# INTERNATIONAL STANDARD

**ISO 8871**

Second edition
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# Elastomeric parts for aqueous parenteral preparations

*Éléments en élastomère pour préparations aqueuses parentérales*



Reference number
ISO 8871:1990(E)

## Contents







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## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established 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. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.



International Standard ISO 8871 was prepared by Technical Committee ISO/TC 76, *Transfusion, infusion and injection equipment for medical use*.



This second edition cancels and replaces the first edition (ISO 8871:1988), presentation has been modified and clauses D.3.2, E.3.2, F.3.2, G.3, J.3.2 and K.3.2 have been technically revised.

Annexes A, B, C, D, E, F, G, H, J, K, L and M form an integral part of this International Standard.

## Introduction

The elastomeric parts described in this International Standard are made from a class of material which is generally called "rubber". The parts are made from various elastomers involving different vulcanization systems, and may vary considerably in their composition with regard to fillers, softeners, pigments and other auxiliary ingredients.

The potency, purity, stability, and safety of a drug during its manufacture, storage and administration can be affected by the nature and performance of an elastomeric part used to seal the drug in its final container.

# Elastomeric parts for aqueous parenteral preparations

## 1 Scope

**1.1** This International Standard defines procedures for identifying and classifying elastomeric parts for primary packs and medical devices used in direct contact with aqueous preparations for parenteral use including dry preparations which have to be dissolved before use.

This International Standard specifies a series of comparative test methods for chemical and biological evaluation (see clause 6) and describes the various fields of application for elastomeric parts. Dimensions and functional characteristics are specified in the relevant International Standards. Required properties as specified in this International Standard shall be regarded as minimum requirements.



**1.2** This International Standard is applicable for the categories of elastomeric parts given in clause 3; specific requirements, however, are laid down in the relevant International Standards dealing with the items or devices listed in clause 3.

NOTE 1 Elastomeric parts for empty syringes for single use are excluded by definition (see ISO 7886).

**1.3** Compatibility studies with the intended preparation have to be performed before the approval for final use can be given; however, this International Standard does not specify procedures for carrying out compatibility studies.

## 2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 48:1979, *Vulcanized rubbers — Determination of hardness (Hardness between 30 and 85 IRHD).*

ISO 247:1978, *Rubber — Determination of ash.*

ISO 2781:1988, *Rubber, vulcanized — Determination of density.*

ISO 3696:1987, *Water for analytical laboratory use — Specification and test methods.*

## 3 Classification

Depending on the intended end-use, elastomeric parts exist in various designs and sizes. These parts serve different purposes depending on the item or device into which they are incorporated; elastomeric parts have, therefore, been classified into the following categories:

— elastomeric parts for injection vials (see ISO 8362-2);

— elastomeric parts for infusion bottles (see ISO 8536-2);

— elastomeric parts for prefilled syringes;

— elastomeric parts for medical devices for pharmaceutical use (excluding gloves and probes);

— elastomeric parts for freeze-dried products.

## 4 Identification

### 4.1 General

Rubber is a complex material and not generally definable. The only property which all elastomeric materials have in common is a special type of resilience or elasticity. When a strip of rubber is stretched, it will extend up to many times its original length without breaking. On release of the stretching force, it snaps back to its original size and shape virtually unaltered. Similarly one can squeeze it,

twist it or distort it in any direction comparatively easily, and it will spring back again to its original shape unchanged.

Owing to its three-dimensional network, achieved by chemical cross-linking of the polymer chains during vulcanization, rubber is practically insoluble in solvents such as tetrahydrofurane, although considerable reversible swelling may occur; this characteristic differentiates rubber from pseudo-elastic materials, such as polyvinylchloride and certain thermoplastic elastomers.

In view of the complexity of rubber, a set of tests is needed for reliable identification and the identity of a given elastomeric material cannot be verified just by a single physical or chemical test. Recommended tests for this purpose are, among others, the following ones:

— determination of density;

— determination of ash;

— ultraviolet spectrometry of extracts;

— infra-red spectrometry of pyrolysates.

The manufacturer shall guarantee that all elastomeric parts of current supplies have been produced from the same formulation and that they exhibit the same characteristics as the samples which have been given to the user first and the suitability of which has been proved.

The tests specified in 4.2 to 4.5 shall be used for identification — especially in tests carried out by the end-user.

### 4.2 Determination of density

Density shall be measured in accordance with the procedure described in ISO 2781:1988, Method A.

### 4.3 Determination of ash

The residue of inorganic materials after combustion shall be determined as described in ISO 247:1978, Method B or, if necessary, Method C.

### 4.4 Ultraviolet spectrometry

The ultraviolet spectrum shall be obtained on an aqueous extract as described in annex A; it shall be compared with a reference spectrum.

### 4.5 Infra-red spectrometry

The infra-red spectrum shall be obtained on a pyrolysate as described in annex B; it shall be compared with a reference spectrum.

## 5 Requirements

### 5.1 Biological requirements

Biological requirements are not specified in this International Standard; biological tests are, however, required by most national pharmacopoeias or related health authority regulations and are mandatory for producers and users in countries where they exist. If this is not the case, reference shall be made to biological tests, e.g. as described in the United States Pharmacopoeia, the European Pharmacopoeia or other pharmacopoeias.

### 5.2 Chemical requirements

Elastomeric parts shall comply with the chemical requirements specified in the relevant International Standards (see clause 3).

Analytical procedures to compare and evaluate the chemical characteristics of elastomeric parts are described in annex A to annex M.

### 5.3 Physical requirements

#### 5.3.1 Hardness

The hardness shall be in the specified limits within the "shelf-life" guaranteed by the manufacturer; hardness shall be determined in accordance with ISO 48.

NOTE 2 The "shelf-life" is understood to be a storage period without interference from outside factors, such as drugs, etc.

#### 5.3.2 Resistance to steam sterilization

Elastomeric parts shall not lose the required biological, chemical and physical properties after a twofold sterilization process in saturated steam at 121 °C ± 1 °C for 30 min.

## 6 Testing

### 6.1 General

The test methods described in annex A to annex M shall be considered as a means of examining various elastomeric formulations in order to select the appropriate rubber formulation for a specific use. A selection of these test methods may be used for assessing product lot-to-lot reproducibility.

In order to provide a certain degree of protection against misinterpretation in the case of erroneous results, all tests shall be performed in duplicate, unless otherwise stated.

### 6.2 Sampling

A statistically random sample of elastomeric parts to be examined shall be representative for each supply and shall be provided in their original state. The necessary number of elastomeric parts shall be as specified in the relevant International Standards (see clause 3).

### 6.3 Apparatus and reagents

**6.3.1** Only reagents of recognized analytical grade shall be used.

Purified water, prepared by distillation, by using an ion exchanger or by any other suitable process shall be used.

Its conductivity should be less than 3 µS/cm.

Purified water as specified in various national pharmacopoeias corresponds to grades 1 and 2 water as specified in ISO 3696.

**6.3.2** Glassware shall be made from borosilicate glass.

### 6.4 Preparation of test solutions

**6.4.1** Use a number of complete elastomeric parts which correspond to a surface area of at least 150 $cm^2$ to give a test solution of 1 $cm^2$ of elastomeric surface area per 2 ml of test solution.

Wash these samples: place them in a suitable glass container, cover with 300 ml of purified water, boil for 5 min and then rinse five times with 300 ml portions of cold purified water.

Place the washed elastomeric parts in a wide-necked flask and add 300 ml of purified water per 150 $cm^2$ surface area of the samples. Cover the mouth of the flask with aluminium foil or a borosilicate glass beaker. Heat in an autoclave so that a temperature of 121 °C ± 1 °C is reached in the flask within 30 min max. and maintain at this temperature for 30 min. Cool to room temperature over 20 min to 30 min.

Shake and immediately separate this solution $S_1$ from the elastomeric parts by decantation. Make up to original volume with purified water. Shake solution $S_1$ before each test.

**6.4.2** Blank solution $S_0$ is prepared in the same way as for solution $S_1$ except that 300 ml of purified water are used without the elastomeric parts.

**6.4.3** Solutions $S_1$ and $S_0$ obtained as described in 6.4.1 and 6.4.2 shall be used to carry out the chemical and biological tests.

## 7 Packaging

The elastomeric parts shall be packaged in a suitable way so that they are protected against contamination and exposure to light.

## 8 Storage

The elastomeric parts shall be stored at a temperature in the range from 0 °C to 30 °C, they shall be protected against exposure to visible and ultraviolet light.



## 9 Marking and labelling

The following information relating to the packaged goods shall be marked on the outside packaging:

a) a description of the contents;

b) the month and year of manufacture;

c) the lot number;

d) the manufacturer's trade-mark or name.

# Annex A
(normative)

# Ultraviolet spectrometry of extracts

## A.1 Principle

The ultraviolet (UV) spectrum obtained on extracts of elastomeric materials is primarily a function of the kind of accelerator or antioxidant present in the individual elastomeric formulations. Recording the ultraviolet absorption with a scanning UV spectrometer is extremely useful in distinguishing formulations with different vulcanization and stabilization systems. This type of test is applicable to all vulcanized rubber products and is usually performed using aqueous extracts.

## A.2 Procedure

Pass the test solution $S_1$ through a membrane filter (mesh size: 0,45 µm) to avoid stray light interference. Within 5 h of preparation, place the solution in a scanning UV spectrometer in a 1 cm quartz cell with the blank solution $S_0$ in the reference cell and obtain the spectrum over the wavelength range from 220 nm to 360 nm.

If a dilution is necessary, the dilution factor shall be noted.

Compare the sample spectrum obtained under standard conditions to the approved reference spectrum for the elastomeric material obtained under the same conditions.

## A.3 Expression of results

Report the results as a recorded diagram showing the absorbance (extinction) plotted versus the wavelength.

# Annex B
(normative)

# Infra-red spectrometry of pyrolysates

## B.1 Principle

The infra-red (IR) spectrometry of pyrolysed elastomeric materials is basically considered to be a qualitative identification test for elastomers and certain rubber ingredients. With the exception of silicone rubber it can be applied to any elastomer formulation.

An elastomeric sample is heated, the pyrolytic vapours are condensed and the resulting condensate is analysed by IR spectrometry.

## B.2 Procedure

Place 1 g to 2 g of the elastomeric sample into a heat-resistant glass tube (preferred size: 160 mm × ø 16 mm). While holding the tube horizontally, heat moderately over a low bunsen burner flame, passing the flame over the bottom and the sides of the test tube until the water in the sample is driven off. When condensate has formed near the top edge of the test tube, deposit several drops onto a potassium bromide crystal of the transmittance cell. Place the assembled cell in the IR spectrometer and scan between 4 000 $cm^{-1}$ and 600 $cm^{-1}$.

## B.3 Expression of results

Report the results as a recorded diagram showing the absorbance (transmittance) plotted versus the wave number.