International Standard

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# Railway applications — Suspension components — Rubber diaphragms for pneumatic suspension springs

*Applications ferroviaires — Pièces de suspension — Membranes à base d'élastomère pour ressorts pneumatiques de suspension*

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# Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 269, *Railway applications*, Subcommittee SC 2, *Rolling stock*.

Any feedback or questions on this document should be directed to the user’s national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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# Introduction

This document is based on EN 13597:2003.

Designing a suspension diaphragm requires knowledge of the mechanical system of which it forms part. Specific characteristics are therefore needed for each case, which only the customer can specify.

The requirements of this document are intended to be implemented in conjunction with the conditions for the supply of air spring suspension diaphragms.

This document is the result of studies and research to improve the performance and quality of rubber diaphragms for pneumatic suspension springs in order to meet the requirements of railway rolling stock.

This document is designed for involved parties such as railway operators, manufacturers and equipment suppliers of the railway industry as well as for suppliers of rubber diaphragms for pneumatic suspension springs.

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# Railway applications — Suspension components — Rubber diaphragms for pneumatic suspension springs

## 1 Scope

This document specifies the characteristics for suspension diaphragms to achieve, together with applicable inspection and test methods to be carried out for verification.

An air spring system usually consists of a diaphragm (subject of this document) and additional components such as either emergency or additional springs, or both, and other assembly parts. This document does not detail the other components of air suspension or control systems such as air reservoirs, air piping, levelling system, frames, stiffeners, emergency suspension systems or elastic supports (such as series springs), etc., which will affect the diaphragm performance.

This document applies to suspension diaphragms (inflated with air) designed to be fitted on railway vehicles and similar vehicles running on dedicated tracks with permanent guide systems, whatever the type of rail and the running surface. These parts are typically made with elastomer, textile fabrics and metallic beads.

## 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 36, *Rubber, vulcanized or thermoplastic — Determination of adhesion to textile fabrics*

ISO 48-2, *Rubber, vulcanized or thermoplastic — Determination of hardness — Part 2: Hardness between 10 IRHD and 100 IRHD*

ISO 48-4, *Rubber, vulcanized or thermoplastic — Determination of hardness — Part 4: Indentation hardness by durometer method (Shore hardness)*

ISO 1431-1, *Rubber, vulcanized or thermoplastic — Resistance to ozone cracking — Part 1: Static and dynamic strain testing*

ISO 1817, *Rubber, vulcanized or thermoplastic — Determination of the effect of liquids*

ISO 2781, *Rubber, vulcanized or thermoplastic — Determination of density*

ISO 4649, *Rubber, vulcanized or thermoplastic — Determination of abrasion resistance using a rotating cylindrical drum device*

ISO 23529, *Rubber — General procedures for preparing and conditioning test pieces for physical test methods*

ISO 24087:2023, *Rubber, vulcanized — Determination of the glass transition temperature and enthalpy by differential scanning calorimetry*

ISO 80000-3, *Quantities and units — Part 3: Space and time*

ISO 80000-4, *Quantities and units — Part 4: Mechanics*

## 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

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ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

**3.1**
**diaphragm**
finished product, comprising rubber, *carcass* (3.4) and *beads* (3.3) for use as part of pneumatic suspension system

Note 1 to entry: The diaphragm is also known as air bellows, air bag, cushion and membrane.

Note 2 to entry: Different types of diaphragm are illustrated in Annex A.

**3.1.1**
**new diaphragm**
diaphragm in new condition and never yet used

**3.1.2**
**used diaphragm**
diaphragm which has been submitted to a fatigue test, and has, as a result, changed dimensionally

**3.2**
**outer layer of diaphragm**
rubber layer located on the outside of the *carcass* (3.4), which is generally responsible for protecting the carcass from external factors

Note 1 to entry: Different parts of a diaphragm are exemplified in Figure 1.

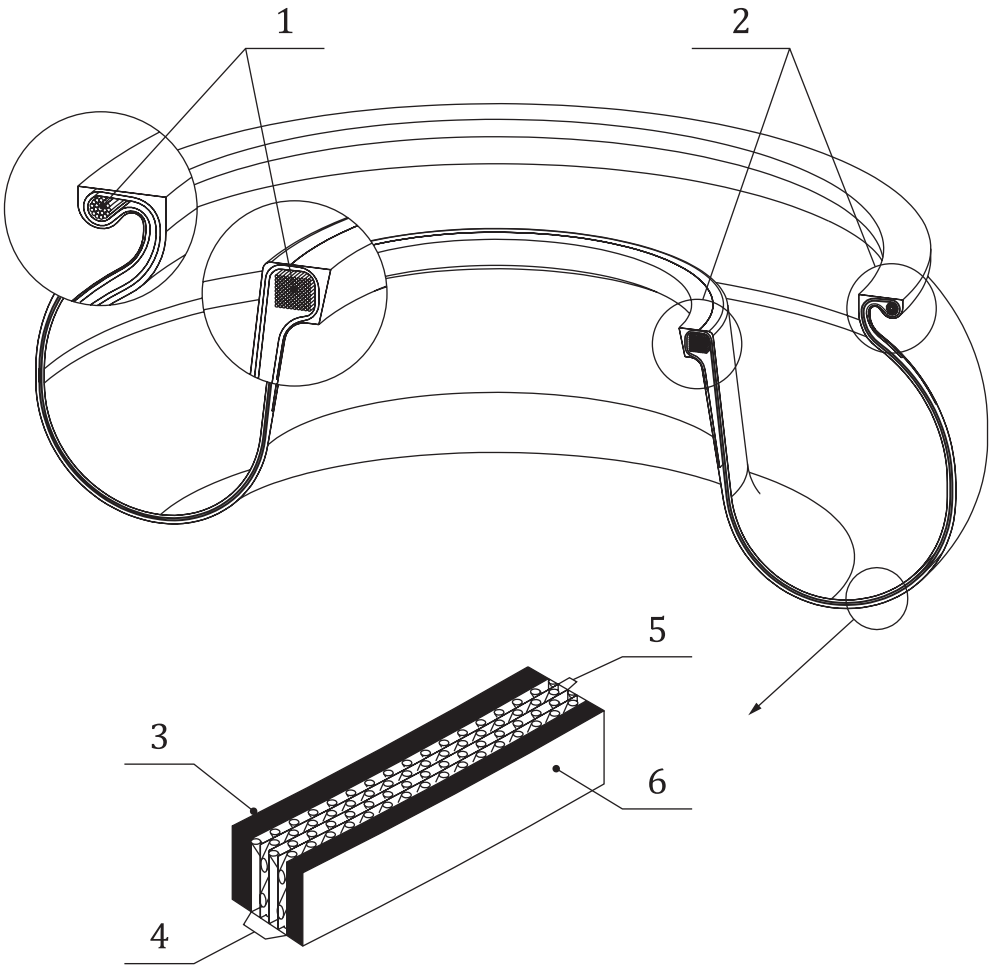
**3.3**
**bead**
end feature of the *diaphragm* (3.1) which enables it to be secured and sealed to the surrounding structure

Note 1 to entry: A diaphragm has two beads.

**3.4**
**carcass**
structure of reinforcing material, typically consisting of strong fabric plies arranged crosswise, embedded in the elastomer for flexible force transmission

**3.5**
**fabric**
textile yarns typically made of polymeric material

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**Key**

| | |
|---|---|
| 1 | bead cores |
| 2 | beads |
| 3 | inner layer of diaphragm |
| 4 | carcass |
| 5 | ply |
| 6 | outer layer of diaphragm |

**Figure 1 — Different parts of a diaphragm**

## 4 Symbols

The units presented in ISO 80000-3 and ISO 80000-4 shall be used for the symbols in Table 1.

Decimal multiples and submultiples of units defined in Table 1 can be used.

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