
**Rubber, vulcanized and
thermoplastic — Preformed gaskets
used in buildings — Classification,
specifications and test methods**

*Caoutchouc vulcanisé et thermoplastique — Profils d'étanchéité
utilisés dans le bâtiment — Classification, spécifications et méthodes
d'essai*

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 45, *Rubber and rubber products*, Subcommittee SC 4, *Products (other than hoses)*.

This third edition cancels and replaces the second edition (ISO 3934:2002), which has been technically revised.

The main changes to the previous edition are as follows:

- requirements on estimation of lifetime have been added;
- hardness tolerance has increased;
- references have been updated.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Preformed gaskets used in buildings have conditions of use which differ depending on their function and position in the building. When preparing this document, it was felt necessary to take into account the various conditions to which the gaskets are subjected in order to define the material specifications. The tests take into account the static and dynamic stresses to which the gaskets are subjected.

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Rubber, vulcanized and thermoplastic — Preformed gaskets used in buildings — Classification, specifications and test methods

WARNING — Persons using this document should be familiar with normal laboratory practice. This document does not purport to address all of the safety problems, if any, associated with its use. It is the responsibility of the user of this document to establish appropriate safety and health practices and to determine the applicability of any national regulatory conditions.

1 Scope

This document specifies a system of classification of materials used in preformed gaskets for buildings. It applies to the following products:

- a) gaskets for use round the inside of door or window casings, i.e. weatherstripping (dynamic gaskets);
- b) gaskets for glazing (static gaskets);
- c) gaskets for use round infilling;
- d) gaskets for use between facade parts;
- e) gaskets for use between masonry walls.

In addition to specifying the characteristics required for the constituent materials, some functional tests on the gaskets themselves are specified. The corresponding test procedures are given in [Annexes A to E](#).

This document applies to preformed gaskets made from vulcanized or thermoplastic rubber. It also applies to preformed gaskets made of cellular rubber designed for use at temperatures between -20 °C and $+55\text{ °C}$ (thermal conditions category P_1) and between -40 °C and $+70\text{ °C}$ (thermal conditions category P_3) (see [Clause 4](#)).

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

ISO 48-4, *Rubber, vulcanized or thermoplastic — Determination of hardness — Part 4: Indentation hardness by durometer method (Shore hardness)*

ISO 105-A02, *Textiles — Tests for colour fastness — Part A02: Grey scale for assessing change in colour*

ISO 188:2011, *Rubber, vulcanized or thermoplastic — Accelerated ageing and heat resistance tests*

ISO 812, *Rubber, vulcanized or thermoplastic — Determination of low-temperature brittleness*

ISO 815-1, *Rubber, vulcanized or thermoplastic — Determination of compression set — Part 1: At ambient or elevated temperatures*

ISO 815-2, *Rubber, vulcanized or thermoplastic — Determination of compression set — Part 2: At low temperatures*

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ISO 1431-1, *Rubber, vulcanized or thermoplastic — Resistance to ozone cracking — Part 1: Static and dynamic strain testing*

ISO 2285:2019, *Rubber, vulcanized or thermoplastic — Determination of tension set under constant elongation, and of tension set, elongation and creep under constant tensile load*

ISO 3384-1:2019, *Rubber, vulcanized or thermoplastic — Determination of stress relaxation in compression — Part 1: Testing at constant temperature*

ISO 4892-2, *Plastics — Methods of exposure to laboratory light sources — Part 2: Xenon-arc lamps*

ISO 11346, *Rubber, vulcanized or thermoplastic — Estimation of life-time and maximum temperature of use*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

3.1 compression force

force needed to compress a test piece through its working range to its *minimum width* (3.3)

3.2 compression recovery

ability of a gasket to recover its shape after being compressed through its working range

3.3 minimum width

lower limit of the *working compression range*. (3.7)

Note 1 to entry: For a glazing gasket, the minimum width is the sum of the gaps between the glass and the frame on each side of the glass. For weatherstripping, it is the gap between the door or window and the casing, measured at the hinge side.

Note 2 to entry: It is recommended that the minimum width of weatherstripping and the minimum clearance between glazing and frame for a glazing gasket be agreed by consultation between designer, manufacturer and user

3.4 sample

complete batch of test material (gaskets) as supplied by the manufacturer for test purposes and from which test pieces are cut

3.5 stress relaxation

time-dependent decrease in stress at a constant deformation

3.6 weathering resistance

resistance to combined detrimental influences of the outdoor environment (e.g. sunlight, ozone, oxygen, humidity, temperature) on a material

3.7**working compression range**

range, stated by the manufacturer, through which the gasket performs its function of being compressed or otherwise deformed when used in any particular product

Note 1 to entry: See [Annex A](#).

EXAMPLE For a gasket of *free height* (3.8) 7,5 mm, the manufacturer states a working range of 3 mm to 6 mm.

3.8**free height**

height of a gasket measured without causing any significant deformation

Note 1 to entry: See [Figure 1](#).

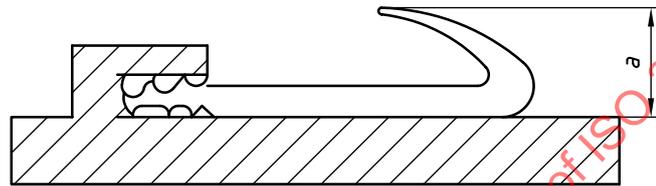


Figure 1 — Example of measurement of free height

4 Environmental conditions

The conditions to which gaskets may be subjected in the working environment are divided into the following categories:

a) Thermal conditions (depending on the climate and the position in the construction)

- P₁: temperature of preformed gasket -20 °C to +55 °C
- P₂: temperature of preformed gasket -20 °C to +85 °C
- P₃: temperature of preformed gasket -40 °C to +70 °C
- P₄: temperature of preformed gasket -40 °C to +100 °C

b) Mechanical conditions

- X: static uses (see [Table 1](#)), i.e. between fixed elements
- Y: dynamic uses (see [Table 1](#)), i.e. between moving elements

c) Weathering

- R₁: protected from solar radiation
- R₂: exposed to solar radiation

5 Classification and specification**5.1 Classification**

From the results of the tests carried out in accordance with this document, the classification of a particular type of gasket shall be determined using [Table 1](#). The numbers from [Table 1](#), taken in the order given, form the classification code for that gasket, viz:

A	B	C	D	E	F	G
---	---	---	---	---	---	---

- A: type of gasket
- B: working compression range
- C: compression force
- D: working temperature range
- E: compression recovery
- F: stress relaxation
- G: weathering resistance

Figure 2 gives a typical example of a classification code.

5.2 Specifications

The characteristics for the different classification criteria shall meet the requirements specified in Tables 2 to 9.

6 Test pieces

Test pieces shall be prepared in accordance with the relevant standard test method or the relevant annex of this document and, whenever possible, shall be cut from the gasket to be tested.

Failing this, they shall be taken from extruded ribbon (2 mm thick, 30 mm in width) or from appropriately dimensioned test slabs prepared from the same batch of material used to produce the gaskets being assessed and obtained under conditions that have been shown by experience to give comparable results.

If measurements are made on test pieces not conforming to the standard referenced in Tables 2 to 9 (e.g. part of a gasket), the results can be different and the requirements to be met shall be subject to agreement between the interested parties.

Table 1 — Classification of gaskets

Code-letter	Characteristic	Class									
		0	1	2	3	4	5	6	7	8	9
A	Type of gasket	X: static use Y: dynamic use									
B	Working compression range (mm) Measured in accordance with Annex A		$u \leq 1$	> 1 but $u \leq 2$	> 2 but $u \leq 4$	> 4 but $u \leq 6$	> 6 but $u \leq 8$	> 8 but $u \leq 10$	> 10 but $u \leq 15$	> 15 but $u \leq 30$	> 30
C	Compression force (N/m) Measured in accordance with Annex B		$u \leq 10$	> 10 but $u \leq 20$	> 20 but $u \leq 50$	> 50 but $u \leq 100$	> 100 but $u \leq 200$	> 200 but $u \leq 500$	> 500 but $u \leq 700$	> 700 but $u \leq 1\,000$	> 1\,000
Key u measured value											

Table 1 (continued)

Code-letter	Characteristic	Class									
		0	1	2	3	4	5	6	7	8	9
D	Working temperature range (°C)		-20 to +55 (P ₁)	-20 to +85 (P ₂)	-40 to +70 (P ₃)	-40 to +100 (P ₄)					
E	Compression recovery (%) Measured in accordance with Annex C		$u \leq 20$	> 20 but $u \leq 30$	> 30 but $u \leq 40$	> 40 but $u \leq 50$	> 50 but $u \leq 60$	> 60 but $u \leq 70$	> 70 but $u \leq 80$	> 80 but $u \leq 90$	> 90
F	Stress relaxation (%) Measured in accordance with Annex D		$u \leq 20$	> 20 but $u \leq 30$	> 30 but $u \leq 40$	> 40 but $u \leq 50$	> 50 but $u \leq 60$	> 60 but $u \leq 70$	> 70 but $u \leq 80$	> 80 but $u \leq 90$	> 90
G	Weathering resistance		R ₁ Table 8	R ₂ Table 9							

Key
u measured value

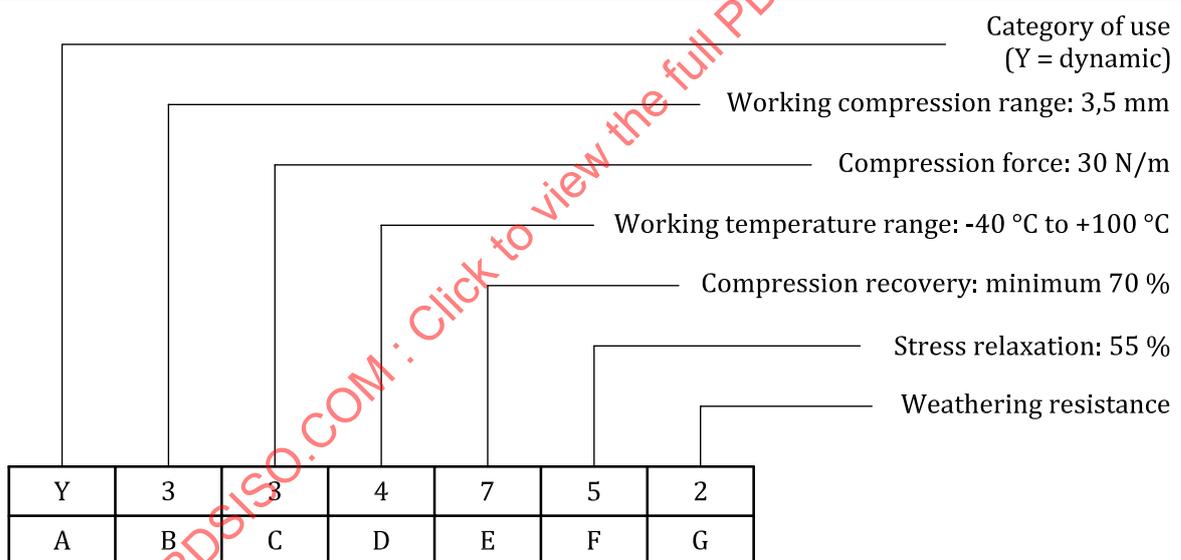


Figure 2 — Typical example of classification code

Table 2 — Requirements for thermal conditions category P₁

Characteristic	Unit	Specification	Test method
Tolerance on nominal hardness	Shore A	+5 -5	ISO 48-4 For thermoplastic rubber read after 15 s
Brittleness temperature limit	°C	-35	ISO 812
Deformation tests		X	Y

Table 2 (continued)

Characteristic	Unit	Specification		Test method
Compression set Type B test piece 25 % compression 22 h in air at 55 °C 22 h recovery at standard laboratory temperature — Vulcanized rubber max. — Thermoplastic rubber max. — Cellular rubber max.	%	30	30	ISO 815-1
Tension set T50 test piece 25 % elongation 22 h in air at 55 °C 22 h recovery at standard laboratory temperature — Vulcanized rubber max. — Thermoplastic rubber max. — Cellular rubber max.	%	15 40 40	15 40 40	ISO 2285:2019, method A
Ageing: 14 days in air at 70 °C Change in hardness Change in stress at 100 % elongation (for thermoplastic rubber) Change in elongation at break Change in length max. Change in elongation at break minimum absolute value	Shore A % % % %	between +10 and -5 between +20 and -15 between +10 and -30 -2 100		ISO 188:2011, method A ISO 48-4 ISO 37 ISO 37 Annex E ISO 37
Estimation of lifetime: Arrhenius procedure Testing of stress relaxation at three temperatures	%	100 years at 30 °C To 50 % relaxation		ISO 11346 ISO 3384-1:2019, method A

Table 3 — Requirements for thermal conditions category P₂

Characteristic	Unit	Specification		Test method
Tolerance on nominal hardness	Shore A	+5 -5		ISO 48-4 For thermoplastic rubber read after 15 s
Brittleness temperature limit	°C	-35		ISO 812
Deformation tests Compression set Type B test piece 25 % compression 22 h in air at 85 °C 22 h recovery at standard laboratory temperature — Vulcanized rubber max. — Thermoplastic rubber max.	%	X 35 70	Y 35 55	ISO 815-1

Table 3 (continued)

Characteristic	Unit	Specification		Test method
Tension set T50 test piece 25 % elongation 22 h in air at 85 °C 22 h recovery at standard laboratory temperature — Vulcanized rubber max. — Thermoplastic rubber max.	% %	20 60	20 50	ISO 2285:2019, method A
Ageing: 14 days in air at 100 °C Change in hardness Change in stress at 100 % elongation (for thermoplastic rubber) Change in elongation at break Change in length max. Change in elongation at break minimum absolute value	Shore A % % % %	between +10 and -5 between +20 and -15 between +10 and -30 -2 100		ISO 188:2011, method A ISO 48-4 ISO 37 ISO 37 Annex E ISO 37
Estimation of lifetime: Arrhenius procedure Testing of stress relaxation at three temperatures	%	100 years at 45 °C To 50 % relaxation		ISO 11346 ISO 3384-1:2019, method A

Table 4 — Requirements for thermal conditions category P₃

Characteristic	Unit	Specification		Test method
Tolerance on nominal hardness	Shore A	+5 -5		ISO 48-4 For thermoplastic rubber read after 15 s
Brittleness temperature limit	°C	-55		ISO 812
Deformation tests Compression set Type B test piece 25 % compression 22 h in air at 70 °C 22 h recovery at standard laboratory temperature — Vulcanized rubber max. — Thermoplastic rubber max. — Cellular rubber max.	% % %		X Y	ISO 815-1
Tension set T50 test piece 25 % elongation 22 h in air at 70 °C 22 h recovery at standard laboratory temperature — Vulcanized rubber max. — Thermoplastic rubber max. — Cellular rubber max.	% % %	35 65 65	35 55 50	
		20 60 60	20 50 50	ISO 2285:2019, method A

Table 4 (continued)

Characteristic	Unit	Specification	Test method
Ageing: 14 days in air at 85 °C			ISO 188:2011, method A
Change in hardness	Shore A	between +10 and -5	ISO 48-4
Change in stress at 100 % elongation (for thermoplastic rubber)	%	between +20 and -15	ISO 37
Change in elongation at break	%	between +10 and -30	ISO 37
Change in length max.	%	-2	Annex E
Change in elongation at break minimum absolute value	%	100	ISO 37
Estimation of lifetime:			
Arrhenius procedure		100 years at 40 °C	ISO 11346
Testing of stress relaxation at three temperatures	%	To 50 % relaxation	ISO 3384-1:2019, method A

Table 5 — Requirements for thermal conditions category P₄

Characteristic	Unit	Specification		Test method
Tolerance on nominal hardness	Shore A	+5 -5		ISO 48-4 For thermoplastic rubber read after 15 s
Brittleness temperature limit	°C	-55		ISO 812
Deformation tests		X	Y	
Compression set				
Type B test piece 25 % compression 22 h in air at 100 °C 22 h recovery at standard laboratory temperature				ISO 815-1
— Vulcanized rubber max.	%	35	35	
— Thermoplastic rubber max.	%	70	55	
Tension set				
T50 test piece 25 % elongation 22 h in air at 100 °C 22 h recovery at standard laboratory temperature				ISO 2285:2019, method A
— Vulcanized rubber max.	%	20	20	
— Thermoplastic rubber max.	%	60	50	
Ageing: 14 days in air at 125 °C				ISO 188:2011, method A
Change in hardness	Shore A	between +10 and -5		ISO 48-4
Change in stress at 100 % elongation (for thermoplastic rubber)	%	between +20 and -15		ISO 37
Change in elongation at break	%	between +10 and -30		ISO 37
Change in length max.	%	-2		Annex E

Table 5 (continued)

Characteristic	Unit	Specification	Test method
Change in elongation at break minimum absolute value	%	100	ISO 37
Estimation of lifetime: Arrhenius procedure		100 years at 50 °C	ISO 11346
Testing of stress relaxation at three temperatures	%	To 50 % relaxation	ISO 3384-1:2019, method A

Table 6 — Mechanical requirements for static use

Characteristic	Unit	Specification	Test method
Stress relaxation			
Initial counterforce	N	To be agreed between manufacturer, designer and user	Annex D
Counterforce after ageing	N		
Result	%		

Table 7 — Mechanical requirements for dynamic use

Characteristic	Unit	Specification	Test method
Compression set			
Type B test piece 25 % compression (for P ₁ , P ₂ , P ₃ , P ₄) 22 h at -25 °C max.			
— Vulcanized rubber	%	max. 80	ISO 815-2
— Thermoplastic rubber	%	max. 90	
Compression recovery test	%	As per classification	Annex C

Table 8 — Requirements for weathering resistance category R₁

Characteristic	Specification	Test method
Ozone resistance test Condition for 96 h at 20 % elongation Ozone concentration 50 pphm Temperature 40 °C	No cracking	ISO 1431-1

Table 9 — Requirements for weathering resistance category R₂

Characteristic	Specification	Test method
Ozone resistance test Condition for 96 h at 20 % elongation Ozone concentration 200 pphm Temperature 40 °C	No cracking	ISO 1431-1
Weathering resistance test Expose to xenon-arc lamp operating at 550 W/m ² to 1 000 W/m ² and between 290 nm and 800 nm Black-panel temperature 55 °C ± 3 °C Spraying time 18 min Interval between spraying 102 min		ISO 4892-2 (see also Table 10)

Table 9 (continued)

Characteristic	Specification	Test method
For 3 GJ/m ² , change in: — Colour	Grey-scale rating W 3	ISO 105-A02
For 8 GJ/m ² , change in: — Stress at 100 % elongation, in % — Elongation at break, in % — Appearance	Not more than ±15 Between +10 and -30 No cracking	

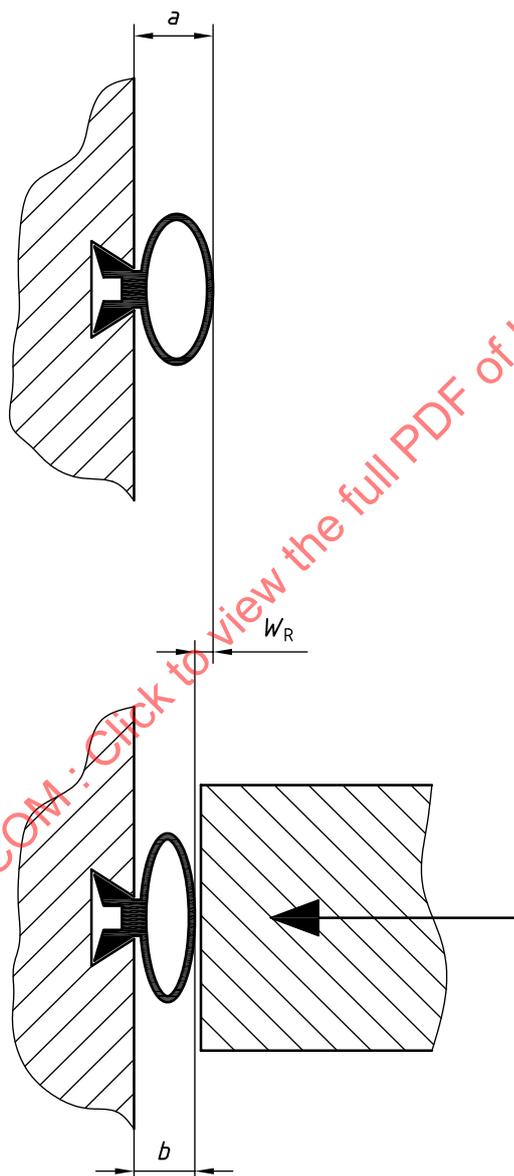
Table 10 — Examples of exposure time calculations for 550 W/m² and 1 000 W/m²

Wavelength of xenon-arc lamp	Energy of exposure	Total energy received by gaskets	Exposure time
Between 290 nm and 800 nm	550 W/m ²	3 GJ/m ²	$\frac{3 \times 10^9}{550 \times 3\,600} \cong 1\,500 \text{ h}$
		8 GJ/m ²	$\frac{8 \times 10^9}{550 \times 3\,600} \cong 4\,000 \text{ h}$
	1 000 W/m ²	3 GJ/m ²	$\frac{3 \times 10^9}{1\,000 \times 3\,600} \cong 800 \text{ h}$
		8 GJ/m ²	$\frac{8 \times 10^9}{1\,000 \times 3\,600} \cong 2\,200 \text{ h}$

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Annex A (normative)

Working compression range



Key

W_R working range

Figure A.1 — Working compression range of preformed gaskets

EXAMPLE $W_R = a - b$

$a = 7 \text{ mm}$

$b = 5 \text{ mm}$

$\therefore W_R = 2 \text{ mm}$

Annex B (normative)

Compression force

B.1 General

This annex specifies the method to be used to test a sample of static or dynamic gaskets to determine the compression force required to compress them by a predetermined amount under the conditions laid down in the test.

The test has been devised to cover all likely gasket shapes and materials.

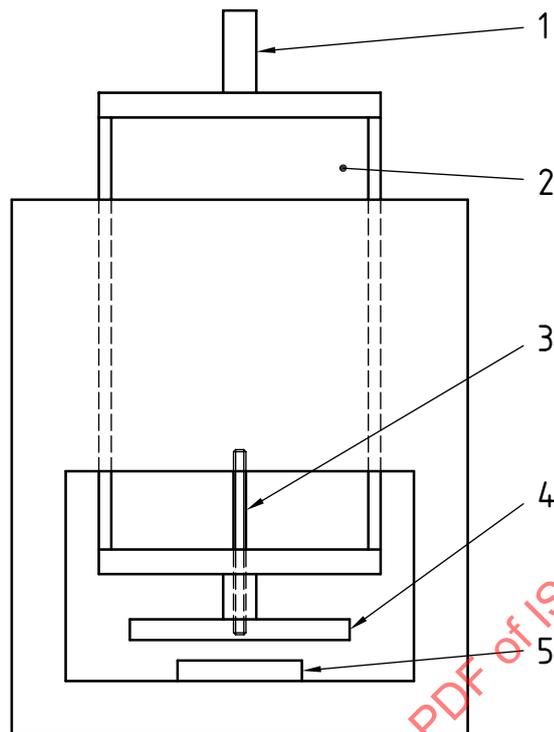
B.2 Apparatus

B.2.1 Compression device (see [Figure B.1](#)), enabling three test pieces to be mounted separately or together and compressed in accordance with the manufacturer's design concept.

B.2.2 Means of measuring height of test piece to an accuracy of $\pm 0,01$ mm.

B.2.3 Means of measuring the compression force to an accuracy of better than 1 %.

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**Key**

- 1 transmission spindle
- 2 locking system
- 3 compensating spring
- 4 plate
- 5 test piece

Figure B.1 — Example of compression device

B.3 Test pieces

A sample of the gasket to be tested shall be provided by the manufacturer, together with drawings depicting its declared free shape and disposition in use, as well as a statement as to the gasket's working compression range.

The sample shall be supplied in a condition truly representative of the requirements for use and stored in the relaxed state for at least one day at standard laboratory temperature and humidity.

After this conditioning period, cut three test pieces of minimum length 100 mm and maximum length 500 mm from various positions within the sample.

B.4 Procedure

Figure B.2 shows an example of a compression force apparatus.

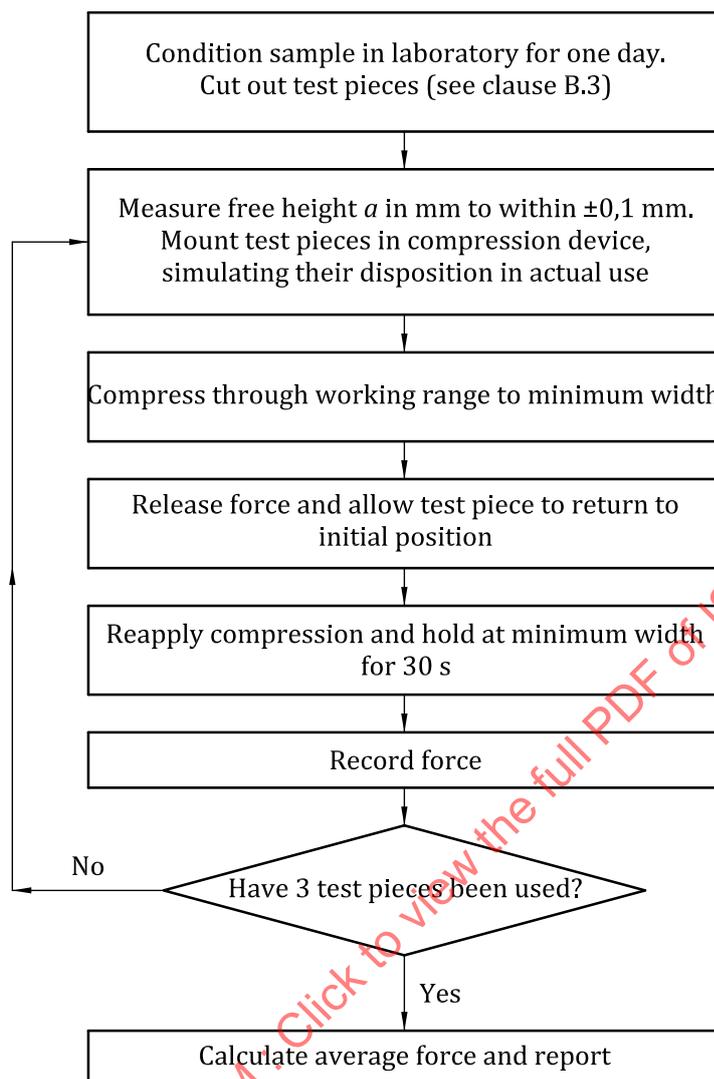


Figure B.2 — Example of a compression force apparatus