

Standard Reference Material® 1082

Cigarette Ignition Strength Standard

CERTIFICATE OF ANALYSIS

Purpose: The certified value delivered by this Standard Reference Material (SRM) is intended for use by test laboratories to assess and control their testing of cigarette ignition strength in accordance with ASTM Standard Methods E2187-16 (and earlier versions of this standard) [1] and with the nearly identical ISO 12863 [2].

Description: A unit of SRM 1082 consists of one (1) carton of cigarettes containing ten (10) packs of twenty (20) cigarettes each.

Certified Value: The certified ignition strength value is given in Table 1. The certified value is traceable to ASTM E2187-16 [1,3].

Table 1. Certified Ignition Strength Value for SRM 1082

Measurand	ASTM Method	Certified Ignition Strength Value
Ignition Strength (on stainless steel plus one layer of filter paper) [4,5]	ASTM E2187-16 ^(a)	15.8 % ± 6.0 %

^(a) Standard test method for measuring the ignition strength of cigarettes.

NOTICE OF VALUE CHANGE: THE ORIGINAL 2006 CERTIFICATE OF ANALYSIS VALUE FOR SRM 1082 (12.6 % ± 3.3 %) IS NO LONGER VALID SINCE THE SUBSTRATE USED TO CONDUCT TESTING HAS CHANGED SIGNIFICANTLY.

Period of Validity: The certified value delivered by **SRM 1082** is valid within the measurement uncertainty specified until **30 June 2027**. The certified values are nullified if the material is stored or used improperly, damaged, disfigured, contaminated, or otherwise modified.

Maintenance of Certified Value: NIST will monitor this SRM over the period of its validity. NIST will conduct stability testing every five years to ensure the ignition strength of SRM 1082 has not changed substantially. In the event that the results of the NIST stability tests indicate ignition strength may be lower than 5 % or greater than 24 % before the expiration of this certificate, NIST will issue an amended certificate through the NIST SRM website (<https://www.nist.gov/srm>) and notify registered users. SRM users can register online from a link available on the NIST SRM website or fill out the user registration form that is supplied with the SRM at the time of purchase. Before making use of any of the values delivered by this material, users should verify they have the most recent version of this documentation, available free of charge through the NIST SRM website.

Safety: THERE ARE SUBSTANTIAL SAFETY HAZARDS ASSOCIATED WITH EXPOSURE TO BOTH PRIMARY AND SECOND-HAND SMOKE FROM CIGARETTES. THESE CIGARETTES ARE ONLY TO BE USED UNDER THE LABORATORY CONDITIONS DESCRIBED IN ASTM E2187-16.

Storage: ASTM E2187-16 and ISO 12863 state that cigarette test specimens are to be protected from physical or environmental damage while in handling and storage. It is important that the specimens not be crushed or deformed in any manner. Careful handling is needed to ensure that the specimens are not contaminated while in storage, and that they are protected from degradation by insects. If test cigarettes are not to be used for more than one week, they are to be stored in a freezer at 0 °C (32 °F) to –20°C (–4 °F).

Use: Prior to testing, the cigarettes are to be removed from the pack(s) and conditioned at a relative humidity of 55 % ± 5 % and a temperature of 23 °C ± 3 °C (73 °F ± 5 °F) for at least 24 h. The cigarettes are to be placed in a clean, open container, with the number of cigarettes being sufficiently small to enable free air access to the specimens, for example, a maximum of 20 cigarettes in a 250 mL polyethylene or glass beaker.

Material Selection and Packaging: The United States, Canada, Australia, and the European Union have enacted legislation requiring that all cigarettes sold in their jurisdictions must not exceed 25 % full-length burns using one of these test methods. A test consists of 40 determinations, each on a substrate consisting of 10 layers of filter paper. The filter paper is to meet the mass requirements in Section 9.4.1 of ASTM E2187-09 (ISO 12863 in Europe) and is to be conditioned prior to testing, as described in the ASTM and ISO standards.

Beginning in approximately 2009, the values obtained with the specified filter paper changed significantly. Therefore, a new substrate was developed that was not significantly dependent on the filter paper [4,5]. In 2016, this additional substrate was added to the ASTM standard. This substrate consists of a sheet of full hard 302 stainless steel shim stock, on top of which is placed a single sheet of filter paper. The specifications for the steel and filter paper are contained in ASTM E2187-16 [1]. ISO 12863 DOES NOT CONTAIN THIS SUBSTRATE NOR THE SPECIFICATIONS FOR ITS USE [2].

This SRM was developed because cigarette companies, the New York Office of Fire Prevention and Control, and Health Canada indicated a need for a standard cigarette that could be used by testing laboratories and manufacturers to assess and control ignition strength testing to assure regulatory compliance and quality control. The planned cigarette was to have a target ignition strength near (a) the required pass/fail criterion and (b) the value to which cigarette companies would need to design products in order to assure success during compliance testing, which is somewhat lower than the pass/fail criterion.

After examining several prototypes, Philip Morris USA submitted the candidate standard cigarettes to NIST. The packs and cartons were printed to NIST specifications at the factory. The cigarettes themselves bear no markings other than “SRM 1082.”

REFERENCES

- [1] ASTM E2187; *Standard Test Method for Measuring the Ignition Strength of Cigarettes*; Annual Book of ASTM Standards, Vol. 04.07; ASTM International: West Conshohocken, PA (2016).
- [2] ISO 12863:2010; *Standard Test Method for Assessing the Ignition Propensity of Cigarettes*; 1st ed.; International Standards Organization, TC 92/SC 1: Geneva, Switzerland (2010).
- [3] Beauchamp, C.R.; Camara, J.E.; Carney, J.; Choquette, S.J.; Cole, K.D.; DeRose, P.C.; Duewer, D.L.; Epstein, M.S.; Kline, M.C.; Lippa, K.A.; Lucon, E.; Molloy, J.; Nelson, M.A.; Phinney, K.W.; Polakoski, M.; Possolo, A.; Sander, L.C.; Schiel, J.E.; Sharpless, K.E.; Toman, B.; Winchester, M.R.; Windover, D.; *Metrological Tools for the Reference Materials and Reference Instruments of the NIST Material Measurement Laboratory*; NIST Special Publication (NIST SP) 260-136, 2021 edition; U.S. Government Printing Office: Washington, DC (2021); available at <https://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.260-136-2021.pdf> (accessed Mar 2022).
- [4] Robbins, A.P.; Gann, R.G.; Guthrie, W.F.; *Identification of an Alternate Substrate for Testing Reduced Ignition Propensity Cigarettes (2013), Proceedings the 13th International Fire Science and Engineering Conference, Interscience Communications*: London; available at https://tsapps.nist.gov/publication/get_pdf.cfm?pub_id=913892 (accessed Mar 2022).
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- [6] Koepke, A.; Lafarge, T.; Possolo, A.; Toman, B.; *NIST Consensus Builder User's Manual* (2017); available at <https://consensus.nist.gov/app/nicob> (accessed Mar 2022).
- [7] JCGM 100:2008; *Evaluation of Measurement Data — Guide to the Expression of Uncertainty in Measurement* (GUM 1995 with Minor Corrections); Joint Committee for Guides in Metrology (JCGM) (2008); available at <https://www.bipm.org/en/publications/guides> (accessed Mar 2022); see also Taylor, B.N.; Kuyatt, C.E.; *Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results*; NIST Technical Note 1297, U.S. Government Printing Office: Washington, DC (1994); available at <https://www.nist.gov/pml/nist-technical-note-1297> (accessed Mar 2022).

Certificate Revision History: 21 March 2022 (Removed shipping temperature specification based on updated information; updated format; editorial changes); 26 October 2020 (Updated ignition strength value and uncertainty; editorial changes); 08 August 2019 (Change of ignition strength value based on new substrate for testing per ASTM E2187-16; editorial changes); 28 September 2017 (Change of expiration date; editorial changes); 02 September 2015 (Change of expiration date; editorial changes); 28 November 2012 (References added; editorial changes); 06 May 2008 (Editorial update); 01 February 2006 (Original certificate date).

Certain commercial equipment, instruments, or materials may be identified in this Certificate of Analysis to adequately specify the experimental procedure. Such identification does not imply recommendation or endorsement by the National Institute of Standards and Technology, nor does it imply that the materials or equipment identified are necessarily the best available for the purpose.

Users of this SRM should ensure that the Certificate of Analysis in their possession is current. This can be accomplished by contacting the Office of Reference Materials 100 Bureau Drive, Stop 2300, Gaithersburg, MD 20899-2300; telephone (301) 975-2200; e-mail srminfo@nist.gov; or the Internet at <https://www.nist.gov/srm>.

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APPENDIX A

Certified Ignition Strength Value Analysis: The measurand is ignition strength as defined by ASTM Method E2187-16. The certified value and its uncertainty interval were obtained using the DerSimonian-Laird analysis (DLA) method within the NIST Consensus Builder [6], applied to testing results separately summarized from each cigarette carton tested. This analysis is consistent with the Guide to the Expression of Uncertainty in Measurement (GUM) [7], and the analysis indicates moderate carton-to-carton variability in ignition strength testing results. The modeling approach and expanded uncertainty interval accounts for random variation both within- and between-carton. The data from each carton was modeled using individual binomial likelihood functions, and a 95 % confidence interval was formed for the ignition strength of each carton. The resulting proportions were transformed via logit function (i.e., $f(p) = \log\left(\frac{p}{1-p}\right)$). A DLA that accommodates potential between-carton variation was used to obtain an expanded uncertainty interval. The estimated logit of ignition strength obtained via the DLA was transformed back to the scale of ignition strength via the logistic function (i.e., $f(x) = \frac{e^x}{1+e^x}$) along with endpoints of a 95 % confidence interval chosen so that the interval is symmetric around the estimated ignition strength. The expanded uncertainty interval provided in Table 1 is intended to represent the range within which NIST scientists would expect the ignition strength of a single randomly selected carton of SRM 1082 cigarettes to fall with 95 % confidence when tested at the NIST laboratory by a trained NIST scientist.

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APPENDIX B

Coordination of the technical measurements leading to certification was performed by R.D. Davis of the NIST Fire Research Division.

Ignition strength measurements at NIST were made by I. Kim of the NIST Fire Research Division.

Statistical consultation on experiment design and analysis of the certification data were performed by S.P. Lund of the NIST Statistical Engineering Division.

Support aspects involved in the issuance of this SRM were coordinated through the NIST Office of Reference Materials.

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