INTERNATIONAL STANDARD

ISO 18782

First edition
2015-09-15

Textiles — Determination of dynamic hygroscopic heat generation

Textiles — Détermination de la production de chaleur dynamique hygroscopique

Reference number
ISO 18782:2015(E)

Contents

Page

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).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword — Supplementary information

The committee responsible for this document is ISO/TC 38, *Textiles*.

Introduction

In the apparel and clothing market, warm heat-comfort textile material is attracting consumers' attention. It offers comfortable warmth through the combined technology of the hygroscopic heat generation and heat insulation.

The phenomenon of the hygroscopic heat generation is known as a common function of natural fibres especially, but not so much for synthetic fibres. So, the synthetic fibre producers have been developing the fibres and textiles with an appropriate warm-feeling property.

This International Standard provides a test method to obtain the practical heat generation of textiles under wearing conditions.

The apparatus used in this test method has multiple test positions. So this method is practical and economical with high accuracy.

Textiles — Determination of dynamic hygroscopic heat generation

1 Scope

This International Standard specifies a test method for the determination of hygroscopic heat generated by flowing low then high humidity air on one side of a surface. It is applicable to all kinds of sheet-shaped textile materials.

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 of the referenced document (including any amendments) applies.

ISO 105-F02, *Textiles — Tests for colour fastness — Part F02: Specification for cotton and viscose adjacent fabrics*

3 Terms and definitions

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

3.1
generated hygroscopic heat
ΔT
hygroscopic heat generated by the loss of kinetic energy of water molecules which are adsorbed at a surface of textile material and then react with fibre molecules

Note 1 to entry: This is obtained from the difference between an initial temperature at low humidity air blow and a peak temperature at high humidity air blow in this test method.

3.2
peak temperature
maximum temperature in the case of *hygroscopic heat generation* (3.1)

4 Principle

Low humidity air is blown on one side of a specimen, then high humidity air is blown on the same side. The temperature of the same side of the specimen is measured during testing. When the air is switched from low humidity to high humidity, the temperature increases, reaches a peak and drops. The difference in the temperature between the initial temperature and the peak is defined as the hygroscopic heat generation. In this test method, the high humidity air flow rate is determined by a cotton control specimen in which the temperature difference becomes 2,8 °C.

5 Testing condition

5.1 Low humidity air. This air is taken from the constant temperature and humidity chamber (6.1) in which the temperature is set at 20 °C ± 2 °C and the humidity at (40 ± 3) % RH. The air flow rate is 1,0 l/min ± 0,1 l/min.

5.2 High humidity air, made by bubbling air through water in a bottle at a temperature, 20 °C ± 2 °C. The air source is the constant temperature and humidity chamber (6.1).

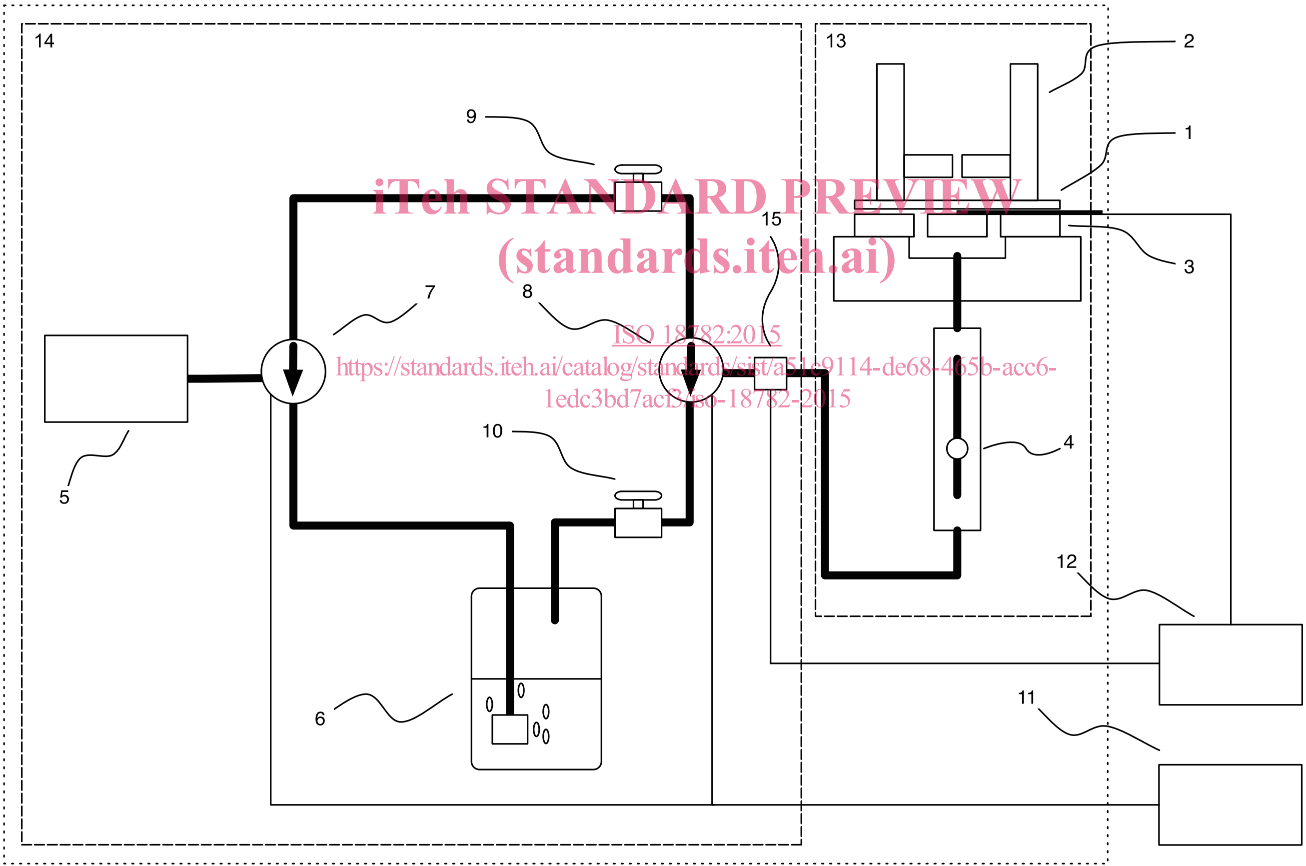
NOTE High humidity air is controlled by the air flow rate only; therefore, humidity measurements are not essential. However, tests have shown that the humidity stabilizes at (90 ± 5) % RH.

6 Apparatus

6.1 Constant temperature and humidity chamber, capable of maintaining the temperature at 20 °C ± 2 °C and the humidity at (40 ± 3)% RH. The hygroscopic heat generation testing apparatus (6.2) is placed in the chamber

6.2 Hygroscopic heat generation testing apparatus.

The schematic diagram of the testing apparatus is shown in Figure 1. All devices are placed in the chamber (6.1), except for the air-flow-path switch controller. Four test positions (Figure 1, 13) against one air supply line (Figure 1, 14) are shown in this example. A practical example is shown in Annex C.



Key

1 specimen
2 specimen holder
3 specimen table
4 air-flow-rate controller
5 air pump
6 air bubbling bottle with water
7, 8 air flow path switch
9, 10 air valve
11 air-flow-path switch controller
12 thermometer and monitoring recorder
13 test position
14 air supply line
15 humidity sensor
16 porous cylinder

Figure 1 — Testing apparatus configuration

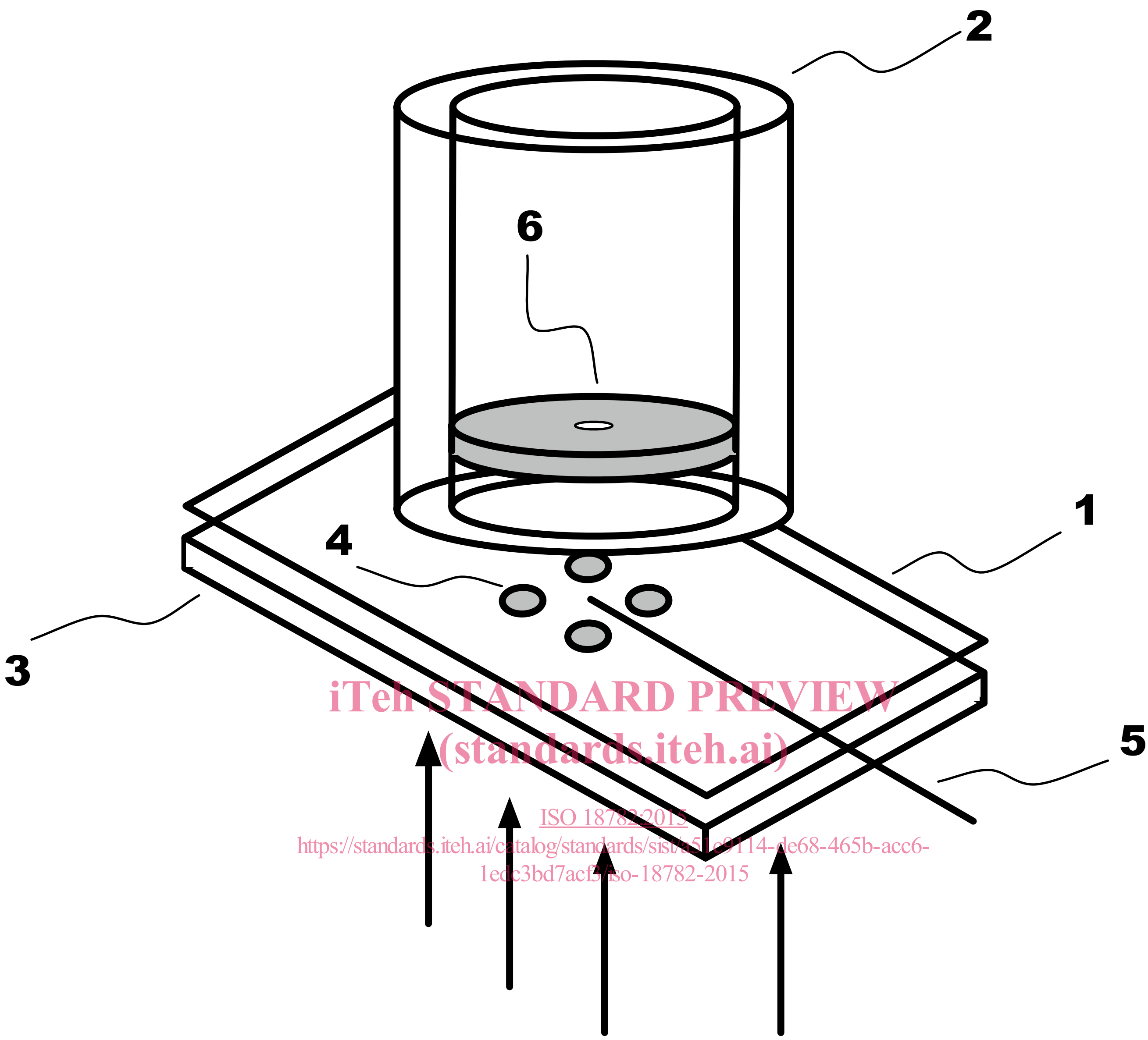
6.2.1 Air pump, capable of blowing air to the specimen at a rate of 1,0 l/min ± 0, 1 l/min.

6.2.2 Bubbling bottle, consisting of an air-tight bottle with an air inlet tube attached to a porous cylinder which is used to make air bubbles and with air outlet tube.

6.2.3 Air flow path switch, used for switching a low humidity air to take a path via 7, 9 and 8 or high humidity air to take a path via 7, 6, 10 and 8 through a water bubbling bottle in Figure 1.

6.2.4 Humidity sensor, used for detecting a humidity of air supply line, from 5 % RH to 100 % RH, accuracy ± 5 % RH.

6.2.5 Specimen table and holder, explained in Figure 2.



Key

1 specimen
2 specimen holder
3 specimen table
4 air path holes
5 thermometer
6 air lid with a vent hole

Figure 2 — Specimen table and holder

6.2.5.1 Specimen holder, consisting of a transparent acrylic cylinder with an outside diameter of 50 mm ± 5 mm, a thickness of 5 mm ± 3 mm and a height of 80 mm ± 5 mm. The air lid of the holder is placed at a height of 5 mm ± 1 mm from the bottom and an insulation material (polystyrene foam with a vent hole of a diameter of 3 mm ± 1 mm) is placed in the centre.

6.2.5.2 Specimen table, consisting of a board of polystyrene foam with a square of 50 mm, a thickness of 7 mm ± 2 mm and 4 air holes with a diameter of 5 mm each. The holes are located 10 mm from the centre of the table in diagonal positions on the square.

EXAMPLE For example, polystyrene foam with a thermal conductivity of 0,035 W/m K can be used as a heat-insulating material.

6.2.5.3 Thermometer, with a film-type sensor as shown in Figure 3, placed on the specimen table located at the centre of the table and covered by a specimen. A film-type sensor has a width of about 4 mm and a thickness of about 0,2 mm, a length is greater than 25 mm. The accuracy is ± 1,2 %.

Figure 3 — Sample of film type thermometer

6.3 Monitoring recorder, connected to the thermometer, to record the temperature data continuously.

6.4 Oven, capable of heating at 105 °C ± 3 °C.

6.5 Desiccant dehumidifier.

7 Reagents and materials

7.1 Water, tap water.

7.2 Control specimen, cut from a cotton fabric as specified in ISO 105-F02.

8 Preparation of specimens

8.1 Dimension, with a square of 60 mm ± 2 mm

8.2 Number of specimens, 4 test specimens for each test sample and 4 control specimens.