INTERNATIONAL STANDARD

ISO 12127-1

First edition
2007-11-15

Clothing for protection against heat and flame — Determination of contact heat transmission through protective clothing or constituent materials —

Part 1: Test method using contact heat produced by heating cylinder

Vêtements de protection contre la chaleur et la flamme — Détermination de la transmission thermique par contact à travers les vêtements de protection ou leurs matériaux constitutifs —

Partie 1: Méthode d'essai utilisant la transmission thermique par contact produite par un cylindre de chauffage

Reference number
ISO 12127-1:2007(E)

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Published in Switzerland

Foreword

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International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 12127-1 was prepared by Technical Committee ISO/TC 94, *Personal safety — Protective clothing and equipment*, Subcommittee SC 13, *Protective clothing*.

This first edition of ISO 12127-1 cancels and replaces ISO 12127:1996, of which it constitutes a minor revision.

ISO 12127 consists of the following parts, under the general title *Clothing for protection against heat and flame — Determination of contact heat transmission through protective clothing or constituent materials*:

— *Part 1: Test method using contact heat produced by heating cylinder*

— *Part 2: Test method using contact heat produced by dropping small cylinders*

Introduction

Protective clothing designed to protect against heat and flame can be exposed to direct contact with hot substances or hot surfaces.

The diversity of such contact conditions makes it difficult to evaluate the hazards that can arise from high temperature.

The test method described in this part of ISO 12127 allows this heat transfer to be assessed when a heating cylinder and the clothing material are brought into contact with each other.

This part of ISO 12127 forms part of a series of standards concerned with clothing designed to protect against heat and fire.

Clothing for protection against heat and flame — Determination of contact heat transmission through protective clothing or constituent materials —

Part 1:
Test method using contact heat produced by heating cylinder

1 Scope

This part of ISO 12127 specifies a test method for the determination of contact heat transmission. It is applicable to protective clothing (including hand protectors) and its contituent materials intended to protect against high contact temperatures.

Application of this part of ISO 12127 is restricted to contact temperatures between 100 °C and 500 °C.

2 Terms and definitions

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

2.1
contact temperature
T_c
surface temperature of the contact area of the heating cylinder, this temperature being kept constant

2.2
start of timing
moment when the upper surface of the calorimeter and the bottom edge of the heating cylinder are within 10 mm of each other

2.3
threshold time
t_t
time between the start of timing and the moment when the temperature of the calorimeter is 10 °C above its starting value

2.4
rate of contact
relative speed with which the heating cylinder and the calorimeter with the test specimen are brought into contact with each other

2.5
contact force
force acting on the test specimen and the calorimeter when they have been brought into contact with the heating cylinder

3 Principle

The heating cylinder is heated to and maintained at the contact temperature and a test specimen is placed on the calorimeter. The heating cylinder is lowered onto the test specimen supported by the calorimeter or, alternatively, the calorimeter with the specimen is lifted up to the heating cylinder. In either case, the operation is carried out at a constant speed. The threshold time is determined by monitoring the temperature of the calorimeter.

4 Apparatus

4.1 Heating cylinder

The heating cylinder shall be constructed from a suitable metal which can withstand temperatures of over 500 °C (e.g. pure nickel). Figure 1 shows an example of the heating cylinder. The contact surface shall have a diameter of (25,2 ± 0,05) mm and shall be surface ground. There shall be a central boring which ends 3 mm above the lower surface of the heating cylinder. This boring is intended to hold the temperature sensor, which is necessary for regulation of the temperature of the heating cylinder, and its diameter should be chosen accordingly. A helical slot of depth D, width B and pitch Z shall be machined in the upper part of the heating cylinder. The values of D, B and Z shall be chosen in such a way that the total heated length of a heating conductor can be placed in the slot. The heating cylinder shall be enclosed by heat-resistant insulation, leaving free the bottom contact surface.

4.2 Calorimeter

The calorimeter (as shown in Figure 2) consists of a cylindrical disc of black anodized pure aluminium of (25 ± 0,05) mm diameter and (5 ± 0,02) mm thickness, which is fixed on a mounting made from polyamide 66. The upper contact surface of the calorimeter shall be surface ground before anodization and on the lower surface a temperature sensor (e.g. platinium resistor) shall be fixed.

4.3 Assembly

Figure 3 shows an example of the assembly. The heating cylinder and calorimeter are mounted with parallel faces and with their symmetrical axes in line in a supporting frame. Provision shall be made for moving at a controlled speed either the heating cylinder down towards the calorimeter or the calorimeter up towards the heating cylinder. The additional weight shall be dimensioned in such a way that the contact force is (49 ± 0,5) N. Between measurement, during cooling periods, a suitable shielding shall be put between the heating cylinder and the calorimeter in order to prevent the calorimeter from being heated by thermal radiation from the heating cylinder.

4.4 Electronic devices

Suitable electronic devices shall be provided to

— heat the heating cylinder to at least 500 °C and to maintain the temperature;

— control the rate of contact;

— measure and register the calorimeter temperature to an accuracy of ± 0,1 °C;

— measure the threshold time.

5 Sampling and conditioning

5.1 Sampling

At least three circular test specimens of 80 mm diameter shall be taken for each contact temperature from the product or from a piece of the material intended for manufacture of the product.

5.2 Conditioning

Before the test, the test specimens shall be conditioned for at least 24 h in an atmosphere having a temperature of (20 ± 2) °C and relative humidity of (65 ± 5) %.

6 Test method

6.1 Starting conditions

The measurements shall be carried out in an atmosphere having a temperature of (20 ± 5) °C and relative humidity between 15 % and 80 %. The heating cylinder shall be brought to ± 2 % of the selected contact temperature (in degrees Celsius). The temperature of the calorimeter shall be at room temperature ± 2 °C before the start of each test. The test shall be started not later than 3 min after the test specimen has been taken out of the conditioning atmosphere (see 5.2).

6.2 Procedure

Place the test specimen on the calorimeter so that its outer face is upwards. Remove the shielding between the heating cylinder and the calorimeter and bring the heating cylinder into contact with the calorimeter with a rate of contact of (5,0 ± 0,2) mm/s. Measure and record the temperature of the calorimeter during the test. Carry out at least three measurements at each contact temperature.

6.3 Evaluation

Determine the threshold time, t_t, to the nearest 0,1 s.

7 Test report

The test report shall contain the following elements:

a) reference to this part of ISO 12127;

b) name of the supplier of the product or material;

c) name, as given by the supplier, and description of the product or material;

d) contact temperature(s), T_c;

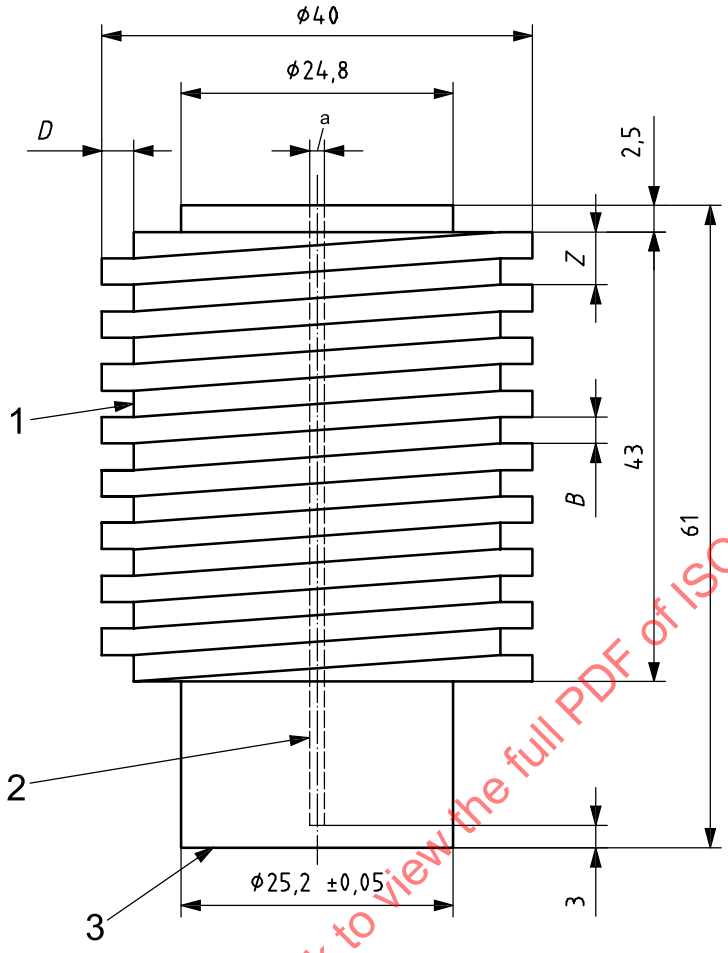
e) threshold time, t_t (individual values or, if five or more measurements per contact temperature have been made, the mean value and standard deviation);

f) description of observed changes in the test specimens;

g) date of test;

h) any deviation from the test method specified in this part of ISO 12127.

Dimensions in millimetres

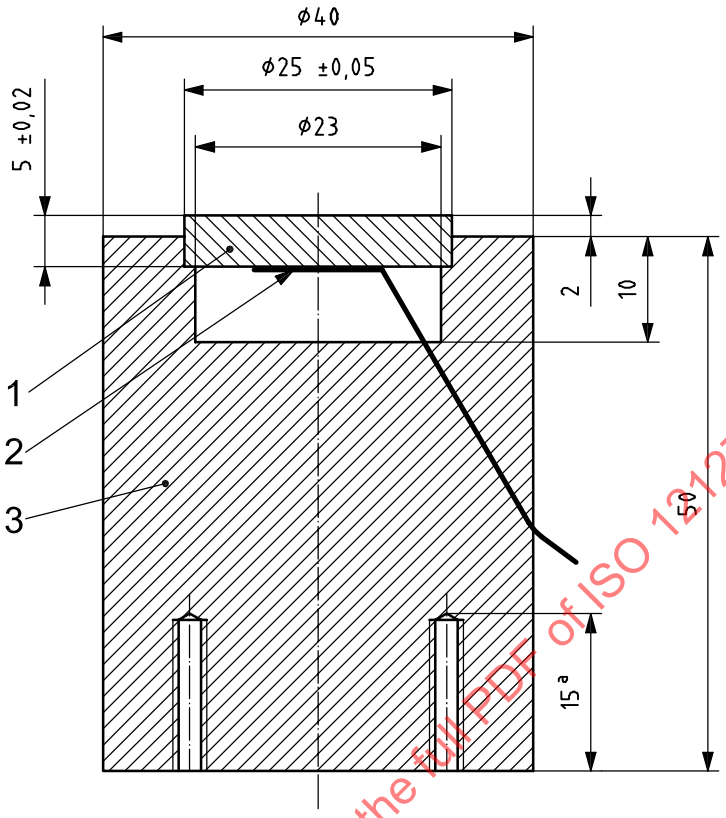


Key

1 slot for the heating conductor
2 boring for temperature sensor
3 contact surface
B width of helical slot
D depth of helical slot
Z pitch of helical slot
a Diameter of the boring appropriate for the temperature sensor.

Figure 1 — Heating cylinder

Dimensions in millimetres



Key

1 cylindrical disc, made from black anodized pure aluminium
2 temperature sensor, e.g. platinum resistor
3 mounting, made from polyamide 66
a Maximum depth of thread holes for mouting the calorimeter.

Figure 2 — Calorimeter