

1 - PURPOSE

1.1 - Type of parts

This specification defines the technical characteristics of elastomer parts for automatic coupler connections.

1.2 - Classification

The elastomer parts are classified in three categories, according to their hardness:

- Extremely flexible: Index ES; (60 ± 5) IRHD hardness.
- Flexible: Index S; (70 ± 5) IRHD hardness.
- Hard: Index F; (80 ± 5) IRHD hardness.

1.3 - Reference documents

Reference is made in this specification to the following documents:

- ISO/R 37: Rubber, vulcanized - Determination of tensile stress-strain properties.
- ISO/R 48: Vulcanized rubbers - Determination of hardness.

- ISO/R 188: Rubber, vulcanized - Accelerated ageing or heat-resistance tests.
- ISO/R 471: Standard atmospheres for the conditioning and testing of rubber test pieces.
- ISO/R 812: Method of test for temperature limit of brittleness for vulcanized rubbers.
- ISO/R 815: Vulcanized rubbers - Determination of compression set under constant deflection at normal and high temperatures.
- ISO/R 1431: Vulcanized rubbers - Determination of resistance to ozone cracking under static conditions.
- ISO/R 1767: Vulcanized rubbers - Determination of rebound resilience - LÜPKE pendulum method.
- ISO/R 1817: Vulcanized rubbers - Resistance to liquids - Methods of test.
- ISO 2286: Vulcanized rubbers - Determination of tension set under constant elongation at normal and high temperatures.
- ISO 3302: Rubber - Dimensional tolerances of solid moulded and extruded products.

2 - PROPERTIES

2.1 - Construction materials

No specific conditions are stipulated concerning the basic materials which constitute the compounds from which elastomer parts are manufactured, providing the properties listed below with reference to finished products are complied with.

2.2 - Properties of the material

2.2.1 - Appearance

The surface of elastomer parts must be smooth and free from splits, pits, bubbles and burrs. There must be no exudation, bloom or cracks in the joints.

The edges must be clean and totally clear of burrs.

The parts must have a compact and uniform texture.

2.2.2 - Dimensional properties

The dimensions of elastomer parts must be in accordance with those stipulated in the order or its appended documents.

Failing any indication on these documents, the tolerances below must be complied with, in accordance with ISO Standard 3302.

- Moulded elastomer parts

- thickness: ± 0.2 mm;
- length, width or external diameter: ± 0.5 mm;
- internal diameter: ± 0.35 mm;
- variation in thickness of any one part: ± 0.2 mm.

2.2.3 - Mechanical and physical properties

2.2.3.1 - Hardness

The hardness of the parts in delivery condition must comply, according to their category, with the indications in § 1.2 or in the documents appended to the order, with a tolerance of ± 5 degrees IRHD.

Variations in the hardness of the parts in delivery condition and following exposure to heat (7 days at 85° C) must not exceed ± 5 degrees.

2.2.3.2 - Ultimate tensile strength and corresponding relative elongation

Unless otherwise stated in the order or its appended documents, the ultimate tensile strength and the corresponding relative elongation must meet the following values, according to the category of the parts:

	ES index	S index	F index
Minimum ultimate strength (in N/mm ²)	10	12	13
Minimum tensile elongation (in %)	300	200	150

In all cases, variations in the ultimate strength of parts following exposure to heat (7 days at 85° C) must not exceed 15% of the value obtained for parts in delivery condition, and variations in

elongation at rupture must remain between + 15 % and - 30 % of the value obtained for parts in delivery condition.

2.2.3.3 - Compression or traction set under constant deflection

Where the dimensions of the parts make it possible, permanent set after compression, under constant deflection of 25% for 24 hours at 100° C, must at most equal 25% for ES parts and 20% for S and F parts.

In all other cases, permanent set is measured after traction under constant elongation of 50% for 24 hours at 100° C.

This permanent set must at most equal 15% for ES parts and 10% for S and F parts.

2.2.3.4 - Unit load under constant elongation

The unit load under constant elongation of 100% must at least equal the following values, according to category:

	Category ES	Category S	Category F
Unit load under 100% elongation	2 N/mm ²	3 N/mm ²	6 N/mm ²

2.2.3.5 - Resistance to oil

- Parts with very high resistance to oil (1)

- Variations in mass following immersion in No. 2 oil at 70° C for 70 hours must not exceed ± 5%.

- Other parts

- Variations in mass following immersion in No. 2 oil at 70° C for 70 hours must not exceed ± 10%.

2.2.3.6 - Resistance to cold

All elastomer parts must have a sufficient degree of flexibility so that, after undergoing the test described in § 4.4.9 at a temperature of - 40° C, no fractures, faults, cracks or perforations become visible to the naked eye.

2.2.3.7 - Resistance to ozone (2)

Elastomer parts must show no cracks after exposure to an ozone concentration of 200 ppHM for 24 hours under 20% elongation at a temperature of 30° C ± 2° C.

(1) Parts permanently in contact with oil or grease.

(2) This property is not demanded of parts with very high resistance to oil.

2.2.3.8 - Rebound resilience (for stops only)

Rebound resilience, measured according to the instructions in ISO Recommendation 1767, must at most equal 60% for categories ES, S and F.

2.2.4 - Manufacturers' markings

Wherever possible, the markings stipulated in the working documents, and in particular the following, must be embossed on all parts, but in the case of seals not on contact surfaces:

- the manufacturer's reference
- the date of manufacture (last two digits of year)
- the part number
- the category index

Moulded items whose dimensions are too small for markings, or extruded, trimmed items must be packed in batches of a maximum of 200 of the same type, category and manufacturing series, and the package labelled with the markings listed above.

3 - MANUFACTURE

3.1 - Preparation of the material

No specific conditions are stipulated for the preparation of elastomers to be used in the manufacture of parts for the automatic

coupler, providing the finished product meets the above requirements.

3.2 - Manufacture of parts

Unless specific instructions are given in the order or its appended documents, elastomer parts must be moulded.

3.3 - Retouching

Any retouching intended to hide a defect which may impair normal working is strictly forbidden.

4 - INSPECTION

4.1 - Presentation

4.1.1 - Condition of the parts on presentation

Elastomer parts shall be presented in delivery condition.

4.1.2 - Batches

A batch comprises parts of the same type, category and manufacturing series which are presented at the same time.

4.1.3 - Advice of presentation

The representative of the purchasing Railway must be advised of the date of presentation by written note, signed by the Director of the factory or his authorised representative. This note must indicate:

- the date of presentation;
- the order references,
- the composition of the batches presented, stating for each batch:
 - the quantity,
 - the type,
 - the category of the parts presented.

4.2 - Type and number of checks and tests

Elastomer parts shall be subjected to the following tests and checks:

Batch size	Test series No.
up to 1 000 parts	1
1 001 - 3 000 parts	2
3 001 - 10 000 parts	3
over 10 000 parts	4

Type of checks and tests	Specification §	Test standard	Minimum number of test pieces per series of tests	Shape and dimensions of test pieces
Size and appearance	4.4.1 4.4.2		At the discretion of the receiving agent, minimum of 1	Actual parts
Hardness: - in delivery condition - after exposure to heat 17 days at 85° C	4.4.3	ISO 48 + ISO/R 188	2 2	Actual parts or test pieces over 4 mm thick
Check on ultimate strength and corresponding relative elongation: - in delivery condition - after exposure to heat 17 days at 85° C	4.4.4	ISO/R 37 + ISO/R 163	3 3	H2 or H3 dumb-bell shaped test pieces for small parts, in accordance with ISO Recommendation 37
Check on unit load under constant elongation: - in delivery condition	4.4.5	ISO/R 37	3	H2 or H3 dumb-bell shaped test pieces for small parts, in accordance with ISO Recommendation 37
Check on tensile set - in delivery condition	4.4.6	ISO 2285	3	H2 or H3 dumb-bell shaped test pieces for small parts, in accordance with ISO Recommendation 37

Check on compression sets in delivery condition	4.4.7	ISO/815	3	Disc-shaped test piece, 29.0 ± 0.5 mm diameter, 12.5 ± 0.5 mm thickness, disc-shaped test piece, 13.0 ± 0.5 mm diameter, 6.3 ± 0.3 mm thickness.
Check on resistance to oil	4.4.8	ISO/1817	3	Test piece of $1 - 3$ cm ³ volume and uniform thickness of 2 ± 0.2 mm.
Check on resistance to cold	4.4.9	ISO/R 812	4 for type A test pieces 10 for type B test pieces	either - type A test piece, strip 6.35 ± 0.5 mm wide, 2 ± 0.2 mm thick, free part 25 ± 5 mm; minimum width of clamp 6 mm or - type B test piece, free part in form of a strip 25 ± 5 mm long, 2.5 ± 0.2 mm wide, 2.0 ± 0.2 mm thick, with square head 6.5 ± 0.5 mm, according to the shape and dimensions of the part
Check on resistance to ozone cracking: - in delivery condition	4.4.10	ISO/1434	3	H2 or H3 dumb-bell shaped test piece for small parts, in accordance with ISO Recommendation 37
Check on rebound resistance	4.4.11	ISO/R 1767	2	Disc-shaped test piece, 12.5 ± 0.5 mm thickness, 20.0 ± 0.5 mm diameter

4.3 - Selection and preparation of samples and test pieces

The checks and tests listed in this specification shall be carried out on each batch presented.

The representative of the purchasing Railway shall select the parts to be checked and tested at random from each batch submitted and mark them indelibly.

4.3.1 - Selection

The same test pieces shall be used for tests in delivery condition and for the corresponding tests after ageing.

However, where the shape and dimensions of parts are such that it is not possible to select test pieces of specific dimensions, and only then:

- several test pieces (maximum of 3) may be superimposed to obtain the thickness required for checking the hardness and compression set;
- the mass of the parts themselves may be varied following immersion in oil.

Where the dimensions and shape of certain parts are such that it is not possible to select specific test pieces, checks on hardness and resistance to oil only shall be carried out.

The thickness of test pieces shall be measured using a push-button micrometer with a dial which exerts a pressure of 0.2 bar.

4.3.2 - Ageing of test pieces

H2 and H3 dumb-bell shaped test pieces shall be used for the tests of small parts, in accordance with the instructions of ISO Recommendation R 37, and as laid down in paragraphs 4.4.3 and 4.4.4 (following ageing by heat for 7 days at 85° C in compliance with the instructions of ISO Recommendation 188).

If the test pieces are too thick, they must be reduced to the specific thickness by grinding or by an appropriate method which avoids heating.

4.3.3 - Processing of test pieces

Processing of all test pieces shall be carried out at 23° C and 50% relative humidity for 24 hours, in accordance with the instructions of ISO Recommendation 471.

4.4 - Check and test procedure

4.4.1 - Appearance check

The conditions described under paragraph 2.2.1 shall be respected.

4.4.2 - Dimension check

The dimensions of elastomer parts shall be measured with the usual instruments appropriate to the size of the parts and degree of accuracy required.

4.4.3 - Hardness check

This check shall be carried out in accordance with the instructions in ISO Recommendation 48 both on test pieces in delivery condition and after ageing.

The results required are indicated in paragraph 2.2.3.1.

4.4.4 - Check on ultimate tensile strength and corresponding relative elongation

This test shall be carried out both on test pieces in delivery condition and after ageing, according to the instructions in paragraph 4.3.2, and in compliance with ISO Recommendation 37.

The results required are indicated in paragraph 2.2.3.2.

4.4.5 - Check on the unit load under 100% elongation

This test shall be carried out on test pieces in delivery condition, in accordance with ISO Recommendation 37.

The results required are indicated in paragraph 2.2.3.4.

4.4.6 - *Check on traction set under constant deflection of 50%*

This check shall be carried out on test pieces in delivery condition, in accordance with ISO Standard 2285.

The results required are indicated in paragraph 2.2.3.3.

4.4.7 - *Check on compression set under constant deflection of 25%*

This check shall be carried out on test pieces in delivery condition, in accordance with ISO Standard 815.

The results required are indicated in paragraph 2.2.2.3.

4.4.8 - *Check on resistance to oil*

This check shall be carried out on test pieces in delivery condition, in accordance with ISO Recommendation 181.

The results required are indicated in paragraph 2.2.3.5.

4.4.9 - *Check on resistance to cold*

This check shall be carried out on test pieces in delivery condition, in accordance with ISO Recommendation 812.

The results required are indicated in paragraph 2.2.3.6.

4.4.10 - *Check on resistance to ozone cracking under static conditions.*

This test shall be carried out in accordance with ISO Standard 1431. The test pieces shall be examined under tension with a 7 X magnifying glass.

The results required are indicated in paragraph 2.2.3.7.

4.4.11 - *Rebound resilience check*

This check shall be carried out on test pieces in delivery condition, in accordance with the instructions in ISO Recommendation 1767.

The test report must refer to all the characteristics specified in paragraph 9 of ISO Recommendation 1767.

The results required are indicated in paragraph 2.2.3.8.

4.5 - **Conclusion of the inspections.**

Any result in a series of tests which does not comply with the stipulated conditions shall result in rejection of the batch in question.

Further tests may be carried out at the supplier's request only with the prior agreement of the purchasing Railway.

5 - DELIVERY

5.1 - Packaging

The various elastomer-based parts shall be delivered in appropriate packaging, which affords protection against damage during transport.

APPLICATION

All Railways in the Union.

RECORD REFERENCES

Heading under which the question has been dealt with:

- *Question 5/S/28* - Automatic Coupling

Determination of technical specifications for the supply of elastomers and slide bars for the automatic coupler.

(Specifications Sub-Committee: Paris, January 1977).