

UIC Code

8 3 1

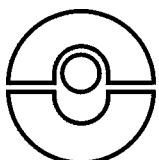
R

3rd edition, December 2001

Translation

Technical specification for the supply of elastomer packing rings for brake cylinder pistons

*Spécification technique pour la fourniture de garnitures en élastomère pour
pistons de cylindres de frein
Technische Lieferbedingungen für Elastomer-Bremszylinderkolbenstulpen*



*Union Internationale des Chemins de fer
Internationaler Eisenbahnverband
International Union of Railways*

UIC



Leaflet to be classified in Sections :

V - Transport stock

VI - Traction

VIII - Technical specifications

Application :

With effect from 1st July 1980

All members of the International Union of Railways

Record of update :

2nd edition, July 1980

3rd edition, December 2001

Retyped in FrameMaker avec incorporation du corrigendum du
01.06.1982

The person responsible for this leaflet is named in the UIC Code



Warning

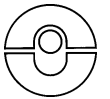
No part of this publication may be copied, reproduced or distributed by any means whatsoever, including electronic, except for private and individual use, without the express permission of the International Union of Railways (UIC). The same applies for translation, adaptation or transformation, arrangement or reproduction by any method or procedure whatsoever. The sole exceptions - noting the author's name and the source - are "analyses and brief quotations justified by the critical, argumentative, educational, scientific or informative nature of the publication into which they are incorporated"

(Articles L 122-4 and L122-5 of the French Intellectual Property Code).

© International Union of Railways (UIC) - Paris, 2001

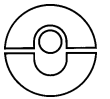
Printed by the International Union of Railways (UIC)
16, rue Jean Rey 75015 Paris - France, December 2001
Dépôt Légal December 2001

ISBN 2-7461-0289-7 (French version)
ISBN 2-7461-0290-0 (German version)
ISBN 2-7461-0291-9 (English version)

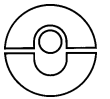


Contents

Summary	1
1 - Scope	2
1.1 - Type of parts.....	2
1.2 - Classification.....	2
1.3 - Reference documents.....	2
2 - Characteristics	3
2.1 - Component materials.....	3
2.2 - Physical characteristics	3
2.2.1 - Appearance.....	3
2.2.2 - Geometrical characteristics.....	3
2.2.3 - Mechanical characteristics	3
2.2.4 - Marks	4
3 - Manufacture.....	5
3.1 - Preparation of the material	5
3.2 - Manufacture of the packing rings.....	5
3.3 - Retouching, if any	5
4 - Inspection	6
4.1 - Submission for acceptance.....	6
4.1.1 - Condition of packing rings on submission.....	6
4.1.2 - Grouping into batches.....	6
4.1.3 - Advice of submission	6
4.2 - Type and extent of checks and tests	6
4.3 - Method of selection and preparation of samples and test pieces.....	8
4.3.1 - Selection	8
4.3.2 - Processing of test pieces	8
4.4 - Check and test procedure.....	8
4.4.1 - Appearance check	8
4.4.2 - Dimensions check.....	9
4.4.3 - Hardness check	9

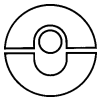


4.4.4 - Check of unit load variation under constant elongation of 100%	9
4.4.5 - Check of deformation resulting from compression under constant deformation of 25%.....	9
4.4.6 - Check of deformation resulting from tension under constant elongation of 50%	10
4.4.7 - Check of non-brittleness when cold	11
4.4.8 - Tests of resistance to oils	11
4.4.9 - Check of resistance to tearing	11
4.4.10 - Check of resistance to abrasion.....	11
4.5 - Conclusion of the inspections	12
5 - Delivery	13
6 - Guarantee	14
Appendix A - Test for resistance to tearing test piece.....	15
Bibliography	16



Summary

The present leaflet defines the technical characteristics of elastomer packing rings for brake cylinder pistons of railway vehicles.



1 - Scope

1.1 - Type of parts

This specification defines the technical characteristics of elastomer packing rings for brake cylinder pistons of tractive and hauled stock.

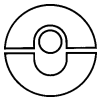
1.2 - Classification

One category only.

1.3 - Reference documents

Reference is made, in this specification, to the following documents:

ISO/37, ISO/48, ISO/188, ISO/471, ISO/812, ISO/815, ISO/1817, ISO/2285 (see - Bibliography - page 16).



2 - Characteristics

2.1 - Component materials

No specific conditions are stipulated concerning the basic materials which constitute the compounds from which elastomer packing rings for brake cylinder pistons are manufactured, provided that the characteristics listed below with reference to finished products are complied with.

2.2 - Physical characteristics

2.2.1 - Appearance

The surfaces of packing rings must be free from roughness, cracks, pitting, blistering, burring or joining splits. The edges must be clean-cut.

2.2.2 - Geometrical characteristics

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

2.2.3 - Mechanical characteristics

2.2.3.1 - Hardness

The hardness of packing rings in delivery condition must comply with that specified by the purchasing Railway in the order or its appended documents, with a tolerance of ± 5 IRHD on this figure.

The hardness after immersion in No. 1 oil (70 hours at 100°C) must not differ from that recorded in delivery condition by more than 5 IRHD.

2.2.3.2 - Unit load variation under 100% elongation

The unit load variation under 100% elongation must not exceed:

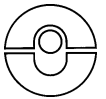
- 15% of the figure obtained in delivery condition after the action of heat for 7 days at 70°C,
- 20% of the figure obtained in delivery condition after immersion in No. 2 oil for 70 hours at 100°C.

2.2.3.3 - Resulting deformation after compression under constant deflection

The resulting deformation recorded after constant compression of 25% for 24 hours at 100°C must not exceed 24% as regards test pieces in delivery condition.

2.2.3.4 - Resulting deformation after tension under constant elongation (in cases where the dimensions of the packing rings make it impossible to measure the resulting deformation brought about by compression)

The resulting deformation recorded after tension under constant elongation of 50% for 24 hours at 100°C must not exceed 18% as regards test pieces ready for delivery.



2.2.3.5 - Non-brittleness when cold

All packing rings in delivery condition and after immersion in No. 1 oil (for 70 h at 100°C) must have a sufficient degree of flexibility so that, at a temperature of -40°C, they can undergo the test described in point 4.4.7 - page 11 without any fractures, splits, cracks or perforations becoming visible to the naked eye.

2.2.3.6 - Resistance to oils

The packing rings must have a resistance to oils such that:

- after immersion in No. 1 oil, under the conditions stipulated in point 4.4.8 - page 11, for 70 hours at 100°C, the variation in volume must remain as follows:

$$- 7\% \leq \frac{\Delta V}{V} \leq + 5\%,$$

- after immersion in No. 2 oil, under the conditions stipulated in point 4.4.8, for 70 hours at 100°C, the variation in volume must remain as follows:

$$0 \leq \frac{\Delta V}{V} \leq + 20\%.$$

2.2.3.7 - Resistance to tearing

The packing rings in delivery condition must have a resistance to tearing at least equal to 30 daN/cm of thickness.

2.2.3.8 - Resistance to abrasion

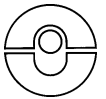
Reserved.

2.2.4 - Marks

Packing rings must bear indelible marks in accordance with the working documents, and in particular:

- the supplier's mark,
- the date of manufacture (number of the month and last two figures of the year).

In no circumstances must the marks be placed on a surface which is intended to ensure the impermeability of the packing ring.



3 - Manufacture

3.1 - Preparation of the material

No special conditions are laid down for the preparation of the elastomers used in the manufacture of packing rings, except that the finished product must comply with the characteristics set out above.

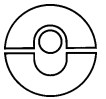
3.2 - Manufacture of the packing rings

The packing rings shall be obtained by moulding in such a way that any burring formation on the sections of the packing ring ensuring impermeability, is prevented.

All sections of the packing rings must be suitably vulcanised.

3.3 - Retouching, if any

Any retouching intended to hide a defect is forbidden.



4 - Inspection

4.1 - Submission for acceptance

4.1.1 - Condition of packing rings on submission

Packing rings shall be submitted for acceptance in delivery condition.

4.1.2 - Grouping into batches

Packing rings of the same type, of the same category, of the same manufacture and submitted for acceptance at the same time shall form a batch.

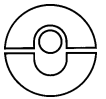
4.1.3 - Advice of submission

The representative of the purchasing Railway shall be advised of the date of submission by a written note, signed by the Director of the producing factory or his authorised representative; this note must indicate:

- the date of submission,
- the order references,
- the composition of the batches submitted, stating for each batch:
 - the quality,
 - the type,
 - the category of the parts submitted,
- the results of the checks and tests which the supplier must have carried out beforehand, on the parts submitted, in accordance with this specification.

4.2 - Type and extent of checks and tests

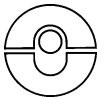
The packing rings shall be subjected to the tests and checks mentioned in Table 1 below, if their dimensions are suitable for the selection of the required test pieces. In cases where the dimensions of the packing rings make it impossible to remove all these test pieces, the special conditions to be observed must be stipulated in the order or its appended documents.



Types of checks and tests	Number of test pieces per test	Shape and dimensions of test pieces
Dimensions and appearance	At the discretion of the purchasing Railway's representative	The packing rings themselves
Hardness: - in delivery condition	5	The packing rings themselves or test pieces with a thickness exceeding 4 mm
Hardness: - after immersion in oil	5	Test pieces with a thickness exceeding 4 mm
Unit load under constant elongation: - in delivery condition - after the action of heat - after the action of oil	3 3 3	Dumb-bell shaped test piece of Type 2 as defined in ISO Standard 37 (see - Bibliography - page 16)
Deformation resulting from tension or compression: - in delivery condition	3	Dumb-bell shaped test piece of Type 2, as defined in ISO Standard 37 or Test piece defined in ISO Standard 815 (see - Bibliography - page 16), made up of two superimposed discs with a diameter of 29 mm and a thickness equal to that of the packing ring
Non-brittleness when cold: - in delivery condition - after immersion in oil	4 4	Test piece of Type A, as defined in ISO Recommendation R 812 (see - Bibliography - page 16), strip measuring 40 mm ± 6 mm in length, 6 mm ± 1 mm in width, 2,0 mm ± 0,2 mm in thickness
Resistance to tearing: - in delivery condition	3	Test piece as shown in the sketch appended to this specification (see Appendix A - page 15)
Resistance to abrasion	Reserved	
Resistance to oils	3	Test piece defined in ISO Standard 1817 (see - Bibliography - page 16) with a volume between 1 and 3 cu.cm and a thickness of 2 mm ± 0,2 mm

The number of test series to be carried out in relation to the size of the batches is shown in the following table:

Size of batches (number of packing rings)	Number of series of tests per batch
up to 500	2
501 to 1000	3
1001 to 2000	4
2001 to 5000	5
above 5000	6



4.3 - Method of selection and preparation of samples and test pieces

The checks and tests mentioned in this specification shall be carried out on each batch submitted.

The packing rings intended for the checks and tests shall be selected at random from each batch submitted and marked indelibly.

The number of packing rings to be selected for a series of tests shall depend upon the nominal diameter of the packing rings making up the batch, as shown below:

- 1 part for packing rings with a diameter: $\varnothing \geq 355$ mm
- 2 parts for packing rings with a diameter: $355 \text{ mm} > \varnothing \geq 254$ mm
- 3 parts for packing rings with a diameter: $254 \text{ mm} > \varnothing \geq 152$ mm
- 4 parts for packing rings with a diameter: $\varnothing < 152$ mm

4.3.1 - Selection

The selection of test pieces for the same test in delivery condition and after the action of heat or oil must be made, when the dimensions make it possible, on the same packing ring.

4.3.2 - Processing of test pieces

The test pieces intended for the tests in delivery condition shall be cut out in the packing rings and processed for at least 24 hours at 23°C and with 50% relative moisture, in accordance with the regulations of the ISO Standard 471 (see - Bibliography - page 16).

The test pieces intended to undergo the preliminary action of heat shall be cut out in the packing rings and subjected to a baking at 70°C for 7 days, in accordance with the regulations of ISO Standard 188 (see - Bibliography - page 16).

The test pieces intended to undergo the preliminary action of oil shall be cut out in the packing rings and subjected either to the action of No. 1 oil or to the action of No. 2 oil at a temperature of 100°C for 70 hours, in accordance with the instructions of ISO Standard 1817 (see - Bibliography - page 16). The immersion liquid must be renewed for each test.

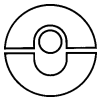
4.4 - Check and test procedure

4.4.1 - Appearance check

The conditions stipulated in point 2.2.1 - page 3 must be complied with.

4.4.2 - Dimensions check

The dimensions of packing rings shall be measured with the usual instruments appropriate to the order of magnitude of these parts and to the degree of accuracy required.



4.4.3 - Hardness check

This check shall be carried out, in accordance with the instructions of ISO Standard 48 (see - Bibliography - page 16), both on packing rings or test pieces in delivery condition, which have undergone the effect of oil under the conditions defined in point 4.3.2 - page 8.

The results required are given in point 2.2.3.1 - page 3.

4.4.4 - Check of unit load variation under constant elongation of 100%

The unit load under elongation of 100% shall be recorded, on test pieces described in point 4.2 - page 6, in delivery condition, after they have undergone the action of heat, the action of No. 2 oil under the conditions stipulated in point 4.3.2 - page 8 and in accordance with the provisions of ISO Standard 37 (see - Bibliography - page 16).

The unit load variation under constant elongation of 100% shall be obtained with the formula

$$\frac{M - M_o}{M_o} \times 100$$

in which:

- M_o is the unit load under constant elongation of 100% in delivery condition,
- M is the unit load under constant elongation of 100% after the action of heat or oil.

The results required are given in point 2.2.3.2 - page 3.

4.4.5 - Check of deformation resulting from compression under constant deformation of 25%

This check shall be carried out on the test pieces described in point 4.2 - page 6, in delivery condition, in accordance with the instructions of ISO Standard 815 (see - Bibliography - page 16), amended or completed by the following provisions:

The 3 test pieces intended for the deformation test shall be tested simultaneously.

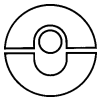
After their original height has been previously measured by means of a micrometer at a pressure of 0,2 bar, the test pieces shall be placed in the device fitted with plates of polished stainless steel, the test pieces being compressed between the plates, which compress them to 25% of their original

height. This device is then placed in an oven at $100^{\circ}\text{C} \pm 1^{\circ}\text{C}$ for 24 h $\begin{matrix} +0 \\ -2 \end{matrix}$ h.

The device shall then be withdrawn from the oven and left at ambient temperature, while the test pieces remain compressed. It is then subjected to the action of a ventilator. The test pieces shall then be removed from the device and left undisturbed in the surroundings defined in point 4.3.2 - page 8 for $30 \text{ mn} \pm 3 \text{ mn}$. The residual height, determined under the same conditions as those described for the original height shall be measured at the end of this period.

The resulting deformation shall be calculated by means of the following formula

$$\frac{h_o - h_1}{h_o - h_s} \times 100$$



in which:

- h_0 is the original height of the test piece,
- h_1 is the height of the test piece after resilience,
- h_s the height under the prescribed stress.

The results required are those given in point [2.2.3.3 - page 3](#).

4.4.6 - Check of deformation resulting from tension under constant elongation of 50%

This check shall be carried out on the test pieces defined in point [4.2 - page 6](#), in delivery condition, in accordance with the instructions of ISO Standard 2285 (see - [Bibliography - page 16](#)), amended or completed by the following provisions:

The length L_0 of the calibrated part of the test piece shall be marked with reference lines made on the concave surface. The distance L_0 shall be measured between the inside edges of the reference lines.

Each test piece shall be placed in a frame and stretched to 50%. This device, with the stretched test piece, shall be placed in an oven at $100^\circ\text{C} \pm 1^\circ\text{C}$ for 24 h $\begin{matrix} +0 \\ -2 \end{matrix}$ h.

The device shall then be withdrawn from the oven and left in the ambient temperature while the test piece remains stretched. It is then subjected to the action of a ventilator. The power of the latter must make it possible to obtain the complete cooling of the device + test piece unit in $30 \text{ mn} \pm 5 \text{ mn}$. The test piece shall then be removed from the device and left undisturbed in the surroundings defined in

point [4.3.2 - page 8](#) for $30 \text{ mn} \begin{matrix} +3 \\ -0 \end{matrix} \text{ mn}$.

The measurement of the distance L_1 between reference marks shall be made between the inside edges, to within an accuracy of 0,1 mm, by means of a micrometric magnifying glass with a magnifying power of 7.

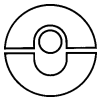
The resulting deformation shall be calculated with the following formula:

$$\frac{L_1 - L_0}{L_s - L_0} \times 100$$

in which:

- L_0 is the original length between the marks of the test piece,
- L_1 is the length between reference marks after resilience,
- L_s is the reference length in the elongated condition.

The results required are those given in point [2.2.3.4 - page 3](#).



4.4.7 - Check of non-brittleness when cold

This check shall be carried out on the test pieces defined in point 4.2 - page 6, in delivery condition and after the action of oil under the conditions laid down in point 4.3.2 - page 8, in accordance with the instructions of ISO Standard 812 (see - Bibliography - page 16). The test shall take place in a heat propagation bath.

The results required are those shown in point 2.2.3.5 - page 4.

4.4.8 - Tests of resistance to oils

This check shall be carried out on the test pieces defined in point 4.2. The variation in volume is assessed:

- after immersion for 70 h \pm 2 h at 100°C \pm 1°C in No. 1 oil,
- after immersion for 70 h \pm 2 h at 100°C \pm 1°C in No. 2 oil,

under the conditions laid down in point 4.3.2.

The results required are those shown in point 2.2.3.6 - page 4.

4.4.9 - Check of resistance to tearing

This check shall be carried out on the test pieces defined in point 4.2, in delivery condition.

The test shall be carried out on a stretching device fitted with a movable jaw or movable roller capable of travelling at a really constant speed of 500 \pm 50 mm/mn, while drawing the test pieces until they are broken.

The resistance to tearing shall be expressed in daN per centimeter of thickness.

The results required are those stated in point 2.2.3.7 - page 4.

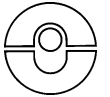
4.4.10 - Check of resistance to abrasion

Reserved.

4.5 - Conclusion of the inspections

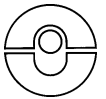
Any characteristic in a serie of tests which does not comply with the stipulated conditions shall result in rejection of the batch in question.

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



5 - Delivery

The various packing rings shall be delivered in appropriate packing, which affords protection against any damage during transport and storing.



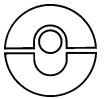
6 - Guarantee

The packing rings shall be guaranteed by the supplier, for a period which expires at the end of the calendar year following that during which the delivery took place, against any defect imputable to manufacture and not detected at the time of acceptance in the factory.

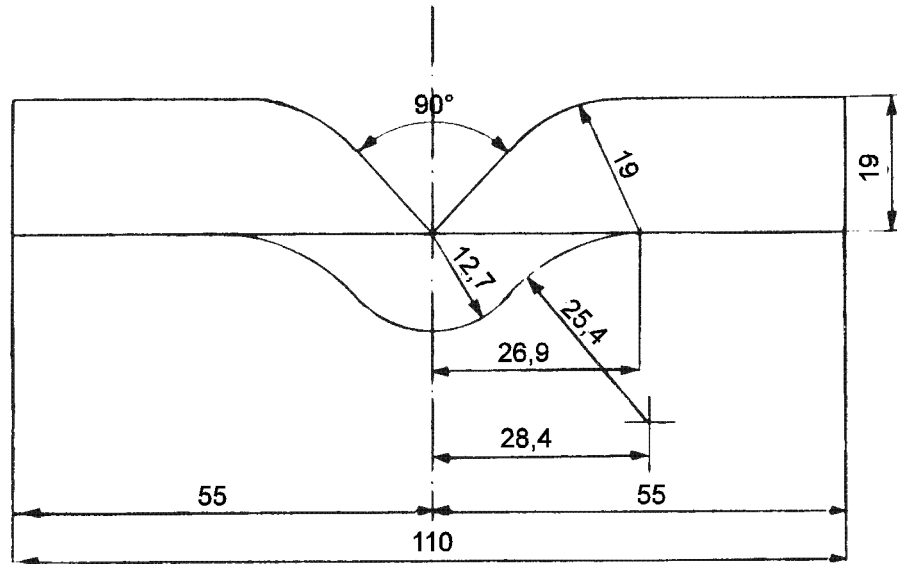
In cases where parts for equipping new stock are involved, the delivery date of the vehicles to which they are fitted shall be considered as the delivery date of the packing rings.

Packing rings which are found to be defective within the guarantee period, rendering them unsuitable for use, shall be rejected.

Rejected parts shall be placed at the disposal of the supplier for replacement or reimbursement.

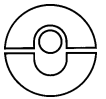


Appendix A - Test for resistance to tearing test piece



Tolerances $\pm 0,05$ mm

NB : The test-piece cutter must be made of treated steel, with sharp cutting edges. It is important for the summit of the angle of 90° to be edged to produce a sharp corner (with no rounding).



Bibliography

1. Minutes of meetings

International Union of Railways

"5th Committee -J.Q. - Preparation of a specification for packing rings for brake cylinder pistons", Prague, June 1959; Stuttgart, May 1960; Paris, May 1961

"5th Committee -J.Q.- Revision of Leaflet 831: "Technical specification for the supply of rubber packing rings" for brake cylinder pistons as regards the test of resistance to abrasion", Portsmouth, May 1962

"5th Committee -J.Q.- Revision of existing specifications to include new data - Leaflet 827-2; - Leaflet 831 "Technical specification for the supply of rubber packing rings for brake cylinder pistons"; - Leaflet 893", Paris, May 1963

"Sub-Committee for Specifications - Finalising of existing Specifications. a) b) Harmonization of guarantee clauses", Paris, January 1975

"Sub-Committee for Specifications - Question 5/Sa/FIC: Revision of Leaflet 831 "Elastomer packing rings for brake cylinder pistons"", Paris, January 1980

2. International standards

ISO/37

"Rubber, vulcanized or thermoplastic - Determination of tensile stress-strain properties", May 1994

ISO/48

"Rubber, vulcanized or thermoplastic - Determination of hardness (hardness between 10 IRHD and 100 IRHD)", May 1994

ISO/48 Amd 1

"Amendment 1 to ISO 48 standard of May 1994", August 1999

ISO/188

"Rubber, vulcanized or thermoplastic - Accelerated ageing and heat resistance tests", April 1998

ISO/471

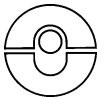
"Rubber - Temperatures, humidities and times for conditioning and testing", March 1995

ISO/812

"Rubber, vulcanized - Determination of low-temperature brittleness", November 1991

ISO/815

"Rubber, vulcanized or thermoplastic - Determination of compression set at ambient, elevated or low temperatures", November 1991



ISO/815 Cor 1

"Corrigendum 1 to ISO 815 standard of November 1991", April 1993

ISO/1817

"Rubber, vulcanized - Determination of the effect of liquids", March 1999

ISO/2285

"Rubber, vulcanized or thermoplastic - Determination of tension set at normal and high temperatures", June 1997

ISO/DIS 2285

"Rubber, vulcanized or thermoplastic - ", March 2000