

Methods for

# Determination of physical properties of tobacco and tobacco products —

## Part 3: Determination of free combustion rate of cigarettes

[ISO title: Tobacco and tobacco products — Cigarettes —  
Determination of rate of free combustion]

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# Cooperating organizations

The Food and Agriculture Standards Committee, under whose direction this British Standard was prepared, consists of representatives from the following Government departments and scientific and industrial organizations:

- Agricultural Co-operation and Marketing Services
- Agricultural Research Council, Meat Research Institute
- British Food Manufacturing Industries Research Association
- British Industrial Biological Research Association Ltd.
- Campden Food Preservation Research Association
- Consumer Standards Advisory Committee of BSI
- Department of Agriculture and Fisheries for Scotland
- Department of Agriculture (Government of Northern Ireland)
- Department of Industry (Laboratory of the Government Chemist)\*
- Flour Milling and Baking Research Association
- Food and Drink Industries Council
- Food Manufacturers' Federation Incorporated
- Institute of Brewing
- Local Authority Joint Advisory Committee on Food Standards
- Ministry of Agriculture Fisheries and Food\*
- National Farmers' Union
- National Farmers' Union of Scotland
- Tobacco Advisory Committee\*

The organizations marked with an asterisk in the above list, together with the following, were directly represented on the committee entrusted with the preparation of this British Standard:

- Department of Industry (Chemicals and Textiles)
- Tobacco Research Council

This British Standard, having been prepared under the direction of the Food and Agriculture Standards Committee, was published under the authority of the Executive Board and comes into effect on 31 July 1979

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# National foreword

This Part of BS 5381, prepared under the direction of the Food and Agriculture Standards Committee, is identical with ISO 3612:1977 *“Tobacco and tobacco products — Cigarettes — Determination of rate of free combustion”*.

Further Parts of this British Standard are being prepared as the corresponding methods are agreed internationally and, subject to UK approval in each case, will describe the following methods.

Cigarettes and filters: determination of draw resistance (ISO in preparation)

Cigarette paper: determination of air permeability (currently ISO/DIS/2965)

**Terminology and conventions.** The text of the International Standard has been approved as suitable for publication, without deviation, as a British Standard. Some terminology and certain conventions are not identical with those used in British Standards; attention is especially drawn to the following.

The comma has been used throughout as a decimal marker. In British Standards it is current practice to use a full point on the baseline as the decimal marker.

Wherever the words “International Standard” appear, referring to this standard, they should be interpreted as “British Standard”.

### Cross-reference

| International Standard | Corresponding British Standard                                                                                 |
|------------------------|----------------------------------------------------------------------------------------------------------------|
| ISO 3402:1975          | BS 5743:1979 <i>Specification for atmospheres for conditioning tobacco and tobacco products</i><br>(Identical) |

When agreement has been reached internationally on the sampling procedures to be specified in ISO .... (see clauses 2 and 5) it is expected that a corresponding British Standard will be prepared. In the meantime, users of this standard should ensure that the sampling procedures adopted will provide a representative sample.

NOTE *Textual error.* In 8.1.2 d), “4 rev/h = 1 rev/15 min = 16 mm/min” should read “4 r/h = 1 r/15 min = 16 mm/min”.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

**Compliance with a British Standard does not of itself confer immunity from legal obligations.**

### Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 8, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

## 1 Scope and field of application

**1.1** This International Standard specifies two methods for the determination of the rate of free combustion of cigarettes. Both methods yield the same result and both methods also enable the combustibility rate (3.3) to be determined.

In addition, the indirect method (see clause 8) enables the free combustion gradient (3.4) and the intrinsic combustibility (3.5) to be calculated, and has an advantage over the direct method (see clause 7) in being unaffected by irregularity in the linear progression of the burning zone.

**1.2** Both methods are applicable to cigarettes and comparable cylindrical products (for example, products wrapped in reconstituted tobacco) that may be consumed by free combustion.

## 2 References

ISO 3402, *Tobacco and tobacco products — Atmospheres for conditioning and testing*.

ISO ....., *Tobacco and tobacco products — Cigarettes — Sampling*<sup>1)</sup>.

## 3 Definitions

### 3.1

**free combustion** (of a cigarette)

combustion without suction through the cigarette

### 3.2

**rate of free combustion** (of a cigarette)

the average speed at which the leading edge of the combustion zone travels along the cigarette during free combustion. It is expressed in millimetres per minute

### 3.3

**combustibility rate** (of a cigarette)

the rate at which the mass of tobacco contained in a cigarette is burnt during free combustion. It is expressed in milligrams per minute

### 3.4

**free combustion gradient** (of a cigarette)

the rate of loss of mass of a cigarette during free combustion. It is expressed in milligrams per minute

### 3.5

**intrinsic combustibility** (of a cigarette)

the ratio of the loss of mass during free combustion of a cigarette to its initial mass before combustion. It is expressed as a percentage

## 4 Principle

### 4.1 Direct method

Measurement of the time taken for a measured length of each of ten cigarettes to burn by free combustion and calculation of the rate of free combustion.

Determination on a further ten cigarettes of the mean mass of tobacco contained in the portion of the cigarettes burnt and calculation of the combustibility rate.

### 4.2 Indirect method

Measurement of the time taken for a measured length of ten cigarettes to burn by free combustion while the loss of mass is continuously recorded, the ash being collected continuously and weighed together with the other remains of the cigarettes. Calculation of the combustibility rate and the intrinsic combustibility from the graph of the free combustion rate.

## 5 Sampling

Carry out sampling by the method described in ISO... Twenty cigarettes are required for the direct method (see clause 7) and 10 cigarettes for the indirect method (see clause 8).

## 6 Conditioning

Condition the sample in accordance with ISO 3402.

## 7 Direct method

### 7.1 Apparatus

**7.1.1 Apparatus capable of measuring the time of free combustion of cigarettes** (Figure 1 and Figure 2 show suitable apparatus).

The apparatus may have more than one testing head. Each testing head shall be identical and shall have the following essential features:

- a) device for timing automatically free combustion over a measured length, normally  $40 \pm 0,5$  mm (see note), of a cigarette; the device shall be activated by the burning through of two cotton threads of diameter  $0,2 \pm 0,1$  mm;

NOTE If necessary for shorter cigarettes, the length of  $40 \pm 0,5$  mm may be reduced to  $30 \pm 0,5$  mm.

- b) facility for adjusting the position of the cigarette so that there is 10 mm between the lighted end and the first cotton thread;
- c) a sliding cigarette holder with central needle on which the cigarette is held horizontally;

<sup>1)</sup> In preparation.