INTERNATIONAL STANDARD

ISO 12127-1

Second edition
2015-12-15

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

Part 1: 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: Transmission thermique par contact produite par un cylindre chauffant

Reference number
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ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

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Foreword

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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).

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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

ISO 12127-1 was prepared by Technical Committee ISO/TC 94, *Personal safety — Protective clothing and equipment*, Subcommittee SC 13, *Protective clothing*, and by Technical Committee CEN/TC 162, *Protective clothing including hand and arm protection and lifejackets* in collaboration.

This second edition cancels and replaces the first edition (ISO 12127-1:2007), of which it constitutes a minor revision. The following changes have been made:

a) title, for better comprehension;

b) alphabetical order, "Terms and definitions";

c) modified clause for "Heating cylinder" regarding example and pictures;

d) modified clause for "Calorimeter" regarding more detailed information;

e) modified clause for "Assembly" regarding speed and picture;

f) latest standard numbers in clause "Test report";

g) new Annex A for "Best practices for cleaning the heating cylinder";

h) new Annex B for "Determination of property values for rating and classification".

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

2.2
contact temperature
T_c
surface temperature of the contact area of the heating cylinder, this temperature being kept constant

2.3
rate of contact
relative speed with which the heating cylinder and the calorimeter with the test specimen are brought into contact with each other

2.4
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

2.5
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

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. Silver Alloy, 925 Sterling Silver). Figures 1, 2 and 3 show an example of the stamp and heating cylinder. The contact surface shall have a diameter of (25,2 ± 0,05) mm and shall be polished. There shall be a central boring which ends 2 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. The heating cylinder shall be enclosed by heat-resistant insulation, leaving free the bottom contact surface.

The heating cylinder shall be capable of being heated to over 500°C and be capable of maintaining the chosen testing temperature.

4.2 Calorimeter

The calorimeter (as shown in Figure 4) consists of a cylindrical disc of black anodized pure aluminium of (25 ± 0,05) mm diameter, and thickness of approximately 5.0 mm and a mass of (6,63 ± 0,03) g, which is pushed into a mounting made from polyamide 6.6 so as to be a tight fit. The upper contact surface of the disc shall be surface ground before anodization and shall have a thermocouple attached to its lower surface by means of adhesive tape.

NOTE A PR 6462 BK/02 Thermocoax thermocouple or equivalent has been found to be suitable.[1)]

4.3 Assembly

Figure 5 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 (5,0 ± 0,5 mm/s) either the heating cylinder down towards the calorimeter or the calorimeter up towards the heating cylinder. An 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

— raise the temperature of the heating cylinder to the chosen testing temperature and maintain this temperature to ± 2°C.

— 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

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. If one specimen fails the performance standard a further set of three specimens shall be tested (see Annex B).

1) This is an example of a suitable product available commercially. This information is given for the convenience of users of this document and does not constitute an endorsement by ISO of this product.

5.2 Conditioning

Before testing, textile specimens shall be conditioned for at least 24 h and leather specimens for at least 48h 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 environment 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 at 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 ISO 12127-1;

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

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

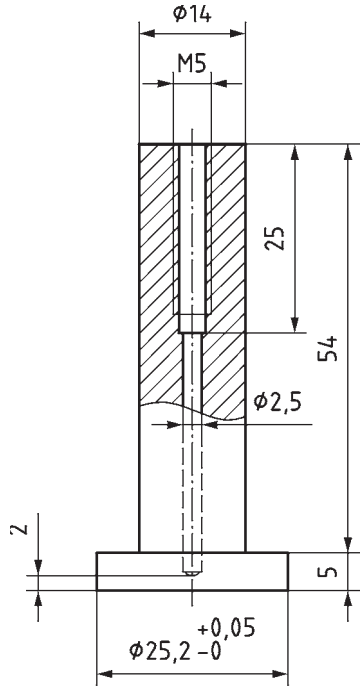
d) contact temperature(s), T_c;

e) threshold time, t_t *for each individual specimen* per contact temperature, the mean value and standard deviation. *T*he uncertainty of measurement of the threshold time t_t shall be given in the report.

f) description of observed changes in the test specimens;

g) date of test.

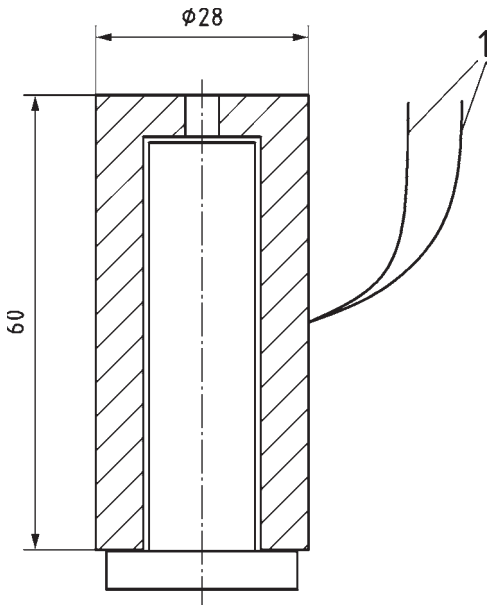
Dimensions in millimetres



Heating Element: e.g. Silver Alloy, 925 Sterling Silver

Figure 1 — Stamp

Dimensions in millimetres

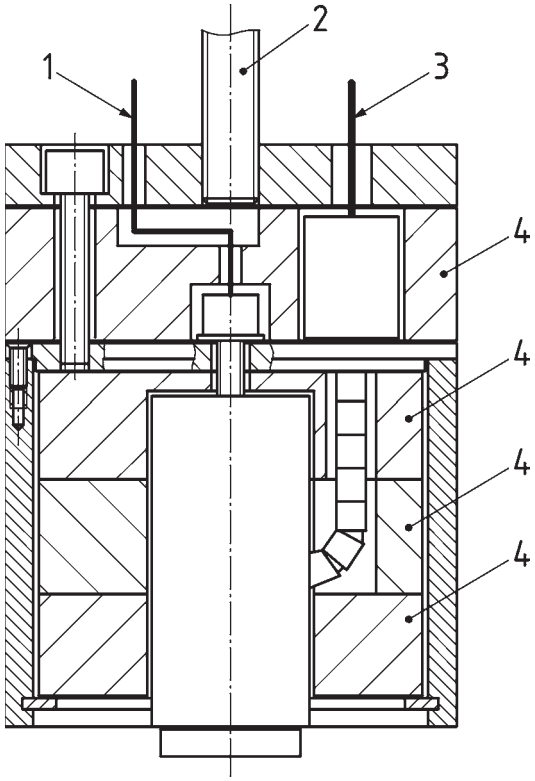


Key

1 connector

Heating Element with Heater, Example: Ersa Type 201 200 W

Figure 2 — Heat cylinder with stamp

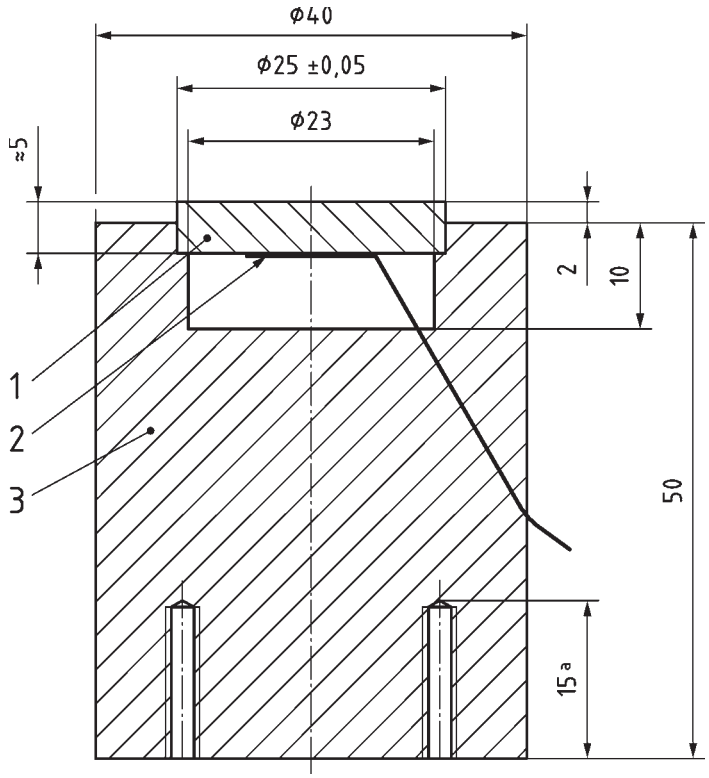


Key

1	thermocouple
2	mounting screw
3	connector
4	heating isolation

Figure 3 — Heating cylinder with stamp built in encased insulating material

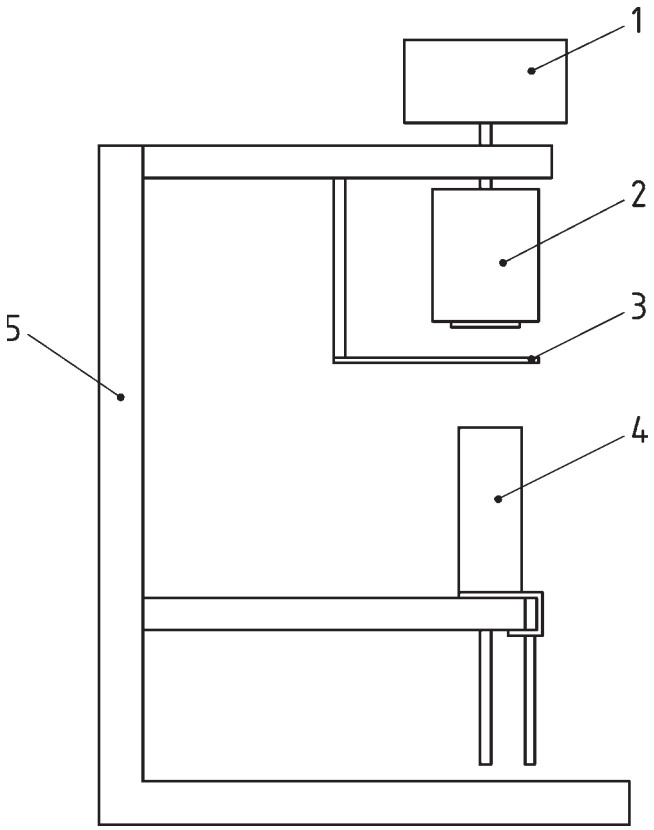
Dimensions in millimetres



Key

1 cylindrical disc, made from black anodized pure aluminium
2 thermocouple
3 mounting, made from polyamide 6.6
a Maximum depth of thread holes for mounting the calorimeter.

Figure 4 — Calorimeter



Key

1	additional weight
2	heating cylinder with insulation
3	shielding
4	calorimeter
5	supporting frame

Figure 5 — Assembly

Annex A
(informative)

Best practices for cleaning the heating cylinder

The following possible cleaning methods are used by different laboratories:

— After the test the cold heating cylinder can be cleaned with acetone.

— If the contamination on the cylinder is minor, then a piece of absorbent paper may be all that is required to remove it.

— If the contamination is more significant, then it may be necessary to heat up the cylinder to 500°C, allow it to cool and then carefully remove the residue with a fine blade.

— Ensure that the cylinder is clean before each test.

Annex B
(normative)

Determination of property values for rating and classification

If a material exhibits differing behaviour for a property in the length and cross directions of the material, the resultant property value shall be the value obtained in the lesser performing direction. All the individual results of the specimens of a test shall meet the performance requirement. In the event that only one specimen fails, another set of specimens shall be tested and all the individual results of this second set of specimens shall meet the requirements. Otherwise the sample is considered to have failed the requirement.

ICS 13.340.10

Price based on 9 pages