



BSI Standards Publication

ISO and Health Canada intense smoking parameters

Part 2: Examination of factors contributing to variability in the routine measurement of TPM, water and NFDPM smoke yields of cigarettes

National foreword

This Published Document is the UK implementation of ISO/TR 19478-2:2015.

The UK participation in its preparation was entrusted to Technical Committee AW/40, Tobacco and tobacco products.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

© The British Standards Institution 2015. Published by BSI Standards Limited 2015

ISBN 978 0 580 88137 4

ICS 65.160

Compliance with a British Standard cannot confer immunity from legal obligations.

This Published Document was published under the authority of the Standards Policy and Strategy Committee on 31 August 2015.

Amendments issued since publication

Date	Text affected
------	---------------

TECHNICAL
REPORT

ISO/TR
19478-2

First edition
2015-08-01

**ISO and Health Canada intense
smoking parameters —**

Part 2:
**Examination of factors contributing
to variability in the routine
measurement of TPM, water and
NFDPM smoke yields of cigarettes**

Paramètres de fumage ISO et Santé Canada Intense —

*Partie 2: Examen des facteurs contribuant à la variabilité des mesures
de routine de MPT, d'eau et de MPAEN dans la fumée de cigarette*



Reference number
ISO/TR 19478-2:2015(E)

© ISO 2015



COPYRIGHT PROTECTED DOCUMENT

© ISO 2015, Published in Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

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

Contents

	Page
Foreword	iv
Introduction	v
1 Scope	1
2 Terms and definitions	1
3 Abbreviated terms	2
4 Principle	2
5 The influence of smoking intensity on the yield and composition of cigarette smoke	3
5.1 General.....	3
5.2 A review of information relevant to conclusion i) of ISO/TR 19478-1:2014.....	3
5.3 Puff by puff smoke temperature measurements.....	4
5.4 Puff by puff smoke yields.....	6
5.5 Smoking intensity and cigarette smoke yields.....	13
5.6 Factors relevant to understanding how cigarettes burn and their use for predicting smoke yield.....	22
5.6.1 A review of additional studies.....	22
5.6.2 A review of WG 10 study data.....	34
6 Comparison of the design and performance of rotary and linear smoking machines	37
6.1 A review of information relevant to conclusion j) of ISO/TR 19478-1:2014.....	37
6.2 Zone 1: The cigarette zone.....	39
6.2.1 Airflow/cigarette movement.....	39
6.2.2 Puffing.....	43
6.2.3 Termination of smoking.....	44
6.3 Zone 2: The smoke collection zone.....	49
6.3.1 General.....	49
6.3.2 Connection of the cigarette holder to the CFH.....	49
6.3.3 Collection of TPM and measurement of water and NFDPM.....	52
6.4 Zone 3: The puff generator.....	56
7 Overall summary	61
8 Conclusions	62
9 Conclusions from ISO/TR 19478-1	63
Annex A (informative) Summaries of presentations to WG 10 and the Ad Hoc Group	64
Annex B (informative) List of meetings of ISO/TC 126/WG 10 and the Ad Hoc Group	72
Annex C (informative) Equipment and procedures for smoking cigarettes	73
Bibliography	75

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 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).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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

The committee responsible for this document is ISO/TC 126, *Tobacco and tobacco products*.

ISO/TR 19478 consists of the following parts, under the general title *ISO and Health Canada intense smoking parameters*:

- *Part 1: Results of an international machine smoking study*
- *Part 2: Examination of factors contributing to variability in the routine measurement of TPM, water and NFDPM smoke yields of cigarettes*

Introduction

ISO/TC 126 Working Group 10 (WG 10) was established by ISO/TC 126 in 2007 in response to a New Work Item Proposal by the British Standards Institution (BSI) for the development of a new regime for the machine smoking of cigarettes that was more intense than the then current ISO 3308:2000, and a subsequent questionnaire sent to TC 126 members. Twenty out of 26 members of ISO/TC 126 voted in favour of the following option:

“to install a Working Group 10 dealing with an ‘Intense Smoking Regime’ which shall start with the preparatory work. WHO is invited to participate with their technical experts. No draft Standard is expected to be presented by this group until the future method proposal of WHO has been taken into consideration”.

The third session of the Conference of the Parties (COP) to the World Health Organization (WHO) Framework Convention on Tobacco Control Durban, South Africa, 17 to 22 November 2008, requested the Convention Secretariat to invite the WHO’s Tobacco Free Initiative (TFI) to undertake the following task:

“validate, within five years, the analytical chemical methods for testing and measuring the cigarette contents and emissions identified as priorities in the progress report of the working group 1 using the two smoking regimens set out in paragraph 18 of that report, and inform the Conference of the Parties through the Convention Secretariat on a regular basis of the progress made.”

The two smoking regimens were specified in paragraph 18 of the report of the COP working group (FCTC/COP/3/6) as follows:

Smoking regimen	Puff volume (ml)	Puff frequency	Ventilation holes
ISO 3308:2000, Routine analytical cigarette-smoking machine — Definitions and standard conditions	35	Once every 60 s	No modifications
Same as ISO 3308:2000 but modified as indicated.	55	Once every 30 s	All ventilation holes must be blocked with Mylar adhesive tape.

The two regimes were those specified in ISO 3308 and by Health Canada in Method T-115. At the early meetings of WG 10, some new human smoking studies were presented and are included in [Annex A](#) for completeness of reporting, but WG 10 never considered the correlation with machine smoking regimes in detail as this brief had previously been given to ISO/TC 126/WG 9 and WG 9 had produced a comprehensive report, ISO/TR 17219:2013.

The WHO TFI requested the WHO Tobacco Laboratory Network (TobLabNet) to carry out the practical work of validating the two smoking regimes. In 2008, TobLabNet organized and carried out a collaborative test to measure the tar, nicotine and carbon monoxide yields of cigarettes when using the Health Canada Intense (HCI) regime. The collaborative test involved 14 laboratories smoking five products (three reference cigarettes/monitor test pieces and two commercial products). Details of this collaborative were supplied to ISO/TC 126/WG 10.

WG 10 had expressed a willingness from its inception to participate with the WHO groups in the development of an intense smoking regime but had not been invited to do so. It, therefore, decided at its fifth meeting in December 2009 to undertake a collaborative study to measure the tar, nicotine and carbon monoxide yields of cigarettes using both the ISO 3308:2000 and Health Canada intense smoking regimes. A steering group was established and the laboratory work was carried out in 2010 involving 35 laboratories smoking 10 products (eight commercial and two reference cigarettes/monitor test piece). A final report on the study was approved by WG 10 and subsequently converted to a Technical Report, ISO/TR 19478-1. ISO/TR 19478-1 provided a basic analysis of the study data, drawing conclusions about the possible sources of the increased variability associated with the HCI regime.

These conclusions provided the basis for the additional studies reported here and instigated to provide a more complete understanding of how the smoke yield changes with increasing smoking intensity.

ISO and Health Canada intense smoking parameters —

Part 2:

Examination of factors contributing to variability in the routine measurement of TPM, water and NFDPM smoke yields of cigarettes

1 Scope

This part of ISO/TR 19478 extends the analysis reported in ISO/TR 19478-1:2014 and reports additional studies focused on the conclusions i) and j) from that Technical Report. It identifies and assesses factors impacting on the measurement of smoke TPM, NFDPM, nicotine, water, and carbon monoxide yields when increasing the intensity of the puffing regime from that specified in ISO 3308:2000 to the regime specified in Health Canada Method T-115.

2 Terms and definitions

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

2.1

cigarette coal

carbonised burning tip of a tobacco rod

2.2

ISO regime

puffing regime when taking one puff of 35 ml volume and 2 s duration every 60 s as defined in ISO 3308:2000

2.3

Health Canada Intense regime

HCI regime

puffing regime, first described by Health Canada, when taking one puff of 55 ml volume and 2 s duration every 30 s with 100 % of the ventilation zone on the cigarette filter blocked

2.4

linear (smoking) machine

smoking machine complying with the requirements of ISO 3308:2000 with each cigarette holder directly coupled to a CFH (smoke trap)

Note 1 to entry: The CFH is coupled via a port to its own suction mechanism and held in a fixed position while each cigarette is smoked. The most common configuration has 20 ports in line.

2.5

rotary (smoking) machine

smoking machine complying with the requirements of ISO 3308:2000 with each cigarette holder coupled sequentially via a port to a single CFH (smoke trap) and suction mechanism

Note 1 to entry: The most common configuration has 20 ports on a carousel sharing a single CFH and suction mechanism.