



**International
Standard**

ISO 5501-2

**Tobacco heating systems —
Definitions and standard conditions
for aerosol generation and
collection —**

**Part 2:
Aerosol heated tobacco
products (aHTPs)**

*Systèmes de chauffage du tabac — Définitions et conditions
normalisées pour la génération et la collecte d'aérosol —*

Partie 2: Produits de tabac chauffés par un aérosol (PTCa)

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

A list of all parts in the ISO 5501 series can be found on the ISO website.

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

Tobacco heating systems (THS) are designed to heat a tobacco substrate, to produce a nicotine-containing aerosol without the combustion of the tobacco substrate. A THS is a combination of a heated tobacco product (HTP) and a tobacco heating device (THD). The HTP part of the THS, is a product containing a tobacco substrate that is designed to be heated and not combusted.

With the emerging development and commercialisation of HTPs, there are a number of different approaches to heating the HTP, categorised as electrically, aerosol and carbon, HTPs, eHTP, aHTP and cHTP, respectively (see ISO 6080).

This document has been developed to define and specify the requirements for an aerosol heated tobacco product (aHTP) puffing regime in order to generate and collect aerosol for subsequent analytical measurement in a robust and reproducible manner.

No machine puffing regime can represent all human use behaviour, so dependent on the testing requirement it may be appropriate to test aHTPs differently according to their design, or under conditions of different intensity to reflect the range of human behaviour.

Machine testing is useful to characterize emissions for device development and regulatory purposes and may be used as inputs for product hazard assessment; however, it is not intended to be nor is it valid as a measure of human exposure or risk.

NOTE This document is a reference document for ISO standards on tobacco heating systems (e.g. ISO 5501). Regulation and standardisation are independent from each other, and standardisation does not pre-empt regulation.

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Tobacco heating systems — Definitions and standard conditions for aerosol generation and collection —

Part 2: Aerosol heated tobacco products (aHTPs)

1 Scope

This document:

- defines the parameters and specifies the standard conditions for the routine analytical generation and collection of aerosol from aerosol heated tobacco products (aHTP);
- specifies technical requirements for the routine analytical puffing machine for aHTP generation and collection of aerosol, termed as “machine” in this document, conforming with the standard conditions stated within [Clause 4](#);

This document does not specify aerosol trapping nor subsequent sample preparation and analytical method of components in the trapped aerosol or the gas phase.

This document is also applicable to products other than those defined in [3.15](#) if a specific method references this document.

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 6080, *Tobacco heating systems — Vocabulary*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 6080 and the following apply.

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

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1 conditioning temperature

temperature in which *aerosol heated tobacco products (aHTPs)* ([3.15](#)) and e-liquid based consumables are kept before being subjected to test

3.2 test atmosphere

atmosphere to which the tobacco heating system (THS) is exposed throughout the test

3.3

pressure drop

static pressure difference between the two ends of a pneumatic circuit when it is traversed by an air flow under steady conditions as described in ISO 7210

Note 1 to entry: Although the pressure drop of a device or a pneumatic circuit is defined for a specific set of reference parameters to describe its physical properties, the device could be used for measurements under conditions other than the reference parameters.

[SOURCE: ISO 20768:2018, 3.16]

3.4

puff duration

interval of time, measured in seconds, during which the port of the machine is pneumatically connected to the suction mechanism

[SOURCE: ISO 20768:2018, 3.4]

3.5

puff volume

volume leaving the *aHTP* ([3.15](#)) and passing through the aerosol trap

3.6

puff frequency

number of puffs in a given time

[SOURCE: ISO 3308:2012, 3.10]

3.7

puff profile

flow rate measured over the time span of the puff at the port of the machine, typically depicted graphically as a function of time

[SOURCE: ISO 20768:2018, 3.8]

3.8

puff number

number of puffs collected from an *aHTP* ([3.15](#))

3.9

THS holder

device for connecting the THS to the port of the machine during aerosol generation and collection

3.10

aerosol trap

device for collecting the aerosol from *aHTP* ([3.15](#)) which is necessary for the determination of specified analytes

3.11

port

aperture of the suction mechanism through which a puff is drawn and to which is attached an aerosol trap

[SOURCE: ISO 20768:2018, 3.13]

3.12

compensation

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

Note 1 to entry: In practice a change of the pressure drop is introduced by the connection of the test product to the machine or the inclusion of an aerosol trap.

[SOURCE: ISO 20768:2018, 3.18]

3.13

clearing puff

puff taken immediately after the THS has been removed from the THS holder of the machine

[SOURCE: ISO 20768:2018, 3.9]

3.14

termination of collection

termination of the connection of the THS to the suction mechanism after completion of the requested number of puffs

3.15

aerosol heated tobacco product

aHTP

product containing a tobacco substrate that is designed to be heated by an aerosol from an e-liquid based consumable (and optionally additional heating of the substrate by other means as in an eHTP), without combustion of the tobacco substrate in order to produce a nicotine-containing aerosol

Note 1 to entry: aHTP category includes products that:

- are the heated tobacco product (HTP) part of a tobacco heating system (THS);
- contain a tobacco substrate that is encapsulated or wrapped in paper or other material;
- are designed to be used with an electrical tobacco heating device (THD) that:
 - produces an aerosol from an e-liquid based consumable that heats the tobacco substrate;
 - designed to prevent combustion of the tobacco substrate;
 - are battery powered.

Note 2 to entry: aHTP category may include products that have:

- a puff count and/or use duration that is limited by either the design of the heated tobacco product (HTP) or tobacco heating device (THD) hardware/software;
- an HTP used in combination with an electrical tobacco heating device (THD) that provides indirect resistive, inductive or other electrical method of heating of the tobacco substrate in addition to the e-liquid based consumable that heats the tobacco substrate;
- an HTP that is changed more frequently than the e-liquid based consumable.

Note 3 to entry: aHTP category does not include products that are designed to have combustion of any material including tobacco.

Note 4 to entry: See NOTE in the Introduction.

Note 5 to entry: An ISO standard or this document, which provides a test method for analysing tobacco heating systems to support the assessment if combustion occurs is under development within ISO/TC 126.

[SOURCE: ISO 6080:2024, 3.2.2]

4 Standard conditions

4.1 Machine pressure drop

The whole of the flow path between the port of the aHTP aerosol collection system and the suction mechanism shall offer the least possible resistance, and its pressure drop shall not exceed 300 Pa.

4.2 Puff duration

The standard puff duration shall be $(3,0 \pm 0,1)$ s.

4.3 Puff volume

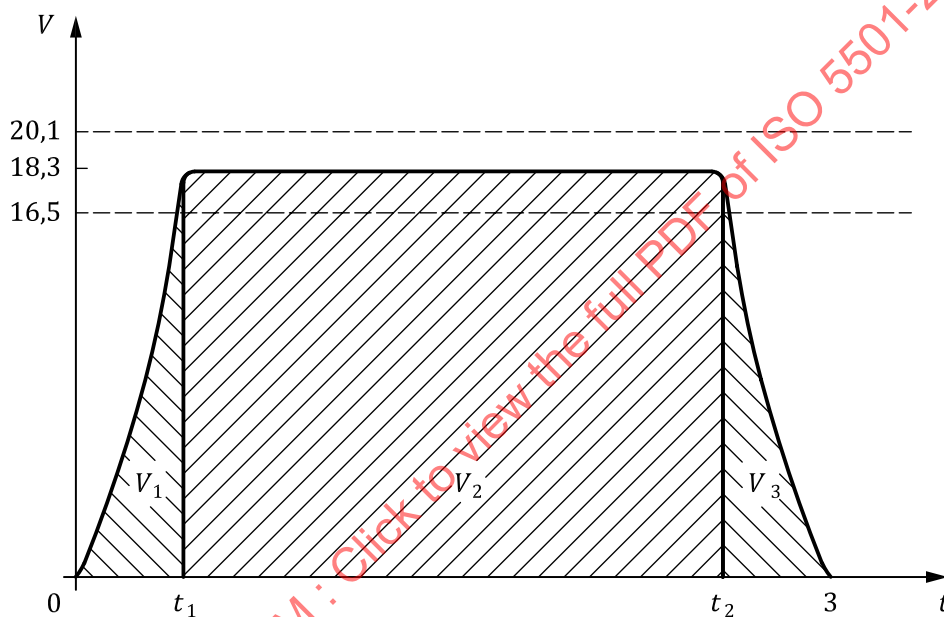
The standard puff volume shall be $(55,0 \pm 0,6)$ ml determined at the port of the machine in series with a pressure drop device of $(1\,000 \pm 50)$ Pa.

4.4 Puff frequency

The standard puff frequency shall be one puff starting every $(30,0 \pm 0,5)$ s.

4.5 Puff profile

The puff profile shall be of approximate rectangular shape, measured at the port of the machine with a pressure drop device of $(1\,000 \pm 50)$ Pa. The volume V_1 plus V_3 of the increasing and decreasing parts of the profile shall not exceed 10 % of the total puff volume $V_1 + V_2 + V_3$. The average flow rate between t_1 and t_2 shall be $(18,3 \pm 1,8)$ ml/s (see Figure 1). The t_1 indicates the timing of achieving average flow rate and t_2 indicates the timing of dropping the flow rate.



Key

V volumetric flow, ml/s

t time, s

NOTE Puff profile (idealized) according to ISO 20768:2018, 4.5

Figure 1 — Puff profile (idealized)

4.6 Puff number

Each individual puff shall be counted and recorded until the collection process is terminated. The machine shall be capable of taking a predetermined number of puffs or allowing operator termination.

5 Specification of the machine

5.1 General

The machine shall conform with the standard conditions (see 4.1 to 4.6).

5.2 Operating principle and puff profile

5.2.1 The machine shall include a device to draw a fixed volume of air (puff) through the THS.

5.2.2 The machine shall produce a rectangular shaped puff profile (see [4.5](#)). A schematic diagram is shown in [Figure 1](#).

5.2.3 The machine shall be switched on and allowed to warm up on automatic cycling for at least 20 min. With the machine warmed up, check that the puff volume on each channel is in accordance with the standard conditions (see [4.3](#)).

5.3 Reliability and compensation

5.3.1 The machine shall contain devices to control the puff volume, the puff duration, and the puff frequency.

5.3.2 The machine shall possess the mechanical and electrical reliability necessary to meet the standard conditions regarding these parameters (see [4.1](#) to [4.6](#)) for prolonged periods of testing.

5.3.3 The machine shall be capable of sufficient compensation.

When the machine has initially been set to give a puff volume of $(55,0 \pm 0,6)$ ml without a pressure drop device, a reduction of no more than 3 ml shall be observed when the machine is tested with a pressure drop device of 3 kPa.

5.3.4 The machine shall be capable of taking one or more clearing puffs after the termination of collection as needed in regard to the requirements of analytical methods to measure the aerosol components.

5.3.5 Each port should have its own puff counter.

5.4 THS holder

5.4.1 The design of the THS holder is such that it shall connect the THS to the port of the machine in a leak-free manner and cover 9,0 mm, with a range of 8,0 mm to 9,5 mm, from the mouth end of a THS. It shall be impermeable to air and HTP aerosol.

NOTE For samples with a diameter between 4,5 mm and 9 mm the cigarette holder described in ISO 3308 can be used without the neoprene washer.

5.4.2 The product orientation should be horizontal. Some products or analytical methods may require a product orientation other than horizontal. In this case, this should be noted in the reporting documents.

5.5 Aerosol traps

5.5.1 When the machine is used for collecting aerosol, a trap shall be fitted between the suction source and the THS. The type of trap will depend on the purpose for which the aerosol is being collected. The efficiency of aerosol collection by the trap shall be specified in the analytical method. When a filter trap is used for collecting aerosol, it should be comprising the following.

- a) Airtight filter holder and end caps made of a non-hygroscopic and chemically inert material, able to contain a filter disc of glass fibre material 1 mm to 2 mm thick. The rough filter surface shall face the oncoming aerosol. Different designs of aerosol trap can meet this requirement. Depending on the amount of aerosol collected, filter pads with a diameter of 44 mm and 92 mm can be used but other sizes are also available. Two examples are given in [Figure 2](#).

- b) Filter material which shall retain at least 99,9 % of all particles having a diameter equal to or greater than 0,3 μm of a dioctyl phthalate aerosol at a linear air velocity of 140 mm/s. The pressure drop of the filter assembly shall not exceed 900 Pa at this air velocity. The content of binder shall not exceed 5 % as mass fraction. Polyacrylate and polyvinyl alcohol (PVA) have been found to be suitable binders for this material.

5.5.2 The filter assembly shall be capable of quantitatively retaining the aerosol produced by the THS without loss.

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