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# Silk — Test method for determining the size of silk yarns

*Soie — Méthode d'essai pour déterminer le titre des fils de soie*



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# Foreword

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This document was prepared by Technical Committee ISO/TC 38, *Textiles*, Subcommittee SC 23, *Fibres and yarns*.



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# Introduction

Silk yarns are made of natural silk fibres, including raw silk, tussah silk, dupion silk, thrown silk, etc. Due to the intrinsic unevenness of the property of silk fibres and its manufacturing technique differing from yarns made of staple fibres, the size (linear density) deviation of the silk yarns, such as raw silk reeled from cocoon baves, is much bigger than that of the conventional yarns covered by ISO 2060. Therefore, when measuring the size of silk yarns, the sample quantity, sample length, test device, drying temperature, test items, calculation method of the results and tolerance for weighing errors are all different from that for the conventional yarns. These special requirements are not prescribed in ISO 2060. This document covers special size test regulations for silk yarns which are not covered by ISO 2060.

# Silk — Test method for determining the size of silk yarns

## 1 Scope

This document specifies the test method for determining the size of silk yarns in all types of package forms.

It is applicable to various kinds of silk yarns.

It is not applicable to spun silk yarns.

## 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 139, *Textiles — Standard atmospheres for conditioning and testing*

ISO 6741-1:1989, *Textiles — Fibres and yarns — Determination of commercial mass of consignments — Part 1: Mass determination and calculations*



## 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**
**silk yarn**
yarn made of nature silk fibres, including raw silk, tussah silk, dupion silk, thrown silk

**3.2**
**thrown silk**
silk that has been twisted or doubled and twisted

**3.3**
**size**
linear density (mass per unit length) of silk yarns

Note 1 to entry: Size expresses the degree of coarseness or fineness of silk yarns.

Note 2 to entry: Size is expressed in dtex. It may also be expressed in deniers (den), for which the conversion from dtex, as given in ISO 1144[1], is 1 den = 0,9 dtex.

**3.4**
**nominal size**
size indicated by the manufacturer

**3.5**
**average size**
average value of the tested size of the sizing skeins

**3.6**
**conditioned size**
size calculated by adding the commercial moisture regain weight to the oven-dry weight

Note 1 to entry: For silk, the commercial moisture regain is 11,0 %, which was developed in 1841, and then was widely used by Japan, China, India, etc. See Reference [4].

**3.7**
**size deviation**
standard deviation of the value of the tested size of the silk samples indicating the deviation degree of the sizing skeins from the average size of the whole lot

**3.8**
**maximum size deviation**
indication of the deviation degree of the finest sizing skeins or the coarsest sizing skeins from the average size of the whole lot

**3.9**
**coefficient of variation of size**
$CV_{\text{size}}$
percentage ratio between the size deviation and the average size

## 4 Principle

Under standard atmosphere, the sizing skeins are prepared by winding prescribed revolutions of silk yarn on a reel with a specified length of circumference from conditioned silk samples. The sizing skeins are weighed. The silk size is calculated from the length and mass, expressed in dtex (or den).



## 5 Apparatus



**5.1 Wrap reel**, with a reel circumference of (1 125 ± 2,5) mm, revolving at a constant speed of (300 ± 15) r/min to ensure a constant tension or fitted with a positive feed system at a controlled tension of (0,05 ± 0,01) cN/dtex, equipped with a dial showing the number of revolutions and an automatic stop-motion to stop the reel.

A reel circumference of (1 000 ± 2,5) mm may be used and reported in the test report (see Clause 9) if mutually agreed by the interested parties**.**

**5.2 Size testing devices.**

a) For balance: resolution ≤0,001 g.

b) For size tester: resolution ≤0,25 dtex (0,25 den).

**5.3 Principle of size testing device**.

The size testing device is a kind of balance with a built-in computing program which changes the weight of each sizing skein (test sample of a prescribed length) into size value according to the definition of size. The built-in program in the device can calculate and print out size distribution, size deviation, maximum size deviation and $CV_{\text{size}}$ automatically.

**5.4 Oven**, as described in ISO 2060[2], in which the silk yarn samples are exposed at a temperature of 140 °C ± 2 °C.

# 6 Atmosphere for conditioning and testing

Atmospheres used for pre-conditioning, conditioning and testing shall be in accordance with ISO 139. Condition the entire samples for a minimum of 12 h prior to testing and keep them conditioned during testing.

# 7 Procedure

## 7.1 Sampling

### 7.1.1 Sample length

The test length of each sizing skein shall be 112,5 m obtained from 100 revolutions of the wrap reel. When the reel circumference of (1 000 ± 2,5) mm is used, the number of revolutions shall be 112,5.

### 7.1.2 Sample quantity

The number of sizing skeins shall be a multiple of 50, subject to specific silk material specifications or agreement between parties concerned. Otherwise, take the skeins as follows:

— 100 sizing skeins, for a nominal size of silk yarn ≥78 dtex (70 den);

— 200 sizing skeins, for a nominal size of silk yarn <78 dtex (70 den).



## 7.2 Preparation

**7.2.1** The number of packages (skein or cone) for the laboratory sample shall be no less than 10.



**7.2.2** For silk in skeins, wind the silk onto bobbins. For silk on cones, prepare sizing skeins directly.

**7.2.3** Put the silk bobbins or cones upright on the wrap reel, and then reel the sizing skein up to a total length of 112,5 m from each silk bobbin or cone. Prepare the sizing skein neatly by tying the two thread ends tightly, with a knot no longer than 1 cm. Reel and prepare a specified quantity (7.1.2) of silk samples for weighing.

## 7.3 Weighing

**7.3.1** Sort every 50 sizing skeins as one group and weigh each skein on a balance or size tester one by one.

**7.3.1.1** With a balance, weigh the sizing skeins of each group on the balance one by one, and record the mass of each sizing skein. Calculate each corresponding size value, and then record the size of each sizing skein according to the following rounding provisions:

— <56 dtex (50 den): to the nearest 0,5 dtex (den);

— ≥56 dtex (50 den) and <167 dtex (150 den): to the nearest 1,0 dtex (den);

— ≥167 dtex (150 den): to the nearest 2,0 dtex (den).

**7.3.1.2** With a size tester, weigh the sizing skeins of each group on the size tester one by one, and then record the size of each sizing skein according to the rounding provisions specified in 7.3.1.1.

**7.3.2** Weigh all the 50 sizing skeins of each group together on the balance to get the total weight, convert the total weight into total size and round the value to the nearest 0,5 dtex (den).