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Cigarettes — Routine analytical cigarette smoking machine — Definitions and standard conditions with an intense smoking regime

Cigarettes — Machine à fumer analytique de routine pour cigarettes — Définitions et conditions normalisées avec un régime de fumage intense

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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 of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 126, *Tobacco and tobacco products.*

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Historically, a set of ISO standards have been developed to specify the requirements of analytical cigarette smoking machines and their use for the quantitative determination of a number of cigarette smoke constituents [such as total particulate matter, nicotine free dry particulate matter, water, nicotine or benzo[a]pyrene] with a unique standard smoking regime. The description of this smoking regime is provided in ISO 3308.

Later, requirements to provide smoke constituents data with an intense smoking regime, different from the ISO 3308 smoking regime, originated from different countries and the Conferences of the Parties to the Framework Convention on Tobacco Control, resulting in a need to specify the conditions for the use of the intense smoking regime on analytical cigarette-smoking machines.

This document is the result of the work performed by ISO/TC 126, comprising experts from members and liaison organizations, including WHO. Elaboration of this document took into account practical work conducted in the framework of a collaborative study involving 35 laboratories (published as Technical Report ISO/TR 19478-1 and ISO/TR 19478-2). It provides specifications for analytical cigarette smoking machines to be used with an intense smoking regime.

No machine smoking regime can represent all human smoking behaviour:

— it is recommended that cigarettes also be tested under conditions of a different intensity of machine smoking than those specified in this document;

— machine smoking testing is useful to characterize cigarette emissions for design and regulatory purposes, but communication of machine measurements to smokers can result in misunderstandings about exposure and risk across brands;

— smoke emission data from machine measurements may be used as inputs for product hazard assessment, but they are not intended to be nor are they valid as measures of human exposure or risks. Communicating differences between products in machine measurements as differences in exposure or risk is a misuse of testing using ISO standards.

Cigarettes — Routine analytical cigarette smoking machine — Definitions and standard conditions with an intense smoking regime

1 Scope

This document:

— defines smoking parameters and specifies the conditions to be provided for the routine analytical machine smoking of cigarettes under specified intense conditions;

— specifies the requirements for a routine analytical smoking machine conforming with these conditions;

— specifies additional test methods for machine verification.

Annex A gives examples of designs of smoking machine enclosures.

NOTE The type of analytical smoking machine used could impact the mass of total particulate matter collected on the smoke trap. This might be due to either incomplete collection or evaporation of water and other volatile compounds from the smoke trap.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

ISO 3308, *Routine analytical cigarette-smoking machine — Definitions and standard conditions*

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
test atmosphere
atmosphere to which a sample or test piece is exposed throughout the test

Note 1 to entry: It is characterized by the following parameters: temperature, relative humidity and pressure.

[SOURCE: ISO 3308:2012, 3.1, modified — Note 2 to entry has been deleted.]

3.2
butt length
length of unburnt cigarette remaining at the moment when the smoking is stopped

[SOURCE: ISO 3308:2012, 3.2]

3.3
restricted smoking
condition that exists when the butt end of a cigarette is closed to the atmosphere between successive puffs

[SOURCE: ISO 3308:2012, 3.3]

3.4
pressure drop
static pressure difference between the two ends of a pneumatic circuit (of a smoking machine) when it is traversed by an air flow under steady conditions in which the measured volumetric flow, under standard conditions, at the output end is 17,5 ml/s

[SOURCE: ISO 7210:2018, 3.1, modified — Notes to entry have been added.]

Note 1 to entry: The pressure drop of a circuit or device is dependent on the viscosity, density and flow rate of the gas flowing through it. For the comparison of different devices, circuits or products, a reference point is defined using ambient air under the conditions described above. This reference point is established in many ISO standards, instruments and laboratories.

Note 2 to entry: The relationship between the determined values of pressure drop of different devices, circuits or products measured at the reference condition stays the same under changed conditions as long as the area of linearity is kept. Therefore, no reason is given to change the reference point if the devices, circuits or products are used under other conditions, such as flow rate. For example, a pressure drop device of 1 kPa at 17,5 ml/s will result in a measured pressure drop at 27,5 ml/s of around 1,6 kPa (1*27,5/17,5) if the ambient conditions are stable.

3.5
pressure drop device
device of known pressure drop determined under reference conditions as defined in 3.4 integrated into a pneumatic circuit

3.6
puff duration
interval of time during which the port of a smoking machine is connected to the suction mechanism

[SOURCE: ISO 3308:2012, 3.7, modified]

3.7
puff volume
volume leaving the butt end of a cigarette and passing through the smoke trap of a smoking machine

[SOURCE: ISO 3308:2012, 3.8, modified]

3.8
puff number
number of puffs necessary to smoke a cigarette to a specified butt length

[SOURCE: ISO 3308:2012, 3.9]

3.9
puff frequency
number of puffs in a given time

[SOURCE: ISO 3308:2012, 3.10]

3.10
puff termination
termination of the connection of the port to the suction mechanism

[SOURCE: ISO 3308:2012, 3.11]

3.11
puff profile
flow rate measured directly behind the butt end of the cigarette, and depicted graphically as a function of time

[SOURCE: ISO 3308:2012, 3.12]

3.12
dead volume
volume which exists between two defined points of a pneumatic circuit

[SOURCE: ISO 3308:2012, 3.13, modified]

3.13
cigarette holder
device for holding the butt end of a cigarette during smoking

[SOURCE: ISO 3308:2012, 3.14, modified — 'mouth end' replaced with 'butt end'.]

3.14
smoke trap
device for collecting such part of the smoke from a sample of cigarettes as is necessary for the determination of specified smoke components

[SOURCE: ISO 3308:2012, 3.15]

3.15
port
aperture of the suction mechanism through which a puff is drawn and to which is attached a smoke trap

[SOURCE: ISO 3308:2012, 3.16]

3.16
channel
element of a smoking machine consisting of one or more cigarette holders, one trap and a means of drawing a puff through the trap

[SOURCE: ISO 3308:2012, 3.17]

3.17
compensation
ability to maintain constant puff volumes and puff profiles when the pressure drop at the port changes

[SOURCE: ISO 3308:2012, 3.18]

3.18
cigarette position
position of a cigarette on the smoking machine

Note 1 to entry: In particular, it is determined by the angle made by the longitudinal axis of the cigarette and the horizontal plane when a cigarette is inserted into a cigarette holder in an analytical smoking machine.

[SOURCE: ISO 3308:2012, 3.19]

3.19
mainstream smoke
smoke which leaves the butt end of a cigarette during the smoking process

[SOURCE: ISO 3308:2012, 3.20]

3.20
sidestream smoke
smoke which leaves a cigarette during the smoking process other than from the butt end

[SOURCE: ISO 3308:2012, 3.21]

3.21
ashtray
device positioned under the cigarettes in their holders to collect ash falling from the cigarettes during smoking

[SOURCE: ISO 3308:2012, 3.22]

3.22
clearing puff
any puff taken after the cigarette has been extinguished or removed from the cigarette holder

[SOURCE: ISO 3308:2012, 3.23]

3.23
ambient air flow
air flow around the cigarettes during the smoking process

Note 1 to entry: See Clause 6 and Annex A.

[SOURCE: ISO 3308:2012, 3.24]

4 Standard conditions

4.1 Puff duration

The standard puff duration shall be (2,00 ± 0,02) s.

4.2 Puff volume

The standard puff volume V, with $V = V_1 + V_2$, measured in series with a pressure drop device of 1 000 Pa ± 50 Pa shall be (55,0 ± 0,6) ml. In one puff duration not less than 95 % of the puff volume shall leave the butt end of the cigarette (V_1).

4.3 Puff frequency

The standard puff frequency shall be one puff every (30 ± 0,5) s.

4.4 Puff profile

The puff profile shall be measured with an impedance of 1 000 Pa ± 50 Pa as specified in 3.4. It shall be shaped as shown in Figure 1 (known as bell-shape profile) with a maximum between 0,8 s and 1,2 s from the start of the puff. The increasing and decreasing parts of the profile shall not have more than one point of inflection each. The maximum flow rate shall be between 40 ml/s and 50 ml/s. At no point shall the direction of flow be reversed.

NOTE 1 The drives for piston pumps result in small perturbations in flow which are acceptable.

NOTE 2 The determination of the puff profile is described in ISO 7210.