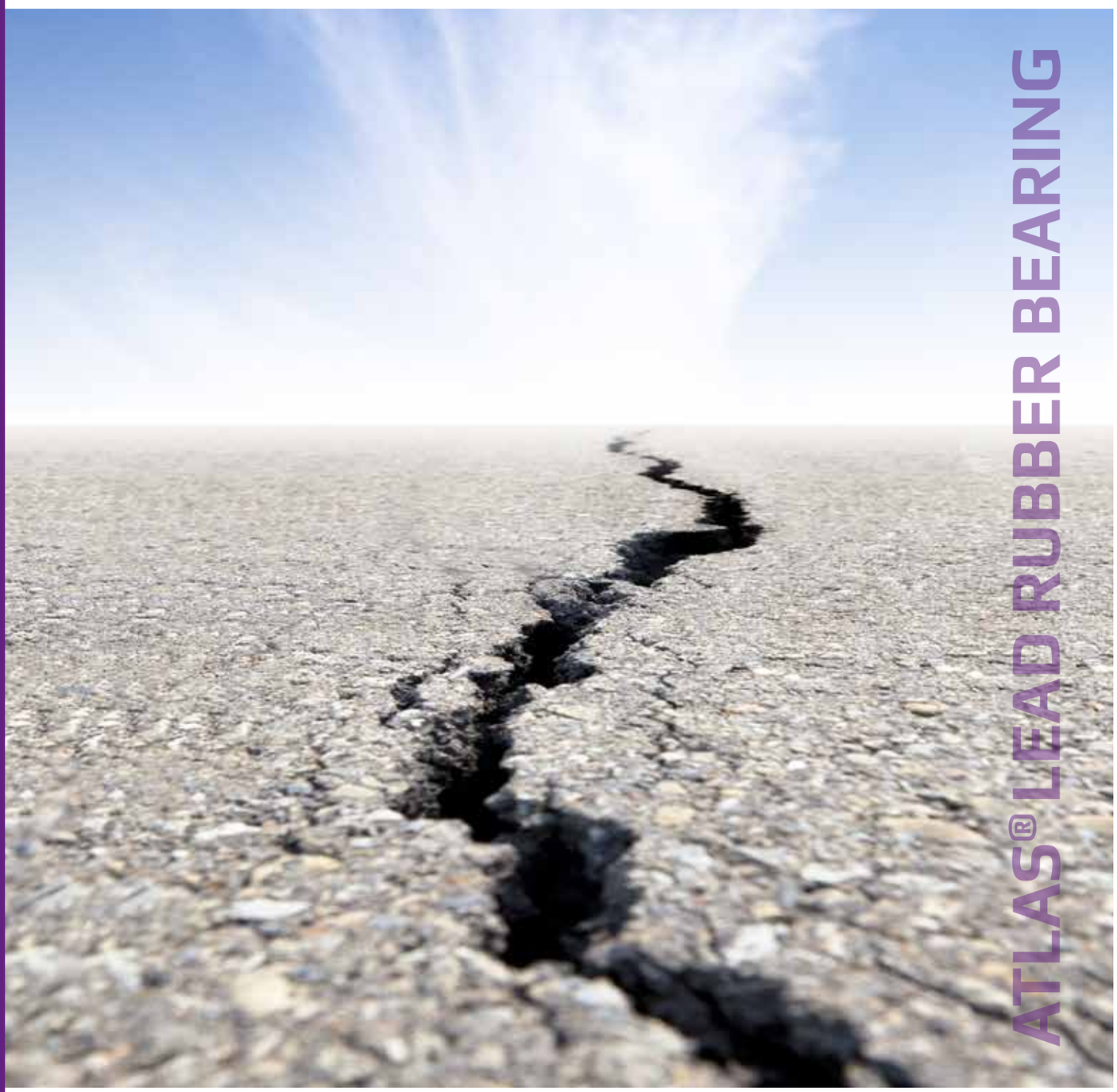
Arsan®

Precise Connections - since 1957



ATLAS® LEAD RUBBER BEARING

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www.arsankaucuk.com.tr

Arsan is a leading manufacturer in Structural/Seismic Bearings, Structural/Seismic Expansion Joints and Pipe/Segment Gaskets Sectors and it continues to grow via its policy focused on continuous improvement since 1957.

Arsan is located in Istanbul Dudullu Industrial Zone, running at 10.000 m2 closed Area which will increase upto 35000 sqm by the end of 2018 via ongoing investment, more than 200 employees are working for Arsan.
60% of its total production is exported and 85% of this turnover is generated from Europe. In addition to these European countries Arsan exports to more than 30 other countries as well.

Arsan is able to develop products according to the drawings and specifications of clients, as well as international standards, thanks to its experienced R&D team. Thus, Arsan is a reliable solution partner of the outperforming construction companies with these capabilities.

Various production methods are used at Arsan such as extrusion, compression and injection. Moulds needed for different products are designed and manufactured in our factory by the talented engineers. Moreover, our laboratory is equipped with testing devices of up to date technology and products are controlled at every stage of production.


Arsan Kauçuk

Arsan ATLAS® LEAD RUBBER BEARING

LRB PRODUCT FEATURES AND PRINCIPLES

Arsan ATLAS® Lead Rubber Bearings are made of rubber with a lead core in order to provide additional stiffness, uniform deformation and additional damping for an adequate level of energy dissipation.

Flexibility

- The period of vibration of the building is lengthened sufficiently to reduce the force response.
- Prevents the occurrence of resonance, which could lead to severe damage or even collapse of a structure.

Energy Dissipation

- Provides an adequate level of energy dissipation in order to control the displacements that could otherwise damage other structural members.

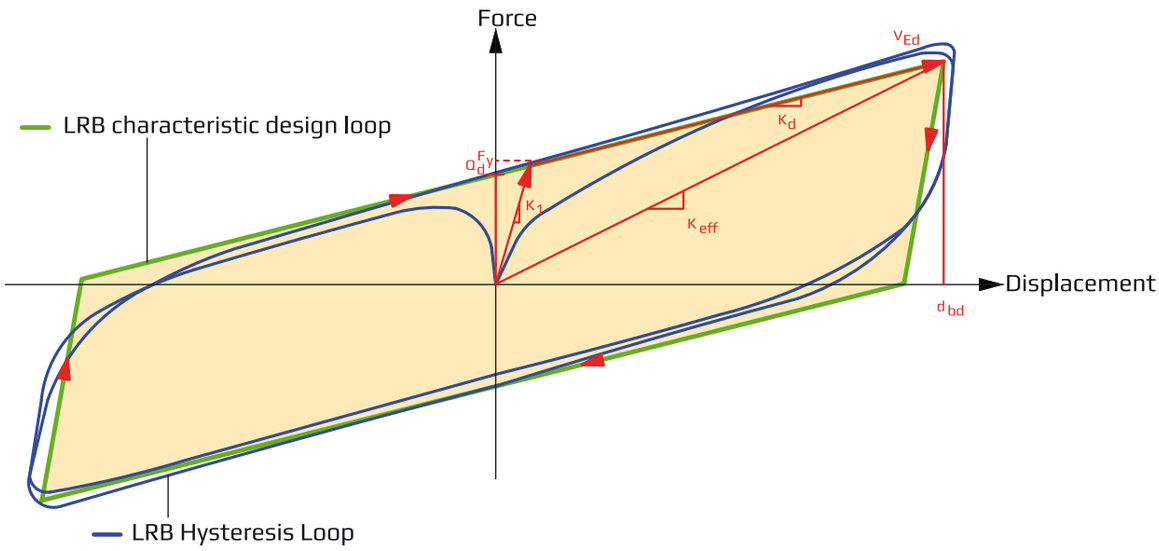
Rigidity for Non-Seismic Loads

- Adequate rigidity for non-seismic loads (e.g. wind and braking) while accommodating thermal, creep, and other shortening effects.

Recentering Capability

- Recentring capabilities after the occurrence of a severe earthquake so that no residual displacements can disrupt the serviceability of the structure.

Deformed shape of LRB during testing



Q_d	=	characteristic strength (after 1 full cycle)	F_y	=	yielding force
K_1	=	lead core stiffness (before 1 full cycle)	V_{Ed}	=	design horizontal force
K_d	=	post- elastic stiffness	d_{bd}	=	design displacement
K_{eff}	=	effective stiffness	Area	=	energy dissipated by cycle

Arsan ATLAS® Lead Rubber Bearings are designed in accordance with seismic isolation principles. Lead core that has sufficient energy dissipation capacity decreases lateral displacement on seismic isolator. LRB has nonlinear force-displacement behavior like hysteretic dampers. As lead core is exposed to shear force causing nonlinear deformation from steel reinforcing layers, it dissipates energy in hysteretic loop after yielding so Arsan ATLAS® LRB achieve an equivalent viscous damping coefficient between %15 and %30.

The amount of dissipated energy by lead rubber bearing is equal to the area under the graph of hystereticloop. For each loop, kinetic energy is dissipated and turns to heat energy. Rubber behaves linear up to strain rate between %100 and %250. Thus, the internal rubber layers provide great flexibility in lateral direction with low shear modulus

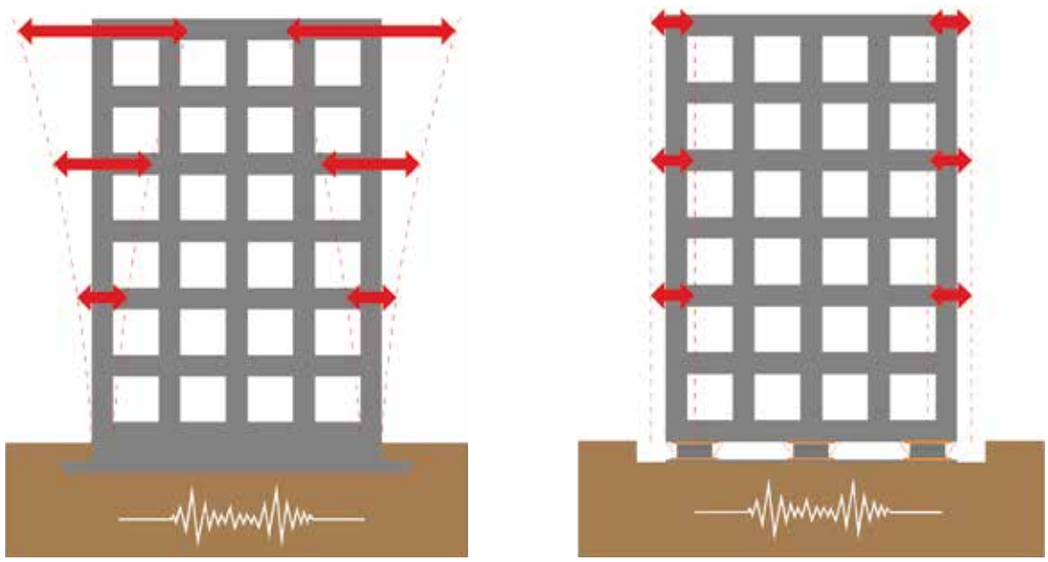
Arsan ATLAS® Lead Rubber Bearing

Packing of ARSAN ATLAS® LRB

SEISMIC ISOLATION AND PURPOSES

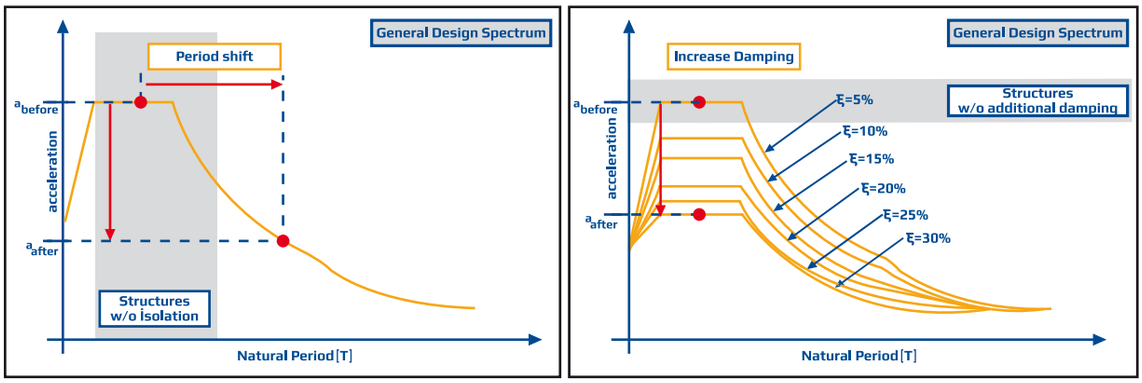
Seismic isolation principle is to isolate the superstructure from substructure with a bearing that vertically stiff but horizontally flexible. This flexibility lengthens the fundamental period of the isolated building and reduces the seismic forces in the superstructure.

When an isolated structure is subjected to an earthquake, the deformation occurs in the isolators rather than the substructure elements. The effects of earthquake forces on the structures can be decreased with this method since seismic isolators dissipate energy to limit relative displacements. In the economic way, that system allows to use smaller sections for structural elements.



Seismic behavior of conventional vs seismic isolated structures

Although the low horizontal stiffness of seismic isolators leads to reduce seismic forces, it may result in larger superstructure displacements but interstory drifts are significantly reduced compared to conventional structures.



Seismic isolation principle – reduction in acceleration with period shift

Increasing natural period of the structure causes the increase in displacements and the effective reduction in floor accelerations. LRB systems have an energy dissipation mechanism to introduce a significant level of damping into the structure to limit displacements to suitable levels.

The system must be sufficiently stiff for structural stability under service conditions such as wind-induced forces, temperature effects, shrinkage and creep effects.

DESIGN CRITERIA

Seismic isolation systems ensure to

- Resist not only seismic conditions but also service conditions including lateral and vertical loads.
- Have adequate flexibility to sustain the required natural period of structure.
- Move to its original position after the earthquake.
- Dissipate energy effectively; otherwise earthquake load effects may exceed ultimate load capacity of structural and nonstructural elements.

DESIGN SPECIFICATIONS

Arsan ATLAS® LRB can be designed according to international specifications for project requirements.

Commonly used specifications are listed below:

- EN 15129 Anti-Seismic Devices with EN 1337 Structural Bearings Standard
- AASHTO Guide Specifications for Seismic Isolation Design
- ASCE 7-16 Minimum Design Loads for Buildings and Other Structures
- Turkish Building Earthquake Code 2018

Northern Marmara Motorway – Part 5

APPLICATION AREAS

Lead rubber bearings are commonly used in buildings and bridges in the world. However, LRB will not be a good solution for the bridges that are going to build on soft soils. For soft soils, increasing the natural period of the structure means amplification in earthquake accelerations.

The all structural system has to work together under seismic action. For example, it is required to use seismic expansion joints for isolated bridges. Mechanical and electrical projects of the structures must be appropriately designed considering large displacements for buildings.

Ulker Sports and Event Hall

MATERIALS

Arsan ATLAS® LRBs are made up of layers of steel laminates and hot-vulcanized rubber with a cylindrical central lead core. Natural rubber enables the structure turns to its original position after earthquake with lateral flexibility and vertical load carrying capacity.

• Shear modulus of rubber used in design generally are given below. Also, different shear modulus can be used for design developing new rubber mixtures for project requirements. Rubber compound with higher values of G up to 1.5 MPa, may be used on request.

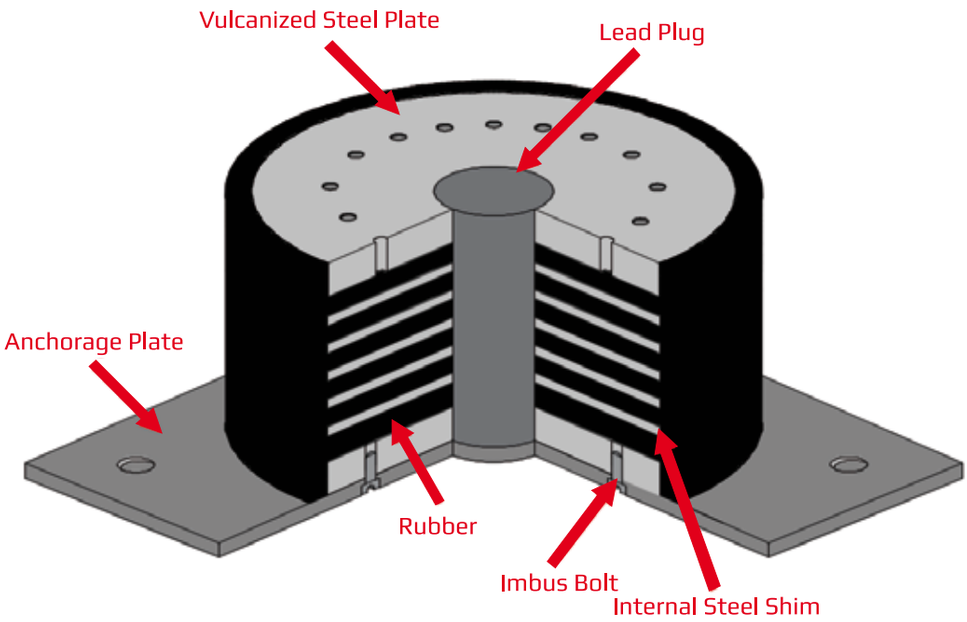
Soft Rubber Compound, G = 0.4 & 0.6 MPa

Medium Rubber Compound, G = 0.6 MPa

Hard Rubber Compound, G = 0.9 MPa

• External steel anchorage plates connect the isolator to the structure and enable to transfer the loads appropriately and allow isolators to be replaced when it is necessary.

• Lead core absorbs energy through plastic deformation of hysteresis damping.



Schematic view of Arsan ATLAS® LRB

Arsan ATLAS® LRB section is designed according to project requirements, general materials used in design are listed below.

- S235 quality internal steel reinforcing layers and hot-vulcanized steel plates are used according to EN 10025.
- Natural rubber, according to EN 1337, is used as a rubber type.
- %99.9 purity of lead is used as specified in EN 15129.
- S355 J2+N quality external anchorage steel plates are used according to EN 10025.

ARSAN dynamic test device

Corrosion Protection

C4 class corrosion protection of Arsan ATLAS® LRB is applied according to EN 12944 based on project requirements. If necessary, C5-M class is used.

Maintenance, Inspection and Installation

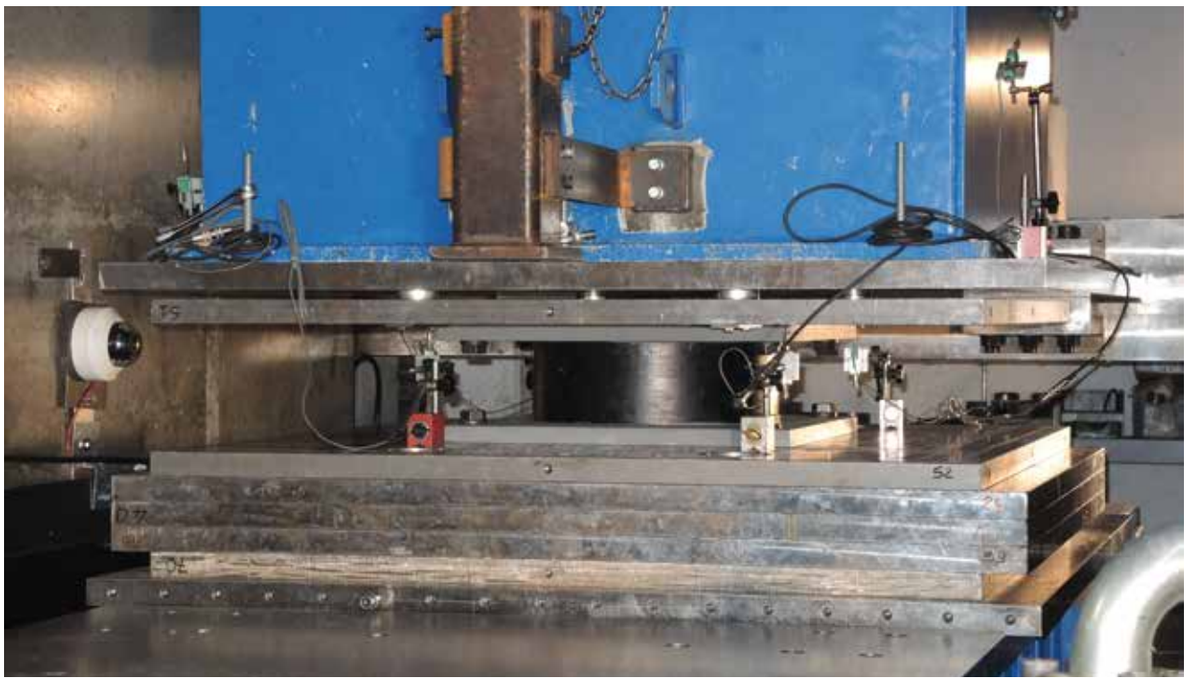
Maintenance and inspection of Arsan ATLAS® LRB are done periodically with customer request. Inspection report is presented to customer for approval.

ARSAN provides consultancy services with experienced engineers for installation of seismic isolators. Therefore, improper and incorrect installations are prevented.

Quality

ARSAN engineers are extremely sensitive during production, post production and field installation due to their qualifications and high-quality understanding.

ARSAN gives great importance to traceability and has gained a new understanding of quality in the sector in accordance with ISO 9001:2008.



Testing of ARSAN ATLAS® LRB

TESTS

ARSAN test laboratory is equipped with to carry out qualification and acceptance tests on LRB.

The factory production control tests are carried out in ARSAN laboratories according to the project requirements specified in the standards or on client request.

The type tests of Arsan ATLAS® LRBs are carried out in 3rd party independent laboratories.

ARSAN dynamic test device

CE Certification

ARSAN produces Lead Rubber Bearing (LRB) with European Conformity (CE) certification obtained from Materials Testing and Research Institute (MPA Karlsruhe). All necessary type testing performed on LRB devices was carried out at independent testing facility and fully supervised by a certified body.

CE certifies that the product meets all the requirements of the relevant European Standard in design and manufacturing of the product.

KIT
Karlsruher Institut für Technologie

MPA
KARLSRUHE
Materialprüfungs- und
Forschungsanstalt

Certificate of constancy of performance

0754 – CPR – 18-0362

In compliance with Regulation (EU) No 305/2011 of the European Parliament and of the Council of 9 March 2011 (the Construction Products Regulation or CPR), this certificate applies to the construction product

Elastomeric Isolators - Lead Rubber Bearings

placed on the market under the name or trade mark of

ARSAN KAUÇUK PLASTİK-MAKİNA SAN. VE TİC. A.Ş.
Yukarı Dudullu Organize Sanayi Bölgesi Nato Yolu No:35
DES Sanayi Sitesi A Kapısı Karşısı
34775 Ümraniye – Istanbul, Turkey

and produced in the manufacturing plant

Yukarı Dudullu Organize Sanayi Bölgesi Nato Yolu No:35
DES Sanayi Sitesi A Kapısı Karşısı
34775 Ümraniye – Istanbul, Turkey

This certificate attests that all provisions concerning the assessment and verification of constancy of performance described in Annex ZA of the standard

EN 15129:2018

under system 1 for the performances set out in this certificate are applied and that the factory production control conducted by the manufacturer is assessed to ensure the constancy of performance of the construction product.

This certificate was first issued on 2018-07-02 and will remain valid as long as neither the harmonised standard, the construction product, the AVCP methods nor the manufacturing conditions in the plant are modified significantly, unless suspended or withdrawn by the notified product certification body.

Karlsruhe, 2018-07-02

Dipl.-Ing. O.Rösch
The Head of the notified certification body

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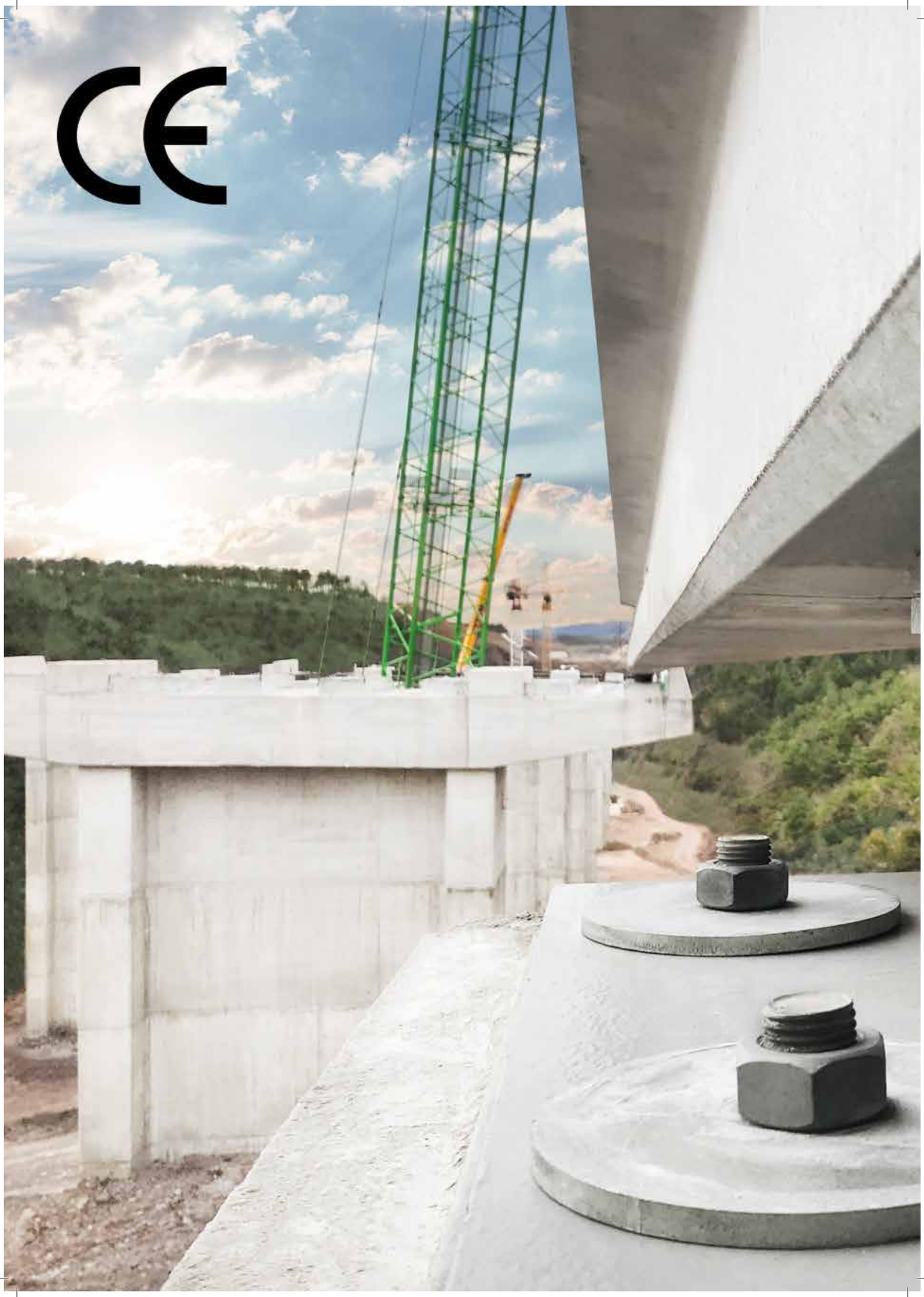
CE


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