



BSI Standards Publication

# Determination of dimensional characteristics of sleeping bags

Part 3: Volume under load and easiness of packing

**National foreword**

This British Standard is the UK implementation of EN 13538-3:2016. It supersedes BS EN 13538-3:2002 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee SW/136/11, Sleeping bags and tents.

A list of organizations represented on this committee can be obtained on request to its secretary.

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English Version

## Determination of dimensional characteristics of sleeping bags - Part 3: Volume under load and easiness of packing

Détermination des caractéristiques dimensionnelles  
des sacs de couchage - Partie 3: Volume sous charge et  
facilité d'emballage

Bestimmung der Maßhaltigkeit von Schlafsäcken - Teil  
3: Kompressionsvolumen und  
Verpackungsfreundlichkeit

This European Standard was approved by CEN on 2 May 2016.

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<b>Contents</b>		Page
<b>European foreword</b> .....		<b>3</b>
<b>1</b>	<b>Scope</b> .....	<b>4</b>
<b>2</b>	<b>Normative references</b> .....	<b>4</b>
<b>3</b>	<b>Terms and definitions</b> .....	<b>4</b>
<b>4</b>	<b>Principle</b> .....	<b>4</b>
<b>4.1</b>	<b>Volume under load</b> .....	<b>4</b>
<b>4.2</b>	<b>Easiness of packing</b> .....	<b>4</b>
<b>5</b>	<b>Measuring device</b> .....	<b>4</b>
<b>6</b>	<b>Conditioning of test specimen</b> .....	<b>4</b>
<b>7</b>	<b>Procedure</b> .....	<b>5</b>
<b>8</b>	<b>Test results</b> .....	<b>5</b>
<b>8.1</b>	<b>Volume of the sleeping bag under load</b> .....	<b>5</b>
<b>8.2</b>	<b>Calculation of the easiness of packing</b> .....	<b>5</b>
<b>9</b>	<b>Test report</b> .....	<b>5</b>
<b>Bibliography</b> .....		<b>6</b>

## European foreword

This document (EN 13538-3:2016) has been prepared by Technical Committee CEN/TC 136 “Sports, playgrounds and other recreational facilities and equipment”, the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by December 2016, and conflicting national standards shall be withdrawn at the latest by December 2016.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 13538-3:2002.

NOTE The text is based on an earlier draft prepared by CEN/TC 222 “Feather and down”.

EN 13538, *Determination of dimensional characteristics of sleeping bags*, consists of the following parts:

- *Part 2: Thickness and elastic recovery;*
- *Part 3: Volume under load and easiness of packing.*

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

## 1 Scope

This European Standard specifies a method of measurement of the volume under load of sleeping bags and a method of calculation of easiness of packing of sleeping bags filled with feather and/or down.

## 2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition on the referenced document (including any amendments) applies.

EN ISO 139, *Textiles - Standard atmospheres for conditioning and testing (ISO 139)*

## 3 Terms and definitions

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

### 3.1

#### **volume under load**

volume occupied by a sleeping bag when compressed in a specific cylinder under a specific load

### 3.2

#### **easiness of packing**

ratio between the volume under load and the volume inside the transport cover

## 4 Principle

### 4.1 Volume under load

A sleeping bag is positioned inside a tube. A load is then applied to it and the residual volume occupied by the bag within the tube is measured.

### 4.2 Easiness of packing

Calculation according to 8.2.

## 5 Measuring device

The device consists of:

- a) a cylinder having an inside diameter of  $(400 \pm 10)$  mm and a height of  $\geq 800$  mm;
- b) a cylindrical load having an outside diameter corresponding to that of the cylinder with 10 mm to 20 mm of clearance. The mass of the load is  $(50 \pm 1)$  kg;
- c) ruler graduated in millimetres;
- d) stopwatch with a resolution of at least 1 s.

## 6 Conditioning of test specimen

The conditioning shall be done in accordance with EN ISO 139.

The sleeping bag shall be conditioned for at least 12 h in ambient conditions of the test at a temperature of  $(20 \pm 2)$  °C and a relative humidity of  $(65 \pm 5)$  %.

## 7 Procedure

The sleeping bag is stuffed unfolded inside the cylinder. Then the cylindrical load (see Clause 5 b)) is lowered onto the sleeping bag inside the cylinder. After a period of  $(300 \pm 15)$  s determine the heights relevant to Formula (1). These measurements are conducted at three points on the circumference of the cylinder spaced  $(120 \pm 10)^\circ$ . The mean value of these three measurements is calculated.

## 8 Test results

### 8.1 Volume of the sleeping bag under load

The volume of the sleeping bag under load is calculated as follows:

$$V = \frac{\left(\frac{d}{2}\right)^2 [h_1 - h_2 - h_3] \cdot 3,142}{1\,000} \quad (1)$$

where

$V$  is the volume of the sleeping bag, in litres;

$h_1$  is the total height of the cylinder, in centimetres;

$h_2$  is the height remaining between the top of the cylinder and the top of the load, in centimetres;

$h_3$  is the thickness of the load, in centimetres;

$d$  is the diameter of the cylinder, in centimetres.

### 8.2 Calculation of the easiness of packing

Calculate according to the following formula:

$$F = \frac{4 \cdot V}{3,142 D^2 \cdot L} \quad (2)$$

where

$F$  is the easiness of packing, index value;

$V$  is the volume of the sleeping bag according to 8.1, in litres;

$D$  is the diameter of the sleeping bag packed in its transport cover, in centimetres;

$L$  is the length of the sleeping bag packed in its transport cover, in centimetres.

## 9 Test report

The test report shall include at least the following information:

- a) reference to this European Standard, i.e. EN 13538-3:2016;
- b) date and place of the test;
- c) identification of the sample;
- d) results rounded to the nearest centimetre;
- e) any deviation from this standard.

## Bibliography

prEN ISO 23537-1, *Requirements for sleeping bags - Part 1: Thermal and dimensional requirements (ISO/DIS 23537-1)*

prEN ISO 23537-2, *Requirements for sleeping bags - Part 2: Fabric and material properties (ISO/DIS 23537-2)*

EN 13538-2, *Determination of dimensional characteristics of sleeping bags - Part 2: Thickness and elastic recovery*





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