



Designation: ~~F400—19~~ F400 – 20

An American National Standard

Standard Consumer Safety Specification for Lighters¹

This standard is issued under the fixed designation F400; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This consumer safety specification covers all flame-producing consumer products commonly known as cigarette lighters, pipe lighters, and cigar lighters and such similar devices as defined in 3.1.9. Matches are specifically excluded from this safety specification; flame-producing products intended solely for igniting apparatus other than cigars, pipes, and cigarettes, including products covered by Specification F2201, are also specifically excluded from this safety specification. Lighters are specifically not intended for use as a candle, flashlight, or for other uses requiring an extended burn time.

1.2 This specification establishes requirements for lighters to ensure a reasonable degree of safety for normal use or reasonably foreseeable misuse of such lighters by users.

1.3 Lighters, being flame-producing devices, ~~can~~ as do all flame sources, present a potential hazard to the consumer. This specification cannot eliminate all hazards, but is intended to minimize potential hazards of lighters to users.

1.4 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

1.5 The following precautionary caveat pertains only to the test methods portion, Section 8, of this specification: *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.6 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 ASTM Standards:²

[D2163 Test Method for Determination of Hydrocarbons in Liquefied Petroleum \(LP\) Gases and Propane/Propene Mixtures by Gas Chromatography](#)

[D2598 Practice for Calculation of Certain Physical Properties of Liquefied Petroleum \(LP\) Gases from Compositional Analysis](#)

[F2201 Consumer Safety Specification for Utility Lighters](#)

¹ This specification is under the jurisdiction of ASTM Committee F15 on Consumer Products and is the direct responsibility of Subcommittee F15.02 on Safety Standards for Lighters.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

2.2 *Other Standards:*

ISO 7941 Commercial Propane and Butane – Analysis by Gas Chromatography³
 UL 1439 Test for Sharpness of Edges on Equipment⁴

2.3 Other references for general information are noted in **Annex A1**.

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *burner valve*—component of a gas lighter that controls the release of fuel.

3.1.2 *burner valve orifice*—tip of the burner valve from which fuel is released.

3.1.3 *dual flame type lighter*—gas lighter that employs a burner valve system(s) that produces more than one type of flame (premixing and postmixing), which ~~could~~ allows for a flame to be produced independently and separately (one flame at a time), or dependently and concurrently (multiple flames at a time).

3.1.4 *flame*—result of combustion of fuel that produces heat and often light which ~~may be~~ is visible with the naked eye under normal or subdued lighting conditions.

3.1.5 *flame height*—linear distance from the tip of the visible flame to the top of the shield or, in the absence of a shield, from the tip of the visible flame to the top of the burner valve orifice or to the bottom of the exposed wick.

3.1.6 *flaring*—variance of flame height from the steady-state flame condition.

3.1.7 *fuel*—a petrochemical based material in a lighter that is released and combusted to release energy as heat and often light which ~~may be~~ is in the form of a flame.

3.1.8 *ignite*—to produce a flame with a lighter by activating the self-contained ignition and fuel release systems of that lighter in the intended manner.

3.1.9 *lighter*—manually operated flame-producing device employing a fuel and an ignition system. It is intended and normally used for deliberately igniting cigarettes, pipes, and cigars, and ~~may~~ foreseeably be used to ignite materials such as paper, wicks, candles, and lanterns.

3.1.10 *lighter, adjustable*—lighter provided with a mechanism for the user to vary the height of the flame.

3.1.11 *lighter, automatic adjusting pipe*—lighter designed specifically for the purpose of lighting pipes and characterized by an automatic increase in flame height when tilted from an upright position.

3.1.12 *lighter, fluid*—lighter that utilizes a hexane-type fluid such as petrol or naphtha whose vapor pressure at 24°C (75°F) 24 °C (75 °F) does not exceed a gage pressure of 34 kPa (5 psi).

3.1.13 *lighter, gas*—lighter that utilizes a butane, isobutane, propane, or other liquefied hydrocarbon mixture whose vapor pressure at 24°C (75°F) 24 °C (75 °F) exceeds a gage pressure of 104 kPa (~~15 psi~~)(15 psi).

3.1.14 *lighter, nonadjustable*—lighter that has a flame height preset by the manufacturer and is not provided with a mechanism to adjust the flame height.

3.1.15 *lighter, non-refillable (disposable)*—lighter provided with a supply of fuel from the manufacturer and that is not intended to be refueled.

³ Available from International Organization for Standardization (ISO), ISO Central Secretariat, BIBC II, Chemin de Blandonnet 8, CP 401, 1214 Vernier, Geneva, Switzerland, <http://www.iso.org>.

⁴ Available from Underwriters Laboratories (UL), 2600 N.W. Lake Rd., Camas, WA 98607-8542, <http://www.ul.com>.

3.1.16 *lighter, non-self-extinguishing*—lighter that, once ignited, does not require intentional or positive action by the user to maintain a flame and requires a subsequent, deliberate user action to extinguish the flame.

3.1.17 *lighter, postmixing burner*—gas lighter in which fuel and air is mixed at the point of combustion.

3.1.18 *lighter, premixing burner*—gas lighter in which fuel and air is mixed before being supplied for combustion.

3.1.19 *lighter, refillable*—lighter that is intended to be refueled either by decanting fuel from an external container or by inserting a new prefilled fuel reservoir.

3.1.20 *lighter, self-extinguishing*—lighter that, once ignited, requires continuous intentional and positive action to maintain a flame and that is subsequently extinguished upon the termination of such positive action.

3.1.21 *multiple flame type lighter*—gas lighter that employs a burner valve system(s) that produces more than one flame of the same type of flame (premixing or postmixing), which ~~could~~ allows for a flame to be produced independently and separately (one flame at a time), or dependently and concurrently (multiple flames at a time).

3.1.22 *shield*—structure that totally or partially surrounds the burner valve orifice of a gas lighter or the wick of a fluid lighter.

3.1.23 *spitting or sputtering*—flame phenomenon of a gas lighter wherein escape of non-evaporated, liquefied gas produces a shower of burning liquid droplets which separate from the main flame.

3.1.24 *sustained self-ignition*—propagation of a flame by other than deliberate manual operation (for example, dropping the lighter, lighter), so as to cause the ignition element to be activated, producing a flame, and the flame continues to burn.

3.1.24 *spitting or sputtering*—flame phenomenon of a gas lighter wherein escape of non-evaporated, liquefied gas produces a shower of burning liquid droplets which separate from the main flame.

4. General Requirements

4.1 *Flame Generation*—In order to minimize the possibility of inadvertent or self-ignition, lighters shall require a deliberate manual operation to produce a flame. This operation shall conform to at least one of the following requirements:

4.1.1 A system such that positive action on the part of the user is required to generate and maintain a flame.

4.1.2 A system that requires two or more independent motions to generate a flame.

4.1.3 A system that requires an actuating force equal to or greater than 15 N (3.4 lbf) to generate a flame (see Fig. 1 and Fig. 2 for examples of test methods).

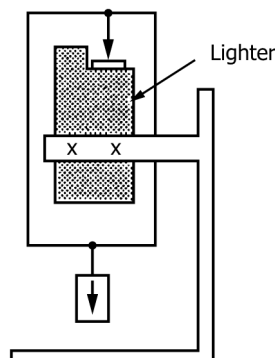


FIG. 1 Block Diagram for a Typical Example of Test Method for Measuring the Flame Generation Actuating Force as Specified in 4.1.3

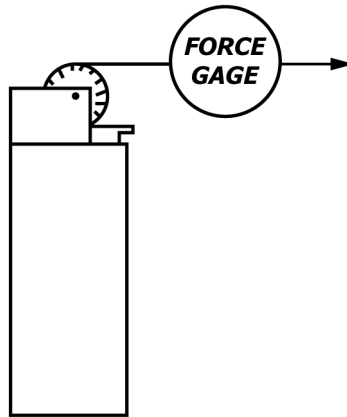


FIG. 2 Block Diagram for a Typical Example of Test Method for Measuring Force as Specified in 4.1.3

4.1.4 Or any combination thereof (4.1.1, 4.1.2, 4.1.3).

4.2 *Flame Control*—The maximum attainable flame height for lighters shall be limited with a setting or by product design, or both. For adjustable flame-height lighters, the maximum flame height that a user will obtain on first striking the lighter without adjustment shall also be limited. These limits shall comply with the following requirements when tested in accordance with 8.1:

4.2.1 Nonadjustable fluid lighters, in accordance with 3.1.14, 3.1.12 and 3.1.14, shall not be capable of producing a flame height greater than 120 mm (4.75 in.) when tested in accordance with 8.1.

4.2.2 Nonadjustable, postmixing and premixing burner gas lighters, in accordance with 3.1.14, 3.1.17, and 3.1.18, shall have a maximum attainable flame height of no more than 50 mm (2 in.) when tested in accordance with 8.1.

4.2.3 Adjustable postmixing burner lighters, in accordance with 3.1.10 and 3.1.17, shall not be capable of producing a flame height greater than 120 mm (4.7 in.) for refillable lighters and no greater than 100 mm (4 in.) for non-refillable lighters when deliberately adjusted by the user to the manufacturer's design limit for maximum flame height and when tested in accordance with 8.1.

4.2.4 Adjustable premixing burner lighters, in accordance with 3.1.10 and 3.1.18, shall not be capable of producing a flame height greater than 75 mm (3 in.) when deliberately adjusted by the user to the manufacturer's design limit for maximum flame height and when tested in accordance with 8.1.

4.2.5 Adjustable postmixing burner lighters, in accordance with 3.1.10 and 3.1.17, shall have the flame height adjusted by the manufacturer in such a manner that the lighter, when first ignited by the user without changing the adjustment, will not produce a flame height in excess of 100 mm (4 in.) when tested in accordance with 8.1.

4.2.6 Adjustable premixing burner lighters, in accordance with 3.1.10 and 3.1.18, shall have the flame height adjusted by the manufacturer in such a manner that the lighter, when first ignited by the user without changing the adjustment, will not produce a flame height in excess of 60 mm (2.5 in.) when tested in accordance with 8.1.

4.2.7 All adjustable flame height lighters, in accordance with 3.1.10, shall be capable of producing a flame not in excess of 50 mm (2 in.) when set at the lowest possible flame height when tested in accordance with 8.1.

4.2.8 Automatic adjusting pipe lighters, in accordance with 3.1.11, shall not be capable of producing a flame height greater than 100 mm (4 in.) when tested in accordance with 8.1 and 8.2.

4.2.9 Dual flame type lighters, in accordance with 3.1.3, for each type of flame, the flame height shall comply with the corresponding requirement for that type of lighter and flame provided in 4.2.

4.2.10 Multiple flame type lighters, in accordance with 3.1.21, the flame height of each flame shall comply with the corresponding requirement for that type of lighter and flame provided in 4.2.

4.3 *Flame-Height Adjustment*—Adjustable flame height lighters in accordance with 3.1.10 shall require a deliberate action on the part of the user to increase or decrease the flame height when the lighter is used in the normal fashion.

4.3.1 For flame control actuators that protrude from the body of the lighter, it shall require a minimum actuating force of 1 N (0.25 lbf) applied over the entire range of adjustment in a tangential direction (see Fig. 3 for an example of the test method).

4.3.2 Adjustable gas lighters having rotary movement flame control actuators approximately at right angles to the flame shall perform as follows:

4.3.2.1 When the flame control actuator is at the top of the lighter and the lighter held so the flame is oriented vertically upward, and the user is facing the flame control actuator, moving the actuator to the left shall produce a decrease in flame height.

4.3.2.2 When the flame control actuator is at the bottom of the lighter and the lighter held so that the user is looking at the actuator, a clockwise movement shall result in a decrease in flame height.

4.3.3 Adjustable gas lighters requiring motion of the flame control actuator approximately parallel to the flame axis shall decrease or increase the flame height according to the direction of the movement.

4.3.4 Adjustable flame height lighters shall indicate the direction of movement to produce a higher or lower flame height. On lighters whose adjusting mechanisms conform to 4.3.2 and 4.3.3, the direction of movement shall be permanently imprinted or engraved on the lighter. Such permanent information shall be placed on the lighter in the vicinity of the adjusting mechanism and be readily visible and understandable.

4.4 *Spitting or Sputtering and Flaring*—Gas lighters as defined in 3.1.13 when set at the maximum flame height, shall exhibit no spitting or sputtering as defined in 3.1.23 or flaring as defined in 3.1.6, when tested in accordance with 8.2.

4.5 *Flame Extinction*:

4.5.1 Adjustable postmixing burner lighters, after a 5-s burn at maximum flame height, when extinguished in the intended manner, such as by closing a cover or releasing a button or lever, shall have any exposed flame completely extinguished within 2 s after such action is completed when tested in accordance with 8.3. In the case of postmixing burner lighters that have shields, an additional 2-s afterburn is acceptable if only when the flame height during this additional 2-s period does not extend above the shield.

4.5.2 Adjustable postmixing burner lighters at a flame height of 50 mm (2 in.), or the maximum height the adjustment allows, if lower than 50 mm (2 in.) or nonadjustable postmixing burner lighters at their permanently set flame heights, after a 10-s burn, when extinguished in the intended manner, such as by closing a cover or releasing a button or lever, shall have any exposed flame completely extinguished within 2 s after such action is completed, when tested in accordance with 8.3. In the case of gas lighters that have shields, an additional 2-s afterburn is acceptable if only when the flame height during this additional 2-s period does not extend above the shield.

4.5.3 Adjustable premixing burner lighters, after a 5-s burn at maximum flame height, when extinguished in the intended manner, such as by closing a cover or releasing a button or lever, shall have any exposed flame completely extinguished in no more than 5 s, when tested in accordance with 8.3.

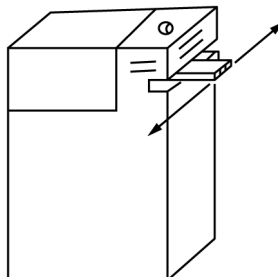


FIG. 3 Block Diagram for a Typical Example of Test Method for Measuring the Flame Control Actuating Force as Specified in 4.3.1

4.5.4 Adjustable premixing burner lighters, when set at a flame height of 50 mm (2 in.) or the maximum flame height the adjustment allows ~~if for flames~~ lower than 50 mm, or nonadjustable premixing burner lighters at their permanently set flame heights, after a 10-s burn, when ~~closed~~ extinguished in the intended manner, such as by closing a cover or releasing a button or lever, shall have any exposed flame completely extinguished in no more than 5 s, when tested in accordance with 8.3.

NOTE 1—In the case of premixing burner lighters, the total afterburn time of 5 s in this specification will be reconsidered periodically with a view to gradual reduction in line with technological progress.

4.5.5 Dual flame type lighters, for each type of flame, the extinction time shall comply with the corresponding requirement for that type of lighter and flame provided in 4.5.

4.5.6 Multiple flame type lighters, for each flame, the extinction time shall comply with the corresponding requirement for that type of lighter and flame provided in 4.5.

4.6 *Volumetric Displacement*—For gas lighters shipped with fuel, the liquid portion of the fuel shall not exceed 85 % of the volumetric capacity of the fuel chamber when tested in accordance with 8.14.

4.7 *Weight of Fuel*—For gas lighters shipped with fuel, the weight of the liquefied fuel shall not exceed 10 g.

5. Structural Integrity Requirements

5.1 Lighters shall have structural integrity as specified in requirements 5.2 – 5.9 (Table A2.1).

5.2 *Drop Test*:

5.2.1 Postmixing and premixing burner lighters as defined in 3.1.17 and 3.1.18 must be capable of withstanding three separate 1.5-m ± 0.1-m (5-ft ± 0.3-ft or ± 4-in.) drops conducted in accordance with 8.4, without fuel reservoir fragmentation, without resulting in sustained self-ignition as defined in 3.1.233.1.24, and without gas escape exceeding ~~±515 mg~~ mg/min and if operable, without impairing/min. For lighters that remain operable, the subsequent safe operation of the lighter/lighter must not be impaired.

5.2.2 Fluid lighters as defined in 3.1.12 must be capable of withstanding three separate 1.5-m ± 0.1-m (5-ft ± 0.3-ft or ± 4-in.) drops conducted in accordance with 8.4, without fuel reservoir rupture, and without resulting in sustained self-ignition as defined in 3.1.233.1.24, and if operable, without impairing. For lighters that remain operable, the subsequent safe operation of the lighter/lighter must not be impaired.

5.2.3 Lighters that meet the requirements of 5.2.1 or 5.2.2, and that are able to be ignited in the intended manner shall subsequently meet all the applicable requirements of 4.1 – 4.5, inclusive.

5.3 *Temperature Test*—Lighters shall be capable of withstanding a temperature of ~~65°C~~ 65 °C ± 2°C (~~149°F~~ 149 °F ± 4°F) for 4 h when tested in accordance with 8.5.

5.3.1 Lighters that meet the requirements of 5.3 and that are able to be ignited in the intended manner shall subsequently meet all the applicable requirements of 4.1 – 4.5, inclusive.

5.4 *Burning Test*—Adjustable gas lighters with the flame height set at maximum, nonadjustable gas lighters at their permanently set flame heights, or fluid-type lighters shall be capable of withstanding a burning time of 5 s with the lighter in a position 45° ± 5° below horizontal (see Fig. 4) without evidence of any burning or distortion of components so as to cause a hazardous condition.

5.4.1 Adjustable gas lighters with the flame height set at ~~50 mm~~ 50 mm (2 in.) or the maximum flame height the adjustment allows, ~~if for flames~~ lower than 50 mm, nonadjustable gas lighters at their permanently set flame heights, or fluid-type lighters shall be capable of withstanding a total burning time of 10 s in two different attitudes (a) with the flame directed vertically upward and (b) with the flame directed 45° ± 5° below horizontal, horizontal (see Fig. 4), without evidence of any burning or distortion of components so as to cause a hazardous condition.

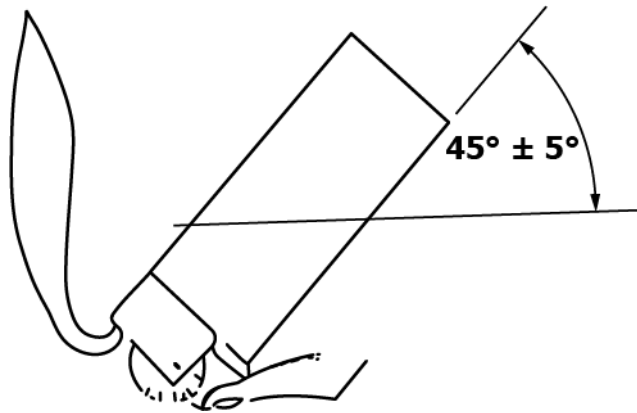


FIG. 4 Flame Height Measurement Lighter in a Position of $45^\circ \pm 5^\circ$

5.4.2 Lighters that meet the requirements of 5.4, and that are able to be ignited in the intended manner shall subsequently meet all the applicable requirements of 4.1 – 4.5, inclusive.

5.5 *Continuous Burn*—Adjustable gas lighters with the flame set at 50 mm (2 in.) or the maximum flame height the adjustment allows, if for flames lower than 50 mm, nonadjustable gas lighters at their permanently set flame heights, or fluid-type lighters shall be capable of withstanding a continuous burning time of 2 min with the lighter and flame directed vertically upward without causing a hazardous condition, when tested in accordance with 8.6.

5.6 *Cycling Burn*—Adjustable gas lighters with the flame set at 50 mm (2 in.) or the maximum flame height the adjustment allows, if for flames lower than 50 mm, nonadjustable gas lighters at their permanently set flame height, or fluid-type lighters shall be capable of withstanding a burning time of 20 s, repeated 10 times, when tested in accordance with 8.7.

5.6.1 Gas and fluid lighters that meet this requirement, and that are able to be ignited in the intended manner shall subsequently meet all the applicable requirements of 4.1 – 4.5, inclusive. Any lighter that cannot make a flame shall not be classified as a failure.

5.7 *External Finish*—Lighters shall have no external sharp edges that could cause accidental cuts or abrasions to the consumer when handled or used in the intended manner. Test for sharp edges—Initial inspection to be performed by visual and tactile (moving a finger slowly and carefully) assessments over the lighter to predetermine for any sharp edges that are present. For any sharp edges found, then test for sharp edges in accordance with UL 1439.

5.8 *Compatibility:*

5.8.1 Components of gas lighters as defined in 3.1.13 that come in contact with the fuel recommended by the manufacturer shall not deteriorate after the exposure to the fuel, so as to cause the lighter to fail any of the criteria contained in this specification or allow gas escape exceeding 15 mg/min when tested in accordance with 8.8.

5.8.2 Components of fluid lighters as defined in 3.1.12 that come in contact with the fuel recommended by the manufacturer shall not deteriorate after extended contact with that fuel, so as to fail any of the criteria contained in this specification when tested in accordance with 8.9.

5.8.3 Gas and fluid lighters that meet this requirement, and that are able to be ignited in the intended manner shall subsequently meet all the applicable requirements of 4.1 – 4.5, inclusive.

5.9 *Pressure Tests*—Gas lighters shall be capable of withstanding an internal pressure of two times the vapor pressure occurring at 55°C (131°F) of the fuel recommended by the manufacturer when tested in accordance with 8.10.

6. **Refilling of Refillable Lighters**

6.1 Refillable fluid lighters, as defined in 3.1.12 and 3.1.19, shall be accompanied with specific instructions and warnings as applicable in accordance with Section 7.