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**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

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**Tolerances for rubber products - Part 1: Dimensional tolerances
(English Translation)**

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1 Scope

This document specifies the dimensional tolerance classes and values for molded, extruded, calendered solid rubber products; describes the appropriate measurement methods required to determine conformity to this document.

The tolerances specified in this document apply primarily to vulcanized rubber products, but also to thermoplastic rubber products.

This document does not apply to precision annular seals or calendered composite products such as rubber sheets, or products covered with rubber by coating or pasting methods.

2 Normative references

The following documents, through normative references herein, constitute essential provisions of this document. For dated references, only the version corresponding to that date applies to this document; for undated references, the latest version (including all amendments) applies.

ISO 3 Preferred numbers - Series of preferred numbers

Note: GB/T 321-2005 Preferred numbers and series of preferred numbers (ISO 3.1973, IDT)

ISO 48-2 Rubber, vulcanized or thermoplastic - Determination of hardness - Part 2.

Hardness between 10 IRHD and 100 IRHD

Note 1: There are no technical differences between the content referenced in ISO 48-2 and the content referenced in ISO 48.

Note 2: GB/T 6031-2017 Rubber, vulcanized or thermoplastic - Determination of hardness (hardness 10 IRHD ~ 100 IRHD) (10 IRHD ~ 100 IRHD) (ISO 48-2:2010, IDT)

ISO 2230 Rubber products - Guidelines for storage

Note: GB/T 20739-2006 Rubber products - Guidelines for storage (ISO 2230:2002, IDT)

ISO 23529 Rubber - General procedures for preparing and conditioning test pieces for physical test methods

Note: GB/T 2941-2025 Rubber - General procedures for preparing and conditioning test pieces for physical test methods (ISO 23529:2016, IDT)

3 Terms and definitions

This document does not contain any terms or definitions that need to be defined.

4.1 General rules

For solid products, dimensional measurements shall be taken 16 hours after vulcanization. In cases of dispute, this minimum time may be extended to 72 hours. The buyer's measurements shall be completed, within three months of the date of shipment or before the product is put into use (whichever is earlier); it shall be performed at standard temperature after adjustment according to ISO 23529. Care shall be taken to ensure that the product is not subject to the adverse storage conditions specified in ISO

2230 and that the product does not deform during measurement.

4.2 Measuring instruments

4.2.1

Measurements shall be performed using one or more of the following types of instruments, as appropriate.

4.2.1.1

Solid products can be measured using a graduated micrometer. According to

ISO 23529 and ISO 48-2, the measuring foot of the micrometer shall apply a pressure of 22 kPa $\pm$ 5 kPa for rubber with a hardness greater than or equal to 35 IRHD, or 10 kPa $\pm$ 2 kPa for rubber with a hardness less than 35 IRHD.

4.2.1.2

Suitable optical measuring instruments.

4.2.1.3

Fixed gauges with upper and lower limits adapted to the dimension to be measured.

4.2.1.4

Other measuring instruments, including tape measures (with or without vernier), vernier calipers, micrometers.

4.2.2

The measurement error of all instruments shall be within the specified tolerance range.

4.2.3

The same measuring instrument shall be used in all measurements intended for comparison.

5 Tolerances

In accordance with ISO 3, the nominal dimensions and tolerances in this document are based on the R5 and R10 series of preferred numbers, respectively.

For a specific product, the dimensions of certain parameters may not all require the same grade of tolerance. For products on the same drawing, different grades of tolerance may be used for different parameter dimensions. When the drawing does not specify the required grade of tolerance, the maximum tolerance listed in the relevant table shall be used.

Note 1: Tolerances specified in this document are expressed using equal positive and negative values (e.g., ± 0.35), or unequal positive and negative values, as long as the difference between the two values remains constant. For example, ± 0.35 can also be expressed as $+0.35$, -0.35 , or $+0.35$, -0.35 , etc.

Note 2: For vulcanizates with low hardness and high tensile strength (e.g., vulcanizates of natural rubber), special consideration is necessary for tolerances.

6.1 General principles

The dimensional tolerances described in this document are wider than those used in some other engineering practices because of the following considerations.

a) All rubbers shrink to some extent after molding and cooling; therefore, this shall be taken into account in mold design. The amount of shrinkage depends on the type of rubber and the compound used; even for the same compound, different batches will have different shrinkage rates. Silicone rubber, fluoro-rubber, other specialty rubber products have higher shrinkage rates, making it difficult to meet

M1 and M2 grade (see 6.2) tolerance requirements using these rubbers.

b) Non-rubber components bonded to the rubber can affect shrinkage, thus impacting the applicable tolerances.

c) Molds are manufactured using different methods depending on the type of product and the required precision. Generally, the precision of the product is not higher than that of the

mold; the higher the required precision, the more expensive the mold and other maintenance costs.

d) Caution shall be exercised when using standard tolerances for products with large cross-sectional variations.

e) Rubber products inevitably deform during demolding, which may affect the product's dimensions. Special allowances must be considered in such cases.

6.2 Classification

The following four tolerance grades are specified for the fixed and closed dimensions (see 6.3) of solid molded products.

a) M1 grade. Applicable to precision molded products. These products require precision molds, fewer cavities, tight control of the rubber compound, resulting in high costs. Optical measuring instruments or other similar measuring instruments are needed to minimize deformation of the rubber caused by measuring instruments. These components require precise control and inspection procedures.

b) M2 grade. Applicable to high-quality molded products, incorporating many of the tight controls required by M1.

c) M3 grade. Suitable for molded products of good quality.

d) M4 grade. Suitable for molded products with less stringent dimensional control.

See 6.5 for flash classification.

6.3 Fixed dimensions and mold closure dimensions

When molding rubber products, more rubber is used than is needed to fill the mold cavity; this excess rubber overflows and becomes flash. This flash often hinders the complete closure of mold components, thus affecting the dimensions of the product.

Note: For products molded using the transfer or injection molding method, all dimensions may be considered fixed dimensions.

The following two sets of definitions for fixed dimensions (F) and mold closure dimensions (C) are given.

6.3.1 Fixed dimensions (F). Dimensions unaffected by flash thickness or deformation

caused by lateral displacement of different mold components (upper mold, lower mold, or mold core). See dimensions I1, I2, I3 in Figure 1.