ARBRIDGE-06	270 mm ±135	890	145	80	2000	24	20	200	170
ARM 100	70 mm ±35	305	45	32	2000	14	12	200	18



STEPS TO BE CONSIDERED IN APPLICATION

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

- The place where the expansion joints is placed 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.
- Do not open the traffic before the all material gain their strength.





SPECIAL ALLOY ALUMINIUM EXPANSION JOINTS

Arfen aluminum 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 aluminium 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, chemical 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.

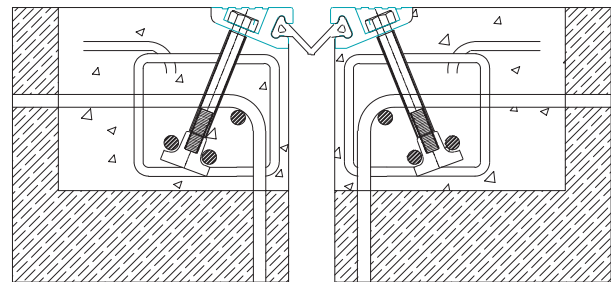
Arfen BE aluminium series bridge expansion joints guarantee a long-term solution to corrosion.

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.

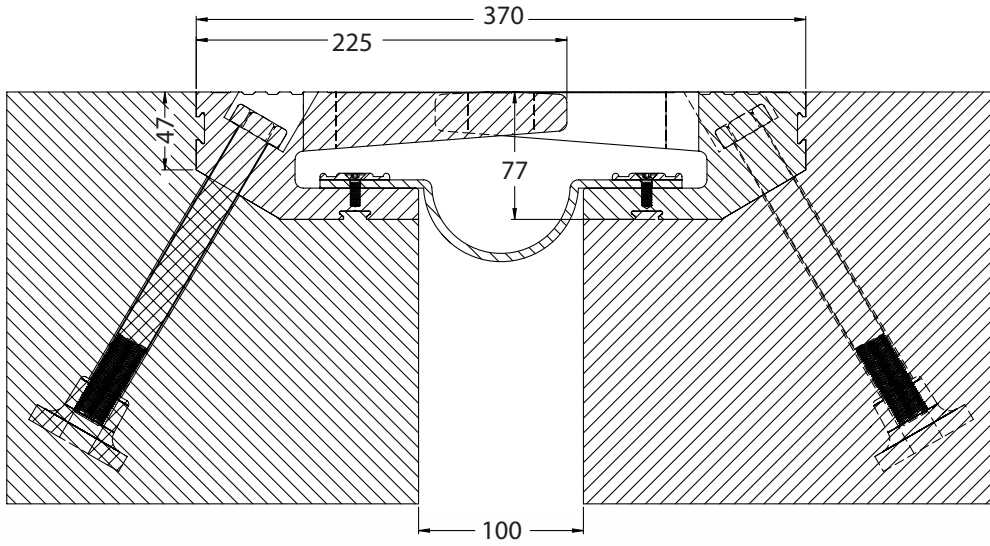
M20 bolts are used in the anchorage process. Repairs and replacement of old expansion joints are very easy. Without breaking concrete you can change expansion joint

A-BE Aluminium Expansion Joint;

- Easy to install
- Movement capacity up to 160 mm
- High watertightness
- High service life
- Comfortable transition on the top of the expansion joint
- Special seal option



Model	Movement Capacity	Installation Gap	Profile Length	M20 Bolt Space
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
AL-BE S 160	0-160 mm	80 mm	2000 mm	200 mm



A BE S160





BITUMINOUS EXPANSION JOINTS (THORMAJOINT)

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.

The service life of the joint is less than other types.

When it is requested, the expansion joint is installed by Arfen.

Features;

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





ARCRETE 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.

Some features of the product are as following;

- 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.



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 Hardness	ASTM D2240	60±5
BİRLEŞTİRİCİ MADDE + AGREGA		
Compressive Strength	ASTM C579 (Test Method B)	24 MPa
Brittleness	Free Fall	min 9,5 N/m

Installation surface should be clean and dry. There should be no chemicals such as salt, oil on the surface. ArCrete 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 ArCrete. 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-35°C, 1-2,5 hours

ASTAR		
PROPERTY	TEST METHOD	VALUE
Flexural Strength (7 günlük)	TS EN 196-1	> 30 N/mm ²
Compressive Strength (7 günlük)	TS EN 196-1	> 75 N/mm ²
Adhesion Strength to Concrete	TS EN 4624	> 4 N/mm ²
Adhesion Strength to Steel	TS EN 4624	> 3 N/mm ²





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 into two types, sound absorption type or sound reflection type according to the material used.

1) SOUND DAMPING TYPE

Sesi sönmölemek üzere tasarlanıp, üretilmektedirler.

TECHNICAL DETAILS:

Height	500 mm
Length	4960 mm
Cover	Electrostatic Polyester Baking Paint (PVC)
Color	Ral Codes
Sound Absorption	16dB=A5 DIN EN 1793-1: DL
Sound Insulation	18dB=B2 DIN EN 1793-2: DL
Certificate	CE / DIN EN 14388:2006

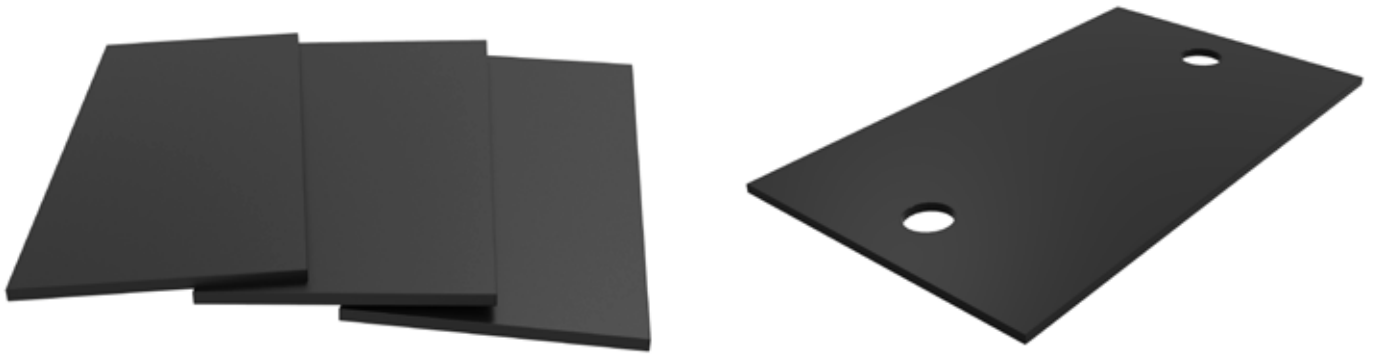
2) SOUND REFLECTING TYPE

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

TECHNICAL DETAILS:

Height	500 mm
Length	4960 mm
Cover	Electrostatic Polyester Baking Paint (PVC)
Color	Ral Codes
Sound Absorption	-
Sound Insulation	-
Certificate	CE / DIN EN 14388:2006





PREFABRICATED PAD FOR PRECAST

EN 1337-3 SUITABLE

The capabilities of manufacturing and testing the bearing pads have become our signature. From the bridge bearings that require compensation of rotation, vertical load and horizontal movements to building, light rail projects and machines that compensate for vibrations, we can produce almost any shape and size.

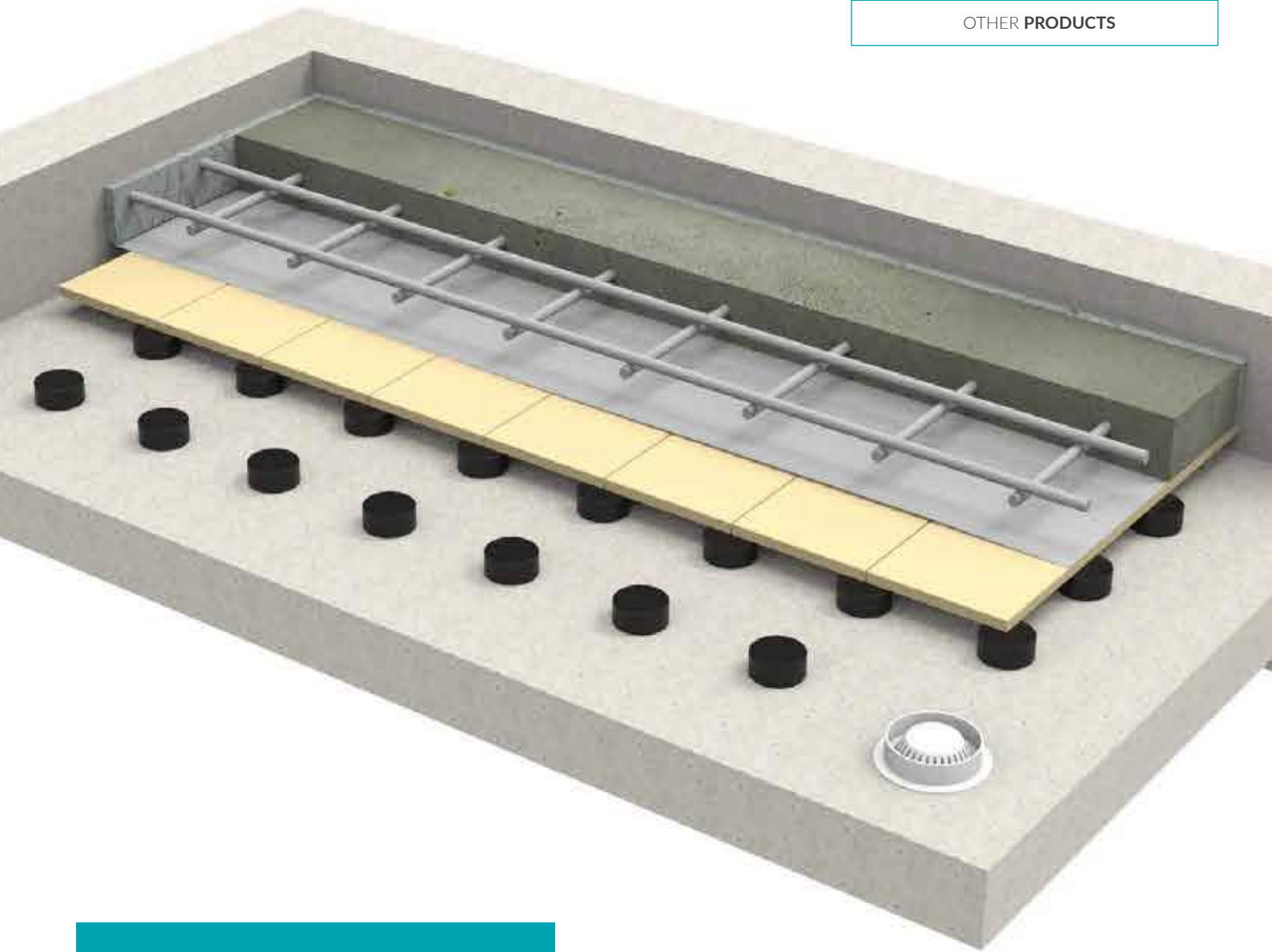
Arfen prefabricated pads (bearings) made of rubber are used in prefabricated buildings to transfer the load from superstructure to the substructure. They can be produced as plain pad or with a single steel plate, with or without holes. Elastomeric bearings are effective and economical carrier element in buildings, bridges, prefabricated beams, pretensioned beams.

Elastomeric bearings are designed and manufactured according to the standard specified in the project. The rubber pads are used for a variety of purposes in the bridge and construction industries. They allow precast and steel components to expand and contract. The movement capacity of the pad depends on the thickness of the pad. Also, they are used to minimize the effects of vibration and noise.



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.



RUBBER VIBRATION PADS

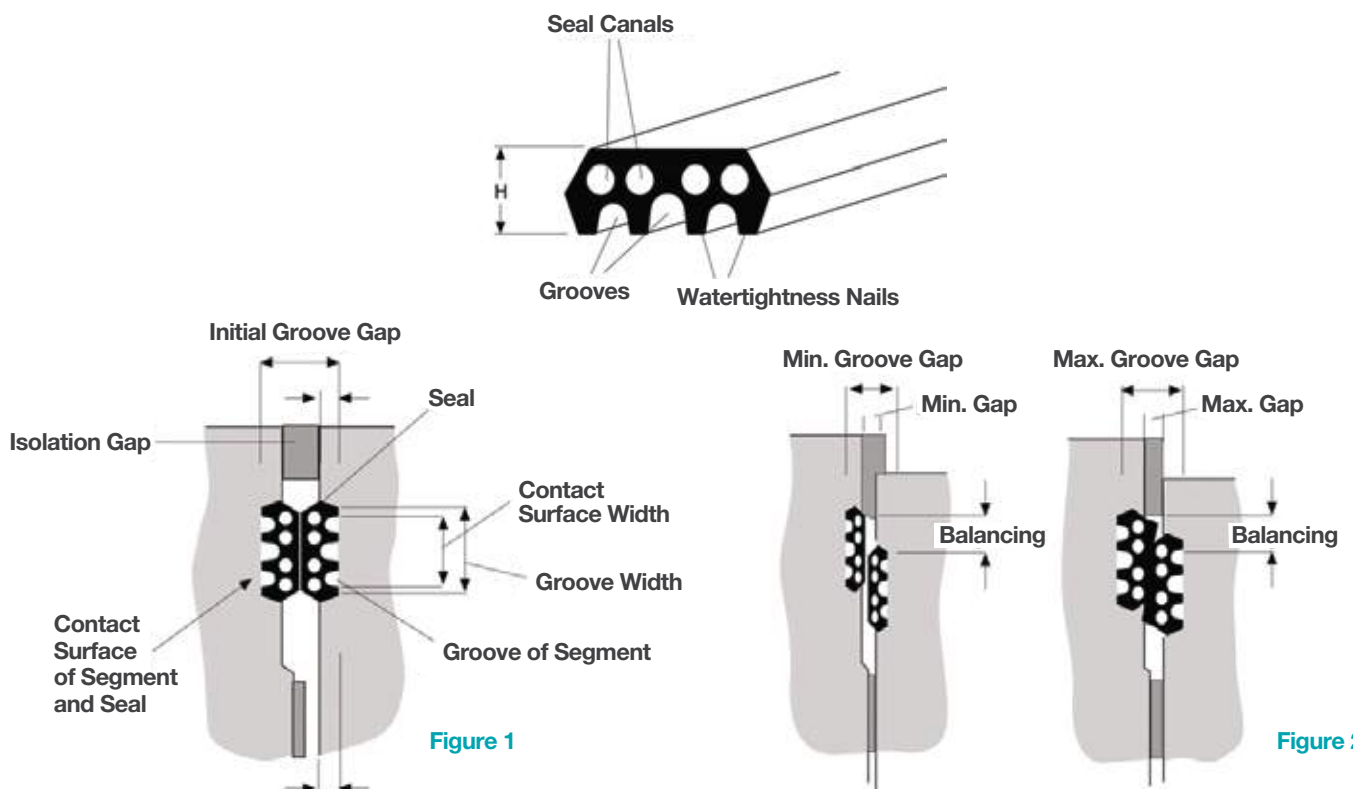
Rubber vibration pads are the pads which are widely used in vibration absorption. They are used in air conditioning and vantilation systems, and under the the machines such as compressor, generator, press, sensitive and heavy type scale type scale that create high vibration effect on the ground.





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.



ARCHITECTURAL TENSION RODS

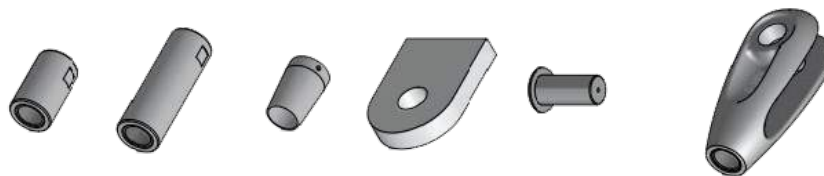
Tension rods which is also known as tie bars or tie rods, consist of 2 main components: high strength round bar and its connecting fittings & accessories. The tension rods provided with ARFEN are produced using high strength steel and their diameter is ranges in 12 - 100 mm. The tension rods are produced up to 12 meters in a single length (For longer length, coupler or turnbuckles can be used to connect the bars.). Hence, this causes low transportation cost and easy installation. According to the load capacity and architectural & constructional needs, ARFEN offers the bars with different type and quality. To give an example, galvanized or stainless steel is used at the place where there are higher corrosion exposure while painted or unpainted steel is used at the place which is dry and indoor. Commonly, these types of rods are used in supports, cross bracing and truss stiffening elements.

Nominal Thread Size	ASD0350-S	ASD0540-S					ASD0E600-S	
	M100-M130	M12	M16-42	M45-85	M90-M100	M105-M160	M12-M42	M48-M56
f_y [N/mm ²]	355	355	540	540	520	630	600	460
f_{ua} [N/mm ²]	510	510	700	700	700	710	800	650



Fitting & Accessories

The standard fitting are shown below. When requested, special types of fittings can be supplied.



Turnbuckles

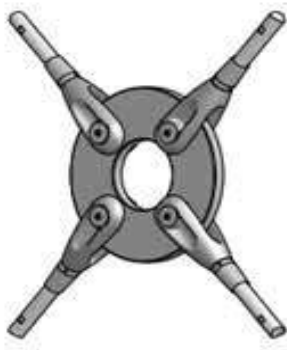
Turnbuckles are used to increase the length of the rods at which 12 m rods are not enough or pretension the tension roads and adjustment of the rods at site.

Advantages of the Tension Rods

- It is adjustable and this causes easy installation and transportation.
- To escape the additional assembly work on site, it can be assembled at the factory according to the requirement.
- Using joints, long tendons can be provided.
- By applying pre-tensioning, deformation like deflection and bending can be controlled during or after installation.
- To provide optimum strength and cost-reduction, cold rolled thread is applied.
- The rod system presents functionality, simplicity, high strength and easy control.

Sample Application Areas

- Industrial Buildings
- Exhibition and Trade Fair Halls
- Bridge Constructions
- Bus Station
- Airports

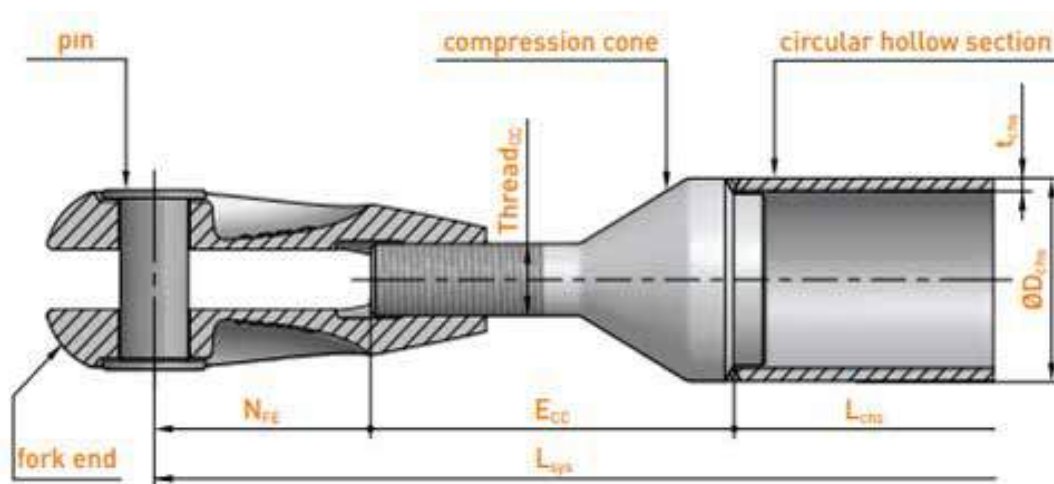


ARCHITECTURAL TENSION ROPES

Architectural tension ropes show very little resistance to pressure and give advance in nonlinear usage. This is the main difference between tension rods and tension ropes. This difference has a main role to determine whether tension ropes or tension rods can be used. The tension ropes are used for long structure with many turns while the tension rods are suitable for linear structure.

Advantages of the Tension Ropes

- With respect to other systems, they have higher strength.
- They can be coiled for transportation cost reduction.
- They have low maintenance cost.
- They are easily installed on site.
- They have high resistance to fatigue and abrasion.
- By applying pre-tensioning, it can be used for long span distance.



ARCHITECTURAL COMPRESSION STRUTS

Architectural compression struts are the system which can be work under both tension compression. The compression struts can be used at the place with bidirectional loads such as roof of the stadium, airports and shopping malls which are exposure to wind loads, which causes tension, and due to their self-weight, compression develops. The difference between tension system and compression system is that compression system can work bidirectional. The architectural compression struts are composed of high-performance carbon steel with circular hollow section with a welded taper connection at each end, assembled to standard forks ends via threaded studs.

CARBON STEEL

	Nominal Thread Size		M12	M16	M20	M24	M27	M30	M36	M42	M45	M48	M52	M56	M60	M60+	
	Dimensional Data	Nominal shaft size	mm	12	16	20	24	27	30	36	42	45	48	52	56	60	Larger diameters available at request
Shaft area Ag		mm ²	113	201	314	452	573	707	1,018	1,385	1,590	1,810	2,124	2,463	2,827		
Thread pitch		mm	1,75	2	2,5	3	3	3,5	4	4,5	4,5	5	5	5,5	5,5		
Thread stress area, As		mm ²	84	157	245	353	459	561	817	1,121	1,306	1,473	1,758	2,030	2,362		
Weight per metre (bar)		kg/m	0,9	1,6	2,5	3,6	4,5	5,5	8,0	10,9	12,5	14,2	16,7	19,3	22,2		
Load Capacities	ASDO350-S	Yield	kN	-	-	-	-	-	-	-	-	-	-	-	-		
		Ultimate	kN	-	-	-	-	-	-	-	-	-	-	-	-		
	ASDO540-S	Yield	kN	31	85	132	190	248	303	441	605	705	795	949	1,096	1,275	
		Ultimate	kN	43	110	171	247	322	392	572	785	914	1,031	1,230	1,421	1,653	
Design Resistance	ASDO350-S	F _{t,Rd}	kN	-	-	-	-	-	-	-	-	-	-	-	-		
	ASDO540-S	F _{t,Rd}	kN	30	79	123	178	232	283	412	565	658	742	886	1,023	1,190	

STAINLESS STEEL

	Nominal Thread Size		M12	M16	M20	M24	M27	M30	M36	M42	M48	M56	M60+	
	Dimensional Data	Nominal shaft size	mm	10,8	15	18	22	25	28	34	39	45	52	Larger diameters available at request
Shaft area Ag		mm ²	92	177	254	380	491	616	908	1,195	1,590	2,124		
Thread pitch		mm	1,75	2	2,5	3	3	3,5	4	4,5	5	5,5		
Thread stress area, As		mm ²	84	157	245	353	459	561	817	1,121	1,473	2,030		
Weight per metre (bar)		kg/m	0,7	1,4	2	3	3,9	4,9	7,3	9,6	12,7	17		
Load Capacities	ASDOE600-S	Yield	kN	51	94	147	212	276	336	490	673	678	934	
		Ultimate	kN	67	125	196	282	368	448	653	897	958	1,320	
Design Resistance		F _{t,Rd}	kN	47	87	136	195	255	311	453	621	656	900	





PRESTRESSED STRAND

The seven wire prestressed strand used in areas such as bridge beams, prefabricated building elements, silo and the applications of ground anchorage can be produced according to ASTM, EN, BS and other national standards. Prestressed strand having low loosening feature is properly labeled to ensure the identification and traceability, and is packaged and made ready for shipment according to customer's request.

Type	13 mm (0.5")				15 mm (0.6")			
	prEN 10138-3 (2006) Y1860S7	ASTM416-12 Grade 270	GB/T 5224-2003		prEN 10138-3 (2006) Y1860S7	ASTM416-12 Grade 270	GB/T 5224-2003	
Nom. Dia. (mm)	12.5	12.9	12.7	12.7	15.3	15.7	15.24	15.2
Nom. Cross Section (mm)	93	100	98.7	98.7	140	150	140	140
Nom. Mass (kg/m)	0.726	0.781	0.775	0.775	1.093	1.172	1.102	1.101
Nom. Yield Strength (MPa)	1634	1640	1675	-	1636	1640	1676	-
Nom. Tensile Strength (MPa)	1860	1860	1860	1860	1860	1860	1860	1860
Min. Breaking Load (kN)	173	186	183.7	184	260	279	260.7	260
Young's Modulus (Gpa)	Approx 195							
Relaxation after 1.000 h at 20°C at 70% Breaking Load	Max. 2.5							
Type	18 mm		22 mm		28 mm			
Designation	JIS G3536-2008		JIS G3536-2008		JIS G3536-2008			
Nom. Dia. (mm)	17.8		21.8		28.6			
Nom. Cross Section (mm)	208.4		312.9		532.4			
Nom. Mass (kg/m)	1.652		2.482		4.229			
Min. Breaking Load (kN)	387		573		949			
Young's Modulus (Gpa)	Approx. 195							
Relaxation after 1.000 h at 20°C at 70% Breaking Load	Max. 2.5							



PRESTRESSED CONCRETE WIRE

The prestressed concrete wire that is generally used in railway sleeper manufacturing can be produced according to ASTM, EN, BS and other national standards. It can be produced in coil and rod form. There are two types of surface: flat and hatched. Prestressed concrete wire having low loosening feature is properly labeled to ensure the identification and traceability, and is packaged and made ready for shipment according to customer's request.

\varnothing		Class	Breaking Strength	Cross-Sectional Area	Unit Weight	Elongation
mm	inch					
12,70	0,500	1725	160,1	92,9	730	3,5
15,20	0,600	1725	240,2	139,4	1094	3,5
12,70	0,500	1860	183,7	98,7	775	3,5
15,20	0,600	1860	260,7	140,0	1102	3,5
15,75	0,620	1860	277,4	149,2	1173	3,5





replacement, maintenance and installation of the bridge expansion joint and bridge bearings

Bridge expansion joints and bearings are replaced and new ones are placed by our expert team. The replacing procedure for the expansion joints is as following: Primarily, the concrete is broken and the old one is removed. Then, the new expansion joint is assembled after the surrounding of the expansion joint is cleaned and necessary adjustment for concrete is applied. While replacing the bearings, the following procedure is applied: the bridge beams are lifted using hydraulic jacks and the old ones are removed and the new bearings are installed.



22 years of experience

professional team

 **ARFEN**[®]

The image shows a construction site with a concrete slab and a rebar grid. The rebar is arranged in a grid pattern, and there are several long, parallel concrete beams or channels running across the slab. The background is a dark, possibly asphalt, surface.



post-tensioning - OVM



Incheon Bridge - South Korea

POST-TENSIONING - OVM

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. Post-tensioning 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.

Arfen has brought the experience of OVM which is one of the best company in this field and worked on the longest bridge (Jiaozhou Gulf Bridge – 42,5 km) and supplied the suspension ropes of the Yavuz Sultan Selim Bridge.

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.



Kuwait University - Kuwait



Giza Palace Hotel - Egypt

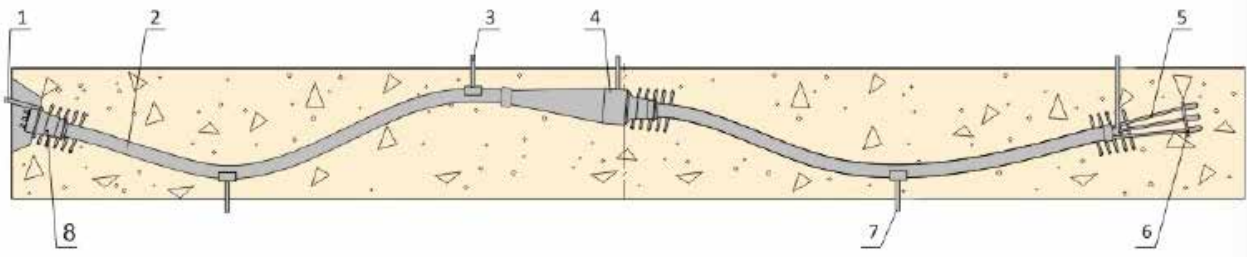
POST-TENSIONING APPLICATIONS HAVE MANY ADVANTAGES

- 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.



POST - TENSIONING PROCESS

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



- | | | | |
|-----------------|-----------------|----------|-------------------|
| 1. Grout Tube | 2. Duct | 3. Valve | 4. Coupler |
| 5. Fixed Anchor | 6. Anchor Plate | 7. Grout | 8. Tension Anchor |

PRODUCTS OF POST TENSION SYSTEM

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.

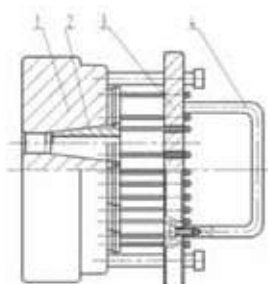
POST - TENSION SYSTEMS



Stressing End

Coupler

Dead End



POST-TENSIONING EQUIPMENT

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



CERTIFICATES





DRAW BRIDGE 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

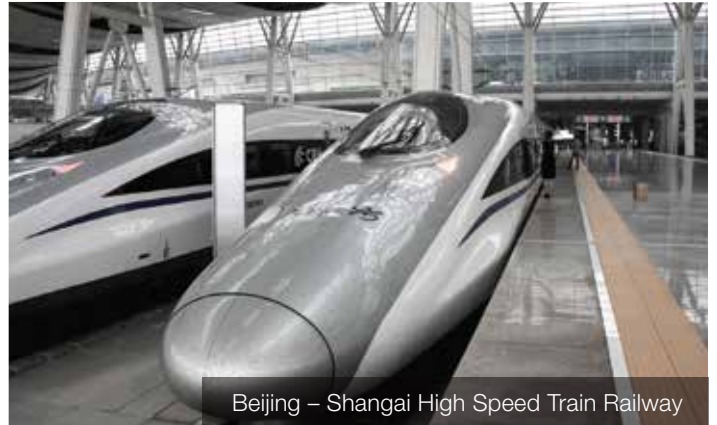
All necessary precautions have been taken in accordance with the CIP and FIB standards against corrosion in the rope systems. These systems have a high fatigue performance.



CABLE-STAYED BRIDGE SYSTEM



3. Istanbul Bosphorus Bridge



Beijing - Shanghai High Speed Train Railway



Mekke Tawaf Way



Iran Sadr Bridge



Kuwait Crown Plaza Hotel



Japan Kisogawa Bridge



Egypt Giza Palace Hotel

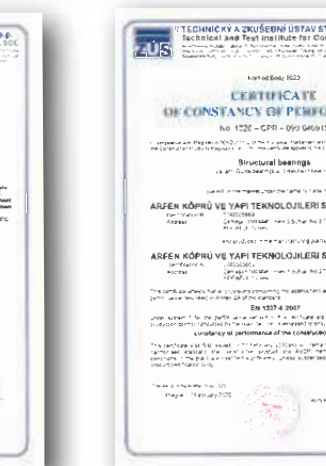
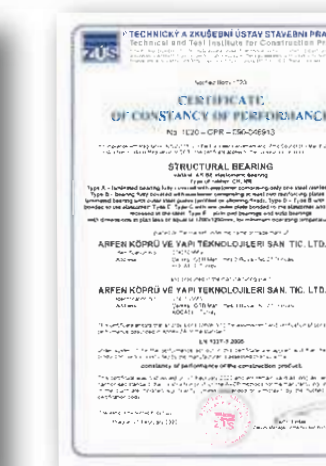


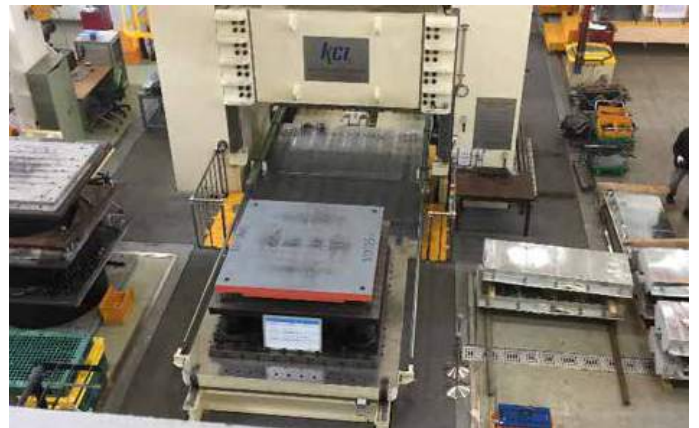
Jiaozhou Gulf Bridge



quality & production control

quality certificates and test reports





quality certificates and test studies





Yavuz Sultan Selim Bridge - Bridge Expansion Joint



North Marmara Highway



Gebze - İzmir Highway



Alibeyköy Subway Line / Metro Station



Türkmenistan Daşoğuz Bridge / Pot Bearing



Haliç Bridge / İSTANBUL



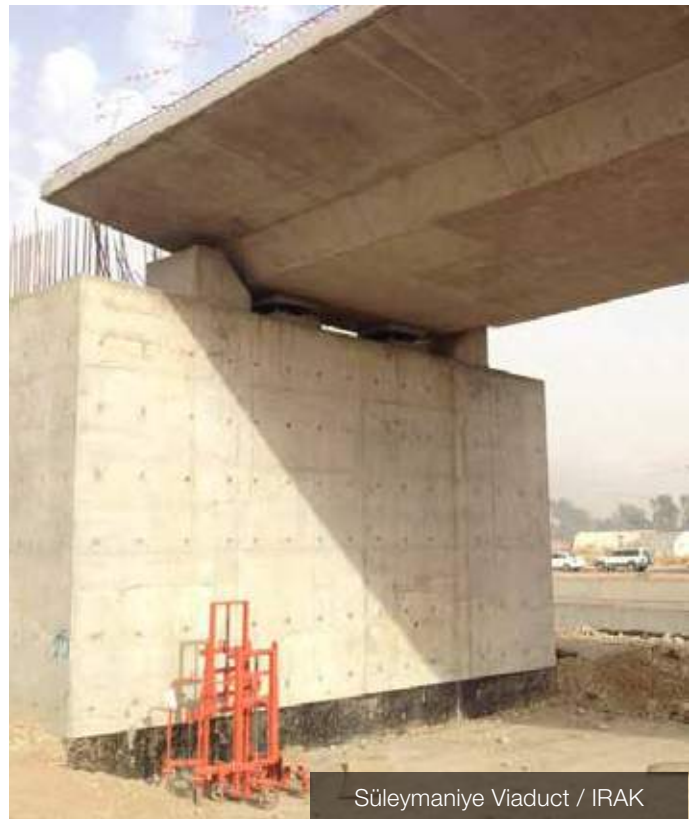
Bursa High Speed Train Line



Iisu Hasankeyf Viaduct / Batman



Baharke Crossroads / IRAK

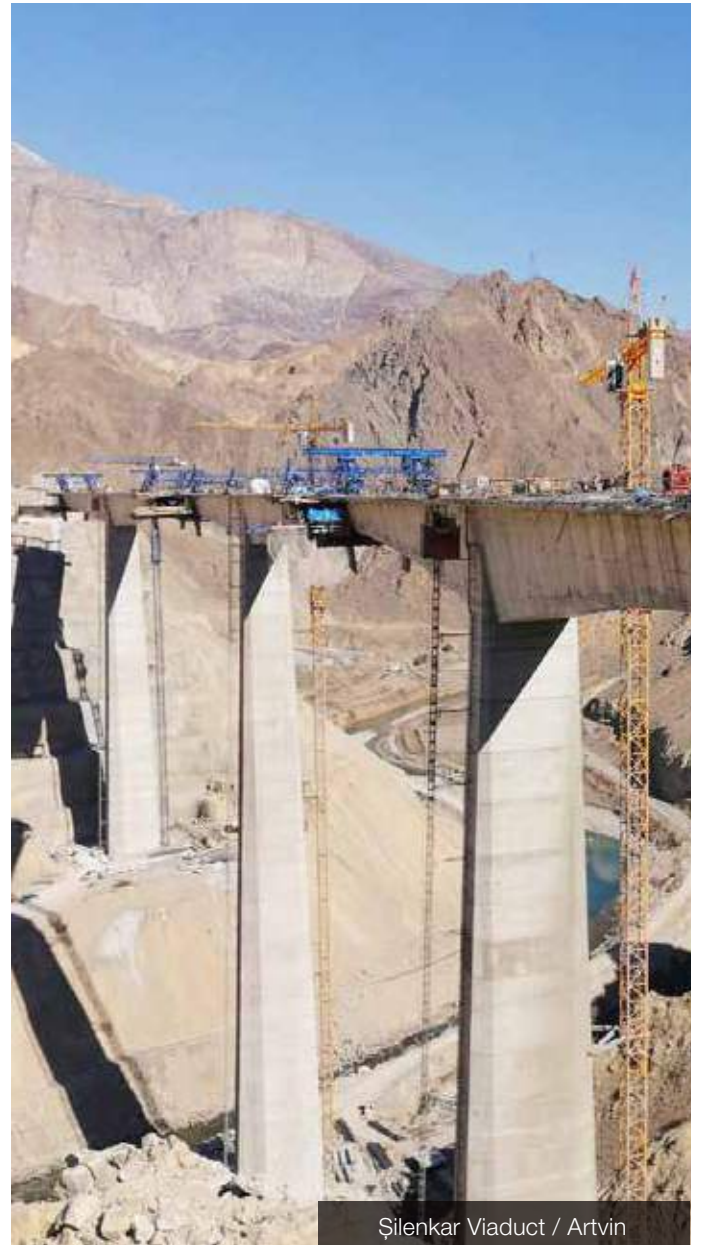




Ertuğrul Viaduct / Balıkesir



Tekkale Viaduct / Artvin



Şilenkar Viaduct / Artvin

steel processing center



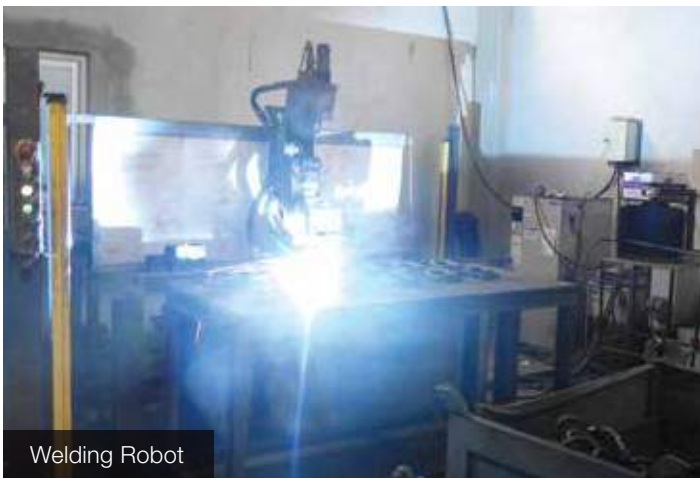
Cutting Metal



Lathe Work



Inert-Gas Welding



Welding Robot



Folding Machine



Plasma Cutting



Sandblasting



Painting Machine



Expansion Joint Assembly Welding

construction of steel bridge

We manufacture according to EN and TSE. Our columns and beams made by inert-gas welding and flux-cored wire get positive results that pass through 100% NDT controls.

We have the capability to manufacture bridge beams and/or main girder by giving three dimensional form.

Our majority is as following

- Wide Span Highway Steel Viaducts
- Steel Pedestrian Overpass
- Steel Pedestrian Crossing
- Installation and Manufacturing of Steel Bridge





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22 years of experience
and expert team



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