International Standard 4635

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION•МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ•ORGANISATION INTERNATIONALE DE NORMALISATION

Rubber, vulcanized — Preformed compression seals for use between concrete motorway paving sections — Specification for material

Caoutchouc vulcanisé — Joints de compression préformés utilisés entre les dalles d'autoroute en béton — Spécifications pour le matériau

First edition — 1982-12-01

UDC 678.4.06 : 625.848 **Ref. No. ISO 4635-1982 (E)**

Descriptors : rubber, vulcanized rubber, rubber products, roads, paving, seals, material specifications.

Price based on 3 pages

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO member bodies). The work of developing International Standards is carried out through ISO technical committees. Every member body interested in a subject for which a technical committee has been set up has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 4635 was developed by Technical Committee ISO/TC 45, *Rubber and rubber products*, and was circulated to the member bodies in August 1980.

It has been approved by the member bodies of the following countries :

Australia	France	South Africa, Rep. of
Austria	Hungary	Spain
Belgium	India	Sweden
Brazil	Korea, Rep. of	Turkey
Canada	Malaysia	USA
China	Poland	USSR
Czechoslovakia	Portugal	
Egypt, Arab Rep. of	Romania	

The member bodies of the following countries expressed disapproval of the document on technical grounds :

Netherlands
Switzerland
United Kingdom

Printed in Switzerland

Rubber, vulcanized — Preformed compression seals for use between concrete motorway paving sections — Specification for material

1 Scope and field of application

This International Standard specifies requirements for material for pre-formed vulcanized rubber seals used between concrete motorway paving sections. It does not cover design or dimensions of seals, but tolerances of the seals should be described in accordance with ISO 3302.

NOTE — This International Standard is based on experience with chloroprene rubber. Work is in progress to take account of material development in this field. (See second footnote to the table of requirements.)

2 References

ISO 37, *Rubber, vulcanized — Determination of tensile stress-strain properties.*

ISO 48, *Vulcanized rubbers — Determination of hardness (Hardness between* 30 *and* 85 IRHD*).*

ISO 188, *Rubber, vulcanized — Accelerated ageing or heat-resistance tests.*

ISO 471, *Rubber — Standard temperatures, humidities and times for the conditioning and testing of test pieces.*

ISO 815, *Rubber, vulcanized — Determination of compression set under constant deflection at normal and high temperatures.*

ISO 1431/1, *Rubber, vulcanized — Resistance to ozone cracking — Part 1 : Static strain test.*

ISO 1817, *Vulcanized rubbers — Resistance to liquids — Methods of test.*

ISO 3302, *Rubber — Dimensional tolerances of solid moulded and extruded products.*

ISO 3387, *Rubbers — Determination of crystallization effects by hardness measurements.*

ISO 4661, *Rubber — Preparation of test pieces.*

3 Materials and workmanship

3.1 All materials and workmanship shall be in accordance with good commercial practice.

3.2 The materials for the seals shall be made from an ozone-resistant rubber and shall not depend for ozone resistance solely on surface protection which can be removed by abrasion, detergents or other means.

3.3 When examined visually, the joints shall be free from porosity, significant surface defects and irregular dimensions, particularly on the sealing surfaces.

3.4 The material shall be black.

4 Test pieces

Test pieces shall be cut from finished products in accordance with ISO 4661.

If the test pieces specified in a particular test method cannot be prepared from the finished products, they shall be taken from moulded test slabs of suitable dimensions, made from the same batch of material as used for the product, and vulcanized under conditions which are comparable with the conditions used in production.

5 Requirements

5.1 Hardness

When determined in accordance with the method specified in ISO 48, the hardness shall comply with the requirements of the table.

5.2 Tensile strength and elongation at break

When determined in accordance with the method specified in ISO 37, using preferably a type 2 dumb-bell test piece, the tensile strength and elongation at break shall comply with the requirements of the table.

5.3 Compression set

When determined in accordance with the method specified in ISO 815 and using the small test piece, the compression set after 24 $^{0}_{2}$ h at 100 °C shall comply with the requirements of the table.

5.4 Accelerated ageing

After ageing test pieces in air for 72 $_{-2}^{0}$ h at 100 °C by the method specified in ISO 188, the change in hardness, tensile strength and elongation at break shall comply with the requirements of the table.

5.5 Ozone resistance

When tested in accordance with the method specified in ISO 1431/1, test pieces shall show no cracks after 96 h at 40 °C, under 20 % elongation, and at an ozone concentration of either (0,5 ± 0,05) × 10^{-6} (V/V) (50 pphm) or (2,0 ± 0,2) × 10^{-6} (V/V) (200 pphm) as agreed by the parties concerned.

NOTE — The ozone concentration of 200 pphm is intended for seals used in those regions where there is a high atmospheric ozone concentration due to pollution and other environmental factors.

5.6 Low temperature hardness change

When determined in accordance with the method specified in ISO 3387, the increase in hardness, after 7 days at − 10 °C, above the initial hardness at − 10 °C shall comply with the requirements of the table.

5.7 Change in volume after immersion in water

When determined in accordance with the method specified in ISO 1817, the change in volume after immersion in water for 7 days at standard laboratory temperature shall comply with the requirements of the table.

5.8 Recovery test on finished seals

When determined in accordance with the method specified in the annex, the recovery under 50 % deflection after 72 $_{-2}^{0}$ h at − 10 °C, 24 $_{-2}^{0}$ h at − 25 °C and 72 $_{-2}^{0}$ h at 100 °C shall comply with the requirements of the table.

Table — Requirements

Property	Units	Requirements			
Nominal hardness	IRHD	55	60	65	70
Tolerance on nominal hardness	IRHD	± 5	± 5	± 5	± 5
Tensile strength, min.	MPa	12		12	
Elongation at break, min.	%	250		200	
Compression set, after 24 $_{-2}^{0}$ h at 100 °C, max.	%	40		40	
Ageing resistance : maximum change from unaged values after ageing for 72 $_{-2}^{0}$ h at 100 °C :					
— hardness	IRHD	0 to + 12		0 to + 12	
— tensile strength	%	− 20		− 20	
— elongation at break	%	− 25		− 25	
Ozone resistance, under 20 % elongation, for 96 h at 40 °C					
— normal conditions; 50 pphm ozone		No cracking		No cracking	
— severe conditions; 200 pphm ozone		No cracking		No cracking	
Hardness increase, after 7 days at − 10 °C, max.*	IRHD	15		10	
Change in volume after immersion in water, for 7 days at standard laboratory temperature, max.	%	0 to + 5		0 to + 5	
Recovery of finished seal,** under 50 % deflection :					
— after 72 $_{-2}^{0}$ h at − 10 °C, min.*	%	88		88	
— after 24 $_{-2}^{0}$ h at − 25 °C, min.*	%	83		83	
— after 72 $_{-2}^{0}$ h at 100 °C, min.	%	85		85	

* These low temperature tests are optional in the case of usage in tropical countries.

** These limits are based on experience with chloroprene rubber. They may not be suitable for other polymers in use. For these, the limits shall be agreed between the interested parties.

Annex

Determination of recovery

A.1 Principle

Determination of the ability of pre-formed seals to recover after being compressed under specified conditions.

A.2 Test pieces

Test pieces of length of 125 mm shall be cut from the finished seal. Each test piece shall be used once only. When making tests at low temperatures, the test pieces may be lightly dusted with talc.

A.3 Procedure

Carry out the test in accordance with ISO 815, but with the following additions.

A.3.1 Measure the width in the middle of the test piece with the pressure foot well centred on the top longitudinal edge and the place of measuring marked on the test piece so that measurement before and after compression is made at the identical position.

A.3.2 Prior to compression, place the test piece in a horizontal position such that the plane through both edges of the top surface of the seal is perpendicular to the compression plates. As the test piece is being compressed, the top surface of the seal should fold inward towards the centre of the test piece. Compress to 50 % of the original width.

A.3.3 For tests at − 10 °C, place a clamp assembly containing the compressed test piece in a refrigerated box and maintain it at a temperature of − 10 °C for 72 $^{0}_{-2}$ h. Then unclamp the test piece and allow it to recover for 1 h at − 10 °C. Measure the recovered width.

A.3.4 For tests at − 25 °C, place a clamp assembly containing the compressed test piece in a refrigerated box and maintain it at a temperature of − 25 °C for 24 $^{0}_{-2}$ h. Then unclamp the test piece and allow it to recover for 1 h at − 25 °C. Measure the recovered width.

A.3.5 For tests at 100 °C, place a clamp assembly containing the compressed test piece in an oven and maintain it at a temperature of 100 °C for 72 $^{0}_{-2}$ h. Do not preheat the clamp assembly. Unclamp the test piece and allow to cool at the standard laboratory temperature (see ISO 471) on a wooden surface for 1 h. Measure the recovered width.

A.4 Calculation

Calculate the test piece recovery R, expressed as a percentage, by the formula

$$R = \frac{w_2}{w_1} \times 100$$

where

w_1 is the original width;

w_2 is the recovered width.

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