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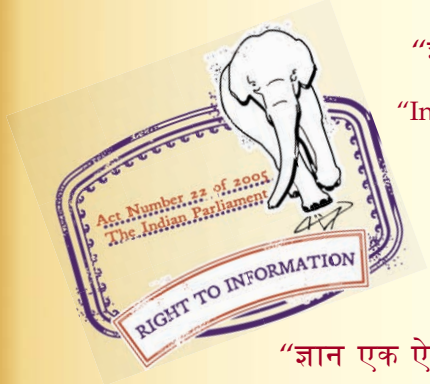
IS 7466 (1994): Rubber gaskets for pressure cookers [PCD 13: Rubber and Rubber Products]



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IS 7466 : 1994
(Reaffirmed 2003)

भारतीय मानक

प्रेशर कुकरों के लिए रबड़ के गैसकेट — विशिष्टि

(पहला पुनरीक्षण)

Indian Standard

RUBBER GASKETS FOR PRESSURE COOKERS — SPECIFICATION

(First Revision)

First Reprint SEPTEMBER 2006
(Including Amendment No. 1)

UDC 621.762.4 [678.4] : 643.352.32

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

May 1994

Price Group 3

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Rubber Products Sectional Committee had been approved by the Petroleum, Coal and Related Products Division Council.

This standard was first published in 1974. The Committee responsible for its preparation decided to update the standard in light of experience gained. In this revision the EDTA Method has been incorporated as given in ISO/DIS 9298 'Rubber compounding ingredients — Zinc oxide — Test Method' for determination of zinc oxide in place of existing Potassium cyanide method because potassium cyanide is highly poisonous and hazardous chemical. And in addition to this the Amendments No. 1, 2, 3 have been incorporated.

The use of pressure cookers is very common in present day living. For proper functioning of the cookers it is essential that the various components used should be of good quality. Rubber gasket is an essential part of the cooker and is subjected to heat and moisture throughout its use. It is therefore, essential that the rubber mix used for making them is of good quality and they are tested for various requirements given in this standard.

This standard contains clauses **3.3** and **4.1** which call for agreement between the purchaser and the supplier.

Through the use of this standard it is found that it is not essential to specify the limits for free sulphur content in the case of pressure cooker gaskets. However, low compression set and better ageing properties have to be ensured by specifying their limits since low free sulphur content is always accompanied by improved compression set and ageing properties and these two properties are vital to the life of the gaskets. The committee, therefore, decided that since ageing properties have already been included in the standard, the free sulphur requirement may now be substituted by a performance requirement, compression set.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

AMENDMENT NO. 1 NOVEMBER 1997
TO
IS 7466 : 1994 RUBBER GASKETS FOR PRESSURE COOKERS — SPECIFICATION

(First Revision)

(*Page* 3, *Annex* A) — Substitute the following for the existing Annex:

'ANNEX A
[*Table* 2, *Item* (vii)]

DETERMINATION OF ZINC OXIDE

A-1 GENERAL

Presence of zinc oxide is estimated by titrating with standardized EDTA solution. Calcium, magnesium, iron, titanium, aluminium, antimony and silica, if present in the gasket material, do not interfere.

The sample is ashed and the ash is dissolved in hydrochloric acid. Aluminium chloride and ammonium fluoride are added to precipitate calcium and magnesium as the hexafluoro-aluminates, fluoride complexes iron, titanium and excess aluminium. The *p*H is adjusted to 4.5 and zinc is titrated with EDTA. Total zinc content of the sample is determined and calculated as zinc oxide.

A-2 APPARATUS

A-2.1 Crucibles, porcelain or silica, 30-ml nominal capacity.

A-2.2 Asbestos Board, approximately 100-mm square and 6-mm thick with a hole in the centre to support the crucible so that approximately two-third of it projects below the board.

A-2.3 Electric Muffle Furnace, with thermocouple and thermostat for control of temperature.

A-2.4 Burette, 10-ml capacity, graduated with 0.02 ml dimensions.

A-3 REAGENTS

A-3.1 Acetone — Conforming to IS 170.

A-3.2 Aluminium Chloride Solution (0.1 M) — Dissolve 2.42 g of aluminium chloride hexahydrate ($AlCl_3.6H_2O$) in water and dilute to 100 ml.

A-3.3 Ammonium Fluoride Solution (3 M) — Dissolve 55.5 g of ammonium fluoride (NH_4F) in water and dilute to 500 ml. Store in a polythene or wax-coated bottle.

A-3.4 Buffer Solution — Dissolve 60 g of acetic acid (CH_3COOH) and 77 g of ammonium acetate (CH_3COONH_4) in water and dilute to 100 ml.

A-3.5 Dithizone Indicator Solution — Dissolve 0.01 g of dithizone in 10 ml of acetone. Prepare fresh every 48 hours.

A-3.6 EDTA Solution (0.01M) — Dissolve 3.72 g of ethylene-diamine tetracetic acid, disodium salt, dihydrate, in water and dilute to 100 ml.

A-3.7 Zinc Chloride, Standard Solution — Ignite zinc oxide in a porcelain crucible for 2 hours at 550 ± 25°C and cool in a desiccator. Dissolve about 1.0 g of the dried reagent, weighed to the nearest 0.001 g in 50 ml of water and 20 ml of HCl. Transfer to a 1 000-ml volumetric flask and dilute to the mark with water.

A-3.8 Standardization of EDTA Solution — Standardize the EDTA solution with zinc chloride standard solution. With a pipette, transfer 25 ml of standard zinc chloride solution to a 250-ml conical flask. Add 5 ml of HCl and proceed according to **A-4.3**, beginning with the addition of aluminium chloride ($AlCl_3$) solution. A 50-ml capacity of burette is to be used.

A-3.9 Methyl Orange Solution (1 g/100 ml) — Dissolve 0.025 g of methyl orange in 25 ml of water.

A-3.10 Magnesium Chloride Solution (0.1 M) — Dissolve 2.03 g of magnesium chloride hexahydrate ($MgCl_2\,6H_2O$) in water and dilute to 100 ml.

A-4 PROCEDURE

A-4.1 Weigh approximately 1 g of sample to the nearest 0.001 g in a porcelain crucible, previously ignited and weighed. Ash it in accordance with **B-2.2**, if the sample does not contain chloroprene or other rubbers containing halogens.

NOTE — If halogens are present, ash the sample by adding about 5 ml of H_2SO_4 to the crucible containing the weighed specimen followed by cautions heating over a small flame slowly, to allow completion of reaction. Heating rate must be adjusted so that there is no splattering or loss of material from the crucible, until all sulphuric acid has been dried off. Ignite to burn off the carbonaceous material over flame, or in a muffle furnace (at about 950°C for approximately 1 h).

A-4.2 Cool the crucible and wash the ash into 250-ml beaker with a stream of water. Add 5 ml of HCl to the crucible and warm it on a hot plate until the solution just begins to boil. Pour the washings into the beaker. Rinse the crucible once more with 5 ml of HCl and again add the washings to the beaker. Do not filter the solution. Then add 10 ml of HCl to the beaker. Break up any large cakes of ash with a glass stirring rod. Evaporate the solution to 10 ml. If large amounts of precipitate are present some bumping and splattering may occur. This can be reduced by agitating the solution until boiling begins. Transfer the solution to a 100-ml volumetric flask and dilute to the mark with water.

A-4.3 Take out an aliquot of 10 ml from the above solution and transfer it to a 250-ml conical flask, mixing the solution and suspended solids well before aliquoting. Dilute the aliquot to 25-ml and add 1 ml of concentrated HCl, 2 ml of $AlCl_3$ solution, 5 ml of $MgCl_2$ solution, 10 ml of NH_4F solution and 1 drop of methyl orange indicator solution. Add NH_4OH until the indicator is pure yellow in colour and add 0.5 ml more NH_4OH. If the sample is known to be high in zinc or calcium, bring it to a boil. Boil for 30 s, and cool to room temperature. Add 10 ml of buffer solution. Titrate with EDTA solution to a yellow-green colour, using the 10-ml capacity burette.

A-5 CALCULATIONS

1. **Standardization** : $C = \dfrac{M}{(V_1 \times 40)}$

2. **Analysis** : ZnO, percent $= \dfrac{(V_2 \times C \times 100 \times 100)}{(S \times A)}$

$= \dfrac{(V_2 \times C \times 1\,000)}{S}$

where,

C = concentration of EDTA solution, g ZnO/ml;
M = mass of zinc oxide, g;
V_1 = volume of EDTA solution used in standardization, ml;
V_2 = volume of EDTA solution used in titration, ml;
S = mass of sample, g; and
A = aliquot size, ml.'

(PCD 13)

Printed at : Prabhat Offset Press, New Delhi-2

Indian Standard

RUBBER GASKETS FOR PRESSURE COOKERS — SPECIFICATION

(First Revision)

1 SCOPE

This standard prescribes the requirements and methods of sampling and test for rubber gaskets used for domestic pressure cookers.

2 NORMATIVE REFERENCES

The following Indian Standards contain provision which through reference in this text, constitute provisions of this standard. At the time of publication the edition indicated were valid. All standards are subjected to revision, and parties to agreements based on the standard are encouraged to investigate the possibility of applying the most recent editions of standards indicated below:

IS No.	*Title*
264 : 1976	Nitric acid (*second revision*)
265 : 1993	Hydrochloric acid (*fourth revision*)
1070 : 1992	Reagent grade water (*third revision*)
3400 (Part 1) : 1987	Methods of test for vulcanized rubbers : Part 1 Tensile stress-strain properties (*second revision*)
3400 (Part 2) : 1980	Methods of test for vulcanized rubbers : Part 2 Hardness (*first revision*)
3400 (Part 4) : 1987	Methods of test for vulcanized rubbers : Part 4 Accelerated ageing (*second revision*)
3400 (Part 10) : 1977	Methods of test for vulcanized rubbers : Part 10 Compression set at constant strain (*first revision*)
4905 : 1968	Methods for random sampling

3 REQUIREMENTS

3.1 Material

The rubber gaskets shall be made from a suitable heat-resistant rubber compound. All the compounding ingredients used in the rubber shall be free from harmful materials liable to extraction in contact with foodstuffs or steam or which may cause the development of undesirable toxicity, odour, taste or discolouration. Inorganic pigments and organic dyestuffs used shall also satisfy the requirement stated above.

3.2 Workmanship and Finish

The gaskets, when visually examined, shall be free from blisters, pinholes, cracks, embedded foreign matters and other defects which may impair their serviceability.

3.3 Dimensions

The dimensions of the gasket shall be as agreed to between the purchaser and the supplier.

3.4 The rubber used for gaskets shall comply with the requirements given in Table 1.

3.5 The gasket shall also pass the performance test as given in Annex C.

4 PACKING AND MARKING

4.1 Packing

The gasket shall be packed as agreed to between the purchaser and the supplier.

4.2 Marking

4.2.1 Each package of gasket shall be marked with the following:

a) Name of the material;
b) Indication of source of manufacture;
c) Capacity of the cooker to which the gasket will fit.
d) Number of gaskets;
e) Lot or batch number; and
f) Month and year of the manufacture.

4.2.2 The package may also be marked with the Standard Mark.

4.2.3 The use of the Standard Mark is governed by the provisions of Bureau of Indian Standard Act, 1986 and the Rules and Regulations made thereunder. The details of conditions under

which the licence for the use of Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

5 SAMPLING

5.1 Representative samples shall be drawn as prescribed in Annex D.

6 TEST METHODS

6.1 The test shall be carried out according to the methods prescribed in col 4 of Table 1.

6.2 Quality of Reagent

Unless specified otherwise, 'pure chemicals and distilled water (*see* IS 1070 : 1992) shall be employed in tests.

NOTE — 'Pure chemicals' shall mean chemicals that do not contain impurities which affect the result of analysis.

Table 1 Requirements of Rubber Used for Gaskets

(*Clause* 3.4)

Sl No.	Characteristic	Requirement	Method of Test, Ref to	
			Annex	Indian Standard
(1)	(2)	(3)	(4)	(5)
i)	Hardness, IRDH	70 ± 5	—	IS 3400 (Part 2) : 1980
ii)	Tensile strength, MN/m^2 (kgf/cm^2), *Min*	10 (approx 100)	—	IS 3400 (Part 1) : 1987
iii)	Elongation at break, percent, *Min*	200	—	do
iv)	After ageing for 3 days at 100°C in air-oven, change from the original value in :		—	IS 3400 (Part 4) : 1987
	a) Hardness, IRHD	$^{+8}_{-2}$		
	b) Tensile strength, percent *	$^{+10}_{-20}$		
	c) Elongation at break percent *	$^{+10}_{-35}$		
v)	After ageing in an autoclave for 8 hours under a direct steam pressure of 100 kN/m^2 (approx 1 kgf/cm^2) and 120°C temperature, change from the original value in :		—	IS 3400 (Part 4) : 1987
	a) Hardness	$^{+5}_{-0}$		
	b) Tensile strength, percent *	±10		
	c) Elongation at break, percent *	$^{+10}_{-25}$		
	d) Volume, percent *	$^{+5}_{-0}$		
vi)	Compression set, at 125 ± 2°C for 21^{+0}_{-2} h percent, *Max*	25	—	IS 3400 (Part 10) : 1977
vii)	Total zinc oxide, percent by mass, *Max*	3·0	A	—
viii)	Heavy metals	To pass the test	B	—

*To be computed as percentage of the recorded value of the unaged test piece.

ANNEX A

[*Table* 1, *Item* (vii)]

DETERMINATION OF ZINC OXIDE

A-1 SAMPLING

Select a representative sample.

A-2 REAGENTS

A-2.1 Nitric acid — 65 percent (m/m), density approx 1·4 mg/m³ (conforming to IS 264 : 1976).

A-2.2 Hydrochloric Acid — 20 percent (m/m), density approx 1·1 mg/m³ (conforming to IS 265 : 1993).

A-2.3 Ammonia Solution — 25 percent (m/m) density approx 0·91 mg/m³.

A-2.4 Hydrogen Peroxide Solution — 3 percent (m/m).

A-2.5 Iron Solution

Dissolve 86 g iron ammonium sulfate and dilute to 1 litre.

A-2.6 Ammonium Chloride Solution

Dissolve 250 g ammonium chloride and dilute to 1 litre.

A-2.7 Buffer Solution

Dissolve 30 g ammonium fluoride
100 g ammonium thiosulfate
250 g ammonium acetate and dilute to 1 litre.

A-2.8 Bromothymol Blue Solution

Dissolve 0·1 g bromothymol blue in 100 ml ethanol.

A-2.9 Xylenolorange Solution

Dissolve xylenolorange-tetrasodium salt in 100 ml water.

A-2.10 EDTA Standard Volumetric Solution (EDTA) = 0·1 mol/l

Dissolve 37·225 g of disodium ethylenedinitrilotetraacetate dihydrate (Na_2EDTA) in water in a 1 000 ml one-mark volumetric flask, dilute to the mark and mix well.

A-3 PROCEDURE

A-3.1 Suspend 20 g zinc oxide with 100 ml water in a 1 000 ml volumetric flask and dissolve carefully with approx 90 ml nitric acid (**A-2.1**). When the zinc oxide is dissolved boil for a short time and cool down the solution, then dissolve up to the mark and shake.

A-3.2 Pipette from this solution 50 ml in a 250 ml calibrated volumetric flask. Add 10 ml iron (III)-solution (**A-2.5**). Shake it and then add successively 5 ml hydrogen peoxide (**A-2.4**), 60 ml ammonium chloride solution (**A-2.6**), and 30 ml ammonia solution (**A-2.3**).

A-3.3 Then shake briefly and cool down.

Fill up to the mark and filter through a dry folded filter into a dry 500 ml conical flask. Transfer 250 ml of this solution with a pipette into an 600 ml beaker, then dilute with water up to 300 ml.

A-3.4 Add four drops of bromothymolblue solution (**A-2.8**) and neutralize with hydrochloric acid (**A-2.2**). The colour changes from blue to a light yellow and furthermore add two drops hydrochloric acid (**A-2.2**) in excess. After addition of 20 ml buffer solution (**A-2.7**) and seven drops xylenolorange solution (**A-2.9**) titrate with the EDTA solution (**A-2.10**) until the colour changes from purple red to orange-yellow.

A-3.5 After further dropwise addition of 0, 5 – 1 ml the colour changes sharply to a pale yellowishgreen:

A-4 TITRE

Dilute nitric acid (**A-2.1**) to a concentration of approx 30 percent (m/m), density approx 1, 2 g/ml. Dissolve 20 g refined zinc (99·995) in the heat with 40 ml of the diluted nitric acid and then treat it as the zinc oxide sample.

A-5 CALCULATION

Calculate the total zinc oxide content:

$$Z_{no} = \frac{V_1 \times 100 \times 1\,245}{V_2}$$

where

Z_{no} = is the zinc oxide content, expressed as a percentage by mass;

V_1 = is the volume, in millilitres of the EDTA-solution (**A-2.10**) required for the titration of zinc in **A-3**;

V_2 = is the volume, in millilitres of the EDTA-solution (**A-2.10**) required for the titration of zinc in **A-4** (titre).

NOTE — 1 ml 0·1 mol (1 EDTA-solution correspond to 0·006 537 g zinc or 0·000 130 g zinc oxide (factor 1·245 for calculating from zinc content to zinc oxide content).

Remarks

Lead and iron are precipitated as hydroxides by adding the ammonia solution. Copper will be camouflaged by ammonium thiosulfate. Aluminium will be camouflaged by ammonium fluoride. Cadmium is also titrated with the EDTA-solution, but of course, the concentration of cadmium is usually lower than 0·1 percent in the examined zinc oxides, this error is negligible.

ANNEX B

[*Table* 1, *Item* (viii)]

TEST FOR HEAVY METALS

B-0 GENERAL

Presence of heavy metals is tested by treating the material with hydrogen sulphide. Appearance of black colour or turbidity or both indicates the presence of heavy metals.

B-1 REAGENTS

B-1.1 Concentrated Hydrochloric Acid — conforming to IS 265 : 1993.

B-1.2 Ammonium Chloride — solid.

B-1.3 Dilute Hydrochloric Acid — 1 : 1 (*v*/*v*).

B-1.4 Dilute Acetic Acid — 1 N.

B-1.5 Hydrogen Sulphide Solution — freshly prepared saturated solution.

B-2 PROCEDURE

B-2.1 Ash the material as described under **B-2.2.** Treat the ash with 3 drops of concentrated hydrochloric acid. Evaporate to dryness over a low flame and return to the muffle furnace for 20 to 30 minutes. A clean white ash shall result; otherwise the hydrochloric acid treatment may be repeated. Dissolve the ash in 1 ml of dilute hydrochloric acid and wash with small quantity of water in an evaporating dish. Repeat washing to ensure complete transfer of the dissolved ash. Evaporate to dryness on a steam-bath and dissolve the residue in about 20 ml of water. Take 10 ml of this solution in a test tube, add 0·5 g of ammonium chloride and 1 ml of acetic acid. Add 5 ml of hydrogen sulphide solution to it.

B-2.2 Weigh, to an accuracy of 0·01 g, about 1 g of the sample into a previously ignited and weighed crucible and place in a hole in the asbestos board. Heat gently over a small Bunsen flame so that the rubber does not ignite and no spurting occurs. When the rubber is completely decomposed to a charred mass, transfer the crucible to the muffle furnace at a temperature of 550±25°C. Continue the heating until the ash is free from specks of carbon, cool in a desiccator and weigh. Repeat heating, cooling and weighing until the change in mass on further heating for 20 minutes does not exceed 1 mg.

B-2.3 The material shall pass the test if the solution does not develop any black colour or turbidity.

ANNEX C

(*Clause* 3.5)

PERFORMANCE TEST FOR PRESSURE COOKER GASKETS

C-0 GENERAL

C-0.1 The test consists of exposing gasket to actual service conditions and observing effects of the test on the gasket.

C-1 APPARATUS

C-1.1 Pressure Cooker — for which the gasket has been designed.

C-2 PROCEDURE

C-2.1 Fill up the pressure cooker to half its height with water. Close the lid properly, ensuring that it fits tight all over the circumference. Put the cooker on the burner or hot plate taking precaution to put the safety counterweight as soon as the steam is generated. Continue the operation for a period of 120 hours, stopping the operation at periodic intervals of 4 hours, replacing water level if need be in the cooker. During this operation of 120 hours, no leakage of steam shall be observed.

ANNEX D

(*Clause* 5)

SAMPLING PROCEDURE FOR RUBBER GASKETS FOR PRESSURE COOKERS

D-1 SCALE OF SAMPLING

D-1.1 Lot

All rubber gaskets of the same material and produced under similar conditions of manufacture, in a single consignment shall be grouped together and each group shall constitute a lot.

D-1.1.1 For determing the conformity of the lot the requirements of this specification, samples shall be tested from each lot separately.

D-1.2 The number of rubber gaskets to be selected for the purpose shall depend on the lot size and shall be in accordance with Table 2.

Table 2 Scale of Sampling and Permissible Number of Deffectives

Lot Size	Sample Size	Permissible Number of Defectives	Sub-sample Size
(1)	(2)	(3)	(4)
Up to 200	13	1	2
201 ,, 500	20	2	3
501 ,, 1 000	32	2	4
1 001 and above	50	3	5

D-1.2.1 These rubber gaskets shall be selected at random. In order to ensure the randomness of the selection, random sampling procedures given in IS : 4905-1968 may be followed.

D-2 CRITERIA FOR ACCEPTANCE

D-2.1 All rubber gaskets selected under **D-1.2** shall be examined for visual and dimensional characteristics (**3.1**,**3.2**,**3.3**) as well as performance test (**3.5**). Any gasket failing to satisfy any of these requirements shall be considered as defective. If the number of defective gaskets found in the sample is less than the corresponding number given in col 3 of Table 2, the lot shall be considered to have met these requirements.

D-2.2 From each lot which has been found satisfactory under **D-2.1**, the number of gaskets as given in col 4 of Table 2 shall be taken and tested for physical characteristics [Table 1, Items (i), to (v)]. The lot shall be deemed to have passed the physical requirements if all these gaskets satisfy the relevant tests.

D-2.3 From each lot found satisfactory under **D-2.1** and **D-2.2**, three more gaskets shall be taken and a composite sample shall be prepared by mixing suitably the rubber material of the gaskets. The composite sample so prepared shall be tested for chemical characteristics [Table 1, Items (vi) to (viii)].

NOTE — The rubber gaskets needed for testing under **D-2.2** and **D-2.3** may be chosen from those which have been selected under **D-2.1**.

D-2.4 The lot shall be considered to conform to the requirements of this specification if **D-2.1**, **D-2.2** and **D-2.3** are satisfied.

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Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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