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**9994**

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## Lighters — Safety specification

*Briquets — Spécifications de sécurité*

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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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 9994 reproduces the technical content of ASTM/ANSI F 400-87 developed by the *American Society for Testing and Materials* and published jointly by the latter and by the *American National Standards Institute*.

ASTM/ANSI F 400-87, which took into account European Standard EN 123:1980 developed by the European Committee for Standardization (CEN), formed the first edition of ISO 9994. It was approved by the ISO member bodies under a special procedure adopted by the ISO Council.

This second edition cancels and replaces the first edition (ISO 9994:1989), of which it constitutes a technical revision.

Annexes A and B of this International Standard are for information only.

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# Lighters — Safety specification

## 1 Scope

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

The safety specification given in this International Standard applies to all flame-producing products commonly known as cigarette lighters, cigar lighters and pipe lighters. It does not apply to matches, nor does it apply to other flame-producing products intended solely for igniting materials other than cigarettes, cigars, and pipes.

Lighters, being flame-producing devices, can, as do all flame sources, present a potential hazard to users. The safety specification given in this International Standard cannot eliminate all hazards, but is intended to reduce potential hazards to users.

## 2 Definitions

For the purposes of this International Standard, the following definitions apply.

**2.1 lighter:** Manually operated flame-producing device, employing a petrochemical derivative as a fuel, normally used for deliberately igniting cigarettes, cigars, and pipes, and which may foreseeably be used to ignite materials such as paper, wicks, candles, and lanterns.

NOTE 1 Lighters are specifically not intended for use as candles, flashlights, or for other uses requiring an extended burn time.

**2.1.1 fluid lighter:** Lighter, with an exposed wick, that employs as fuel liquid hydrocarbons such as hexane whose gauge vapour pressure at 24 °C does not exceed 34,5 kPa.

**2.1.2 gas lighter:** Lighter that employs as fuel liquefied hydrocarbons such as *n*-butane, isobutane and propane whose gauge vapour pressure at 24 °C exceeds 104 kPa.

**2.2 disposable lighter:** Lighter marketed with an integral supply of fuel and that is not intended to be refuelled.

**2.3 refillable lighter:** Lighter intended to be refuelled either by transferring fuel from an external container or by inserting a new prefilled fuel reservoir.

**2.4 adjustable lighter:** Lighter provided with a mechanism for the user to vary the flame height.

**2.5 non-adjustable lighter:** Lighter that is not provided with a user-accessible mechanism to adjust the flame height. (The flame height is preset by the manufacturer.)

**2.6 automatically adjusting pipe lighter:** Lighter characterized by an automatic increase in flame height when tilted from an upright position, designed specifically for the purpose of lighting pipes.

**2.7 self-extinguishing lighter:** Lighter that, once ignited, requires continuous intentional and positive action to maintain a flame and that is subsequently extinguished by the termination of such positive action.

**2.8 non-self-extinguishing lighter:** 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.

**2.9 windproof lighter:** Lighter (generally a fluid lighter, with an exposed wick and shield around it) designed to provide the user with a product having wind-resistant features.

NOTE 2 In this type of lighter, the shield is sometimes referred to as flameguard, windguard or windshield.

**2.10 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 wick or burner valve orifice.

NOTE 3 Flame heights are measured in accordance with 5.2.

**2.11 shield:** Structure that totally or partially surrounds the burner valve orifice of a gas lighter or the wick of a fluid lighter.

**2.12 burner valve:** Component of a gas lighter which controls the release of fuel.

**2.13 burner valve orifice:** Tip of the burner valve from which fuel is released.

**2.14 flaring:** Variation of flame height from the steady-state flame condition.

**2.15 sustained self-ignition:** Propagation of a flame by other than deliberate manual operation, such as by dropping the lighter, so as to cause the ignition element to be activated and the flame to continue to burn.

**2.16 spitting; 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.

The maximum attainable flame height for lighters shall be limited by pre-setting or by product design, or both.

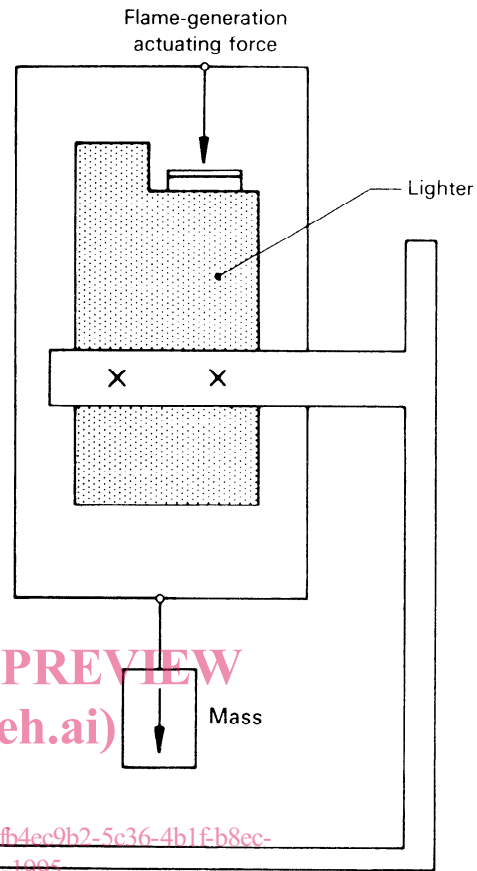


Figure 1 — Application of flame-generation actuating force as specified in 3.1 c): push-button actuator

### 3 Functional requirements

#### 3.1 Flame generation

In order to minimize the possibility of inadvertent ignition, 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:

- a) a system such that positive action on the part of the user is required to generate and maintain a flame;
- b) a system that requires two or more independent actions by the user to generate a flame;
- c) a system that requires an actuating force equal to, or greater than, 15 N to generate a flame (see figure 1 or figure 2).

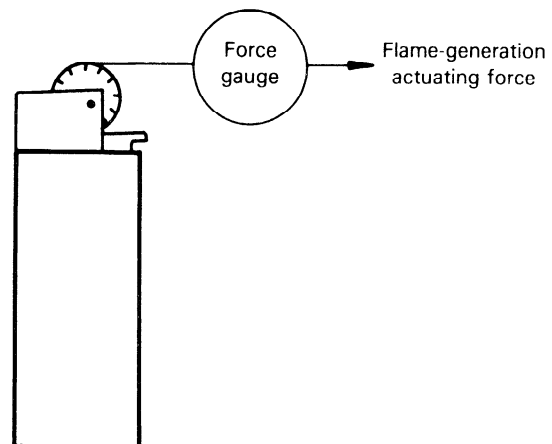


Figure 2 — Application of flame-generation actuating force as specified in 3.1 c): rotary actuator

## 3.2 Flame heights

NOTE 4 Maximum flame heights specified in this International Standard will be reconsidered periodically with a view to gradual reduction in line with technological progress.

### 3.2.1 Non-adjustable lighters

**3.2.1.1** Non-adjustable windproof lighters shall not be capable of producing a flame height greater than 120 mm when tested in accordance with 5.2.

**3.2.1.2** Non-adjustable, non-windproof lighters shall not be capable of producing a flame height greater than 50 mm when tested in accordance with 5.2.

### 3.2.2 Adjustable lighters

For adjustable lighters as defined in 2.4, the maximum flame height that a user will obtain under different conditions of use shall comply with the following requirements when tested in accordance with 5.2.

**3.2.2.1** Adjustable lighters shall have the flame height adjusted prior to reaching the user in such a manner that the lighter, when first struck by the user — without changing the adjustment — will not produce a flame height greater than 100 mm.

**3.2.2.2** Adjustable lighters shall not be capable of producing a flame height greater than 150 mm when deliberately adjusted by the user to the manufacturer's design limit for maximum flame height.

**3.2.2.3** Adjustable lighters shall not be capable of producing a flame height greater than 50 mm when set at the lowest possible flame height.

NOTE 5 See also annex A on AQL's and annex B, **Bibliography**, for sampling scheme references.

**3.2.2.4** Automatically adjusting pipe lighters shall not be capable of producing a flame greater than 100 mm, in any position.

## 3.3 Flame-height adjustment

Adjustable lighters, as defined in 2.4, shall require a deliberate action on the part of the user either to decrease or to increase the flame height when used in the normal manner. Adjustable lighters shall bear an indication showing the direction of movement of the

adjusting mechanism required to produce a higher or lower flame.

**3.3.1** On lighters whose adjusting mechanisms conform to 3.3.3 and 3.3.4 respectively, the direction of movement may be permanently imprinted or engraved on the lighter, or it may be of a non-permanent nature such as an attached tag or stick-on label. Such a non-permanent tag or label shall be placed on the lighter in the vicinity of the adjusting mechanism and be readily visible and understandable.

**3.3.2** On lighters whose adjusting mechanisms do not conform to 3.3.3 and 3.3.4, the direction of movement shall be permanently imprinted or engraved on the lighter. This shall be in the vicinity of the adjusting mechanism and be readily visible and understandable.

**3.3.3** Gas lighters having rotary-movement flame-control actuators approximately at right-angles to the flame shall perform as follows:

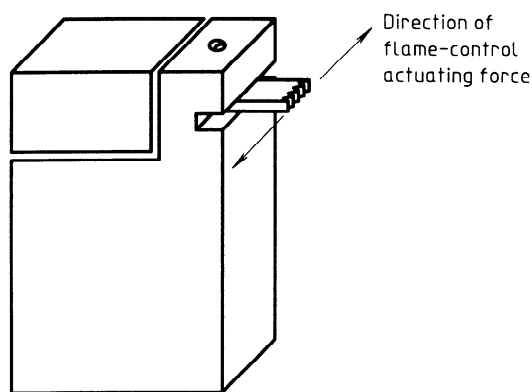
- a) when the flame-control actuator is at the top of the lighter and the lighter is held so that the flame is oriented vertically upward, and the user is facing the flame-control actuator, moving the actuator to the left shall produce a decrease in flame height;
- b) when the flame-control actuator is at the bottom of the lighter, and the lighter is held so that the user is facing the actuator, a clockwise movement shall produce a decrease in flame height.

**3.3.4** For gas lighters requiring movement of the flame-control actuator approximately parallel to the flame axis, the flame height shall decrease or increase in accordance with the direction of the movement.

**3.3.5** If the flame-control actuator protrudes from the body of the lighter, it shall require a minimum actuating force of 1 N applied over the entire range of adjustment in a tangential direction. (See figure 3.)

## 3.4 Resistance to spitting or sputtering and flaring

Gas lighters as defined in 2.1.2, when set at the maximum flame height, shall exhibit no spitting or sputtering as defined in 2.16, or flaring as defined in 2.14, when tested in accordance with 5.3.



**Figure 3 — Application of flame-control actuating force as specified in 3.3.5**

### 3.5 Flame extinction

When extinguished in the intended manner, for example by closing a cover or by releasing a button or a lever,

- a) non-adjustable lighters, at their permanently set flame heights, when tested in accordance with 5.4, shall have any exposed flame completely extinguished within 2 s after a 10 s burn;
- b) adjustable lighters, when tested in accordance with 5.4, shall have any exposed flame completely extinguished within 2 s
  - 1) after a 10 s burn when set at a flame height of 50 mm, or the maximum flame height the adjustment allows if lower than 50 mm;
  - 2) after a 5 s burn when set at maximum flame height.

In the case of gas lighters that have shields, an additional 2 s afterburn (i.e. continuous burning) is acceptable if the flame, during this additional 2 s period, does not extend above the shield.

### 3.6 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 5.7.

## 4 Structural integrity requirements

### 4.1 External finish

Lighters shall have no external sharp edges that could cause accidental cuts or abrasions to the user when handled or used in the intended manner.

### 4.2 Compatibility with fuel

**4.2.1** Components of fluid lighters defined in 2.1.1 that come into contact with the fuel recommended by the manufacturer shall not deteriorate after extended contact with that fuel, so as to cause the lighter to fail any of the criteria contained in this specification, when tested in accordance with 5.5.

**4.2.2** Components of gas lighters defined in 2.1.2 that come into contact with the fuel recommended by the manufacturer shall not deteriorate after 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 5.5.

### 4.3 Resistance to fuel loss

**4.3.1** Refillable fluid lighters having a sealed fuel chamber shall have a fill plug which shall prevent loss or leakage of fuel from the reservoir when such a plug is installed in the lighter by the user in the intended manner, when tested in accordance with 5.6.

**4.3.2** Refillable gas lighters shall have a pressurized fuel reservoir whose refilling valve shall be secure enough to prevent an escape of gas exceeding 15 mg/min when tested in accordance with 5.6.

### 4.4 Resistance to dropping

Without impairing their subsequent safe operation, lighters shall be capable of withstanding three separate  $(1,5 \pm 0,1)$  m drops conducted in accordance with 5.8

- without fuel reservoir rupture/fragmentation, and
- without resulting in sustained self-ignition, as defined in 2.15.

In addition, for gas lighters, gas escape shall not exceed 15 mg/min.

In the event of a shield becoming detached during the drop test, it can be re-attached, if this is practicable, and the test continued.



Lighters that meet this requirement, and that are still operable in the intended manner, shall be capable of meeting all the applicable requirements of clause 3.

#### 4.5 Resistance to elevated temperature

Gas lighters, and fluid lighters with a sealed compartment filled with non-absorbed fuel shall be capable of withstanding a temperature of 55 °C for 4 h when tested in accordance with 5.9.

Lighters that meet this requirement, and that are still operable in the intended manner, shall be capable after return to an ambient temperature of  $(23 \pm 2)$  °C of meeting all the applicable requirements of clause 3.

#### 4.6 Resistance to internal pressure

Gas lighters shall be capable of withstanding an internal pressure of twice the vapour pressure at 55 °C of the fuel recommended by the manufacturer, when tested in accordance with 5.10.

#### 4.7 Burning behaviour

##### 4.7.1 Any position

The following types of lighter shall be capable of withstanding a burning time of 5 s in any hand-held attitude without evidence of any burning or distortion of components so as to cause a hazardous condition:

- fluid lighters;
- non-adjustable gas lighters at their permanently set flame heights;
- adjustable gas lighters, with the flame height set at maximum.

##### 4.7.2 Inclined position at 45°

The following types of lighter shall be capable of withstanding a burning time of 10 s when held in a position such that the top of the wick, or burner valve orifice, forms an angle of 45° below the horizontal (see figure 4), without evidence of any burning or distortion of components so as to cause a hazardous condition:

- fluid lighters;
- non-adjustable gas lighters at their permanently set flame heights;

- adjustable gas lighters, with the flame height set at 50 mm, or the maximum flame height the adjustment allows if lower than 50 mm.

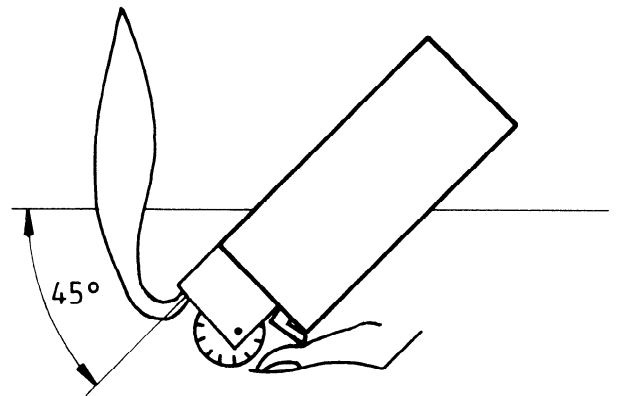


Figure 4 — Position of the lighter for the burning test described in 4.7.2

#### 4.8 Resistance to cyclic burning

The following types of lighter shall be capable of withstanding a burning time of 20 s — repeated 10 times — when tested in accordance with 5.11:

- fluid lighters;
- non-adjustable gas lighters at their permanently set flame heights;
- adjustable gas lighters, with the flame height set at 50 mm, or the maximum flame height the adjustment allows if lower than 50 mm.

Lighters that meet this requirement, and that are still operable in the intended manner, shall be capable of meeting all the applicable requirements of clause 3.

#### 4.9 Resistance to continuous burning

The following types of lighter shall be capable of withstanding a continuous burning time of 2 min with the flame in a vertically upward position without causing a hazardous condition, when tested in accordance with 5.12:

- fluid lighters;
- non-adjustable gas lighters at their permanently set flame heights;

- adjustable gas lighters, with the flame height set at 50 mm, or the maximum flame height the adjustment allows if lower than 50 mm.

## 5 Test methods

**WARNING — Test methods specified in this International Standard involve hazardous materials, operations, and equipment. This International Standard does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of this International Standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.**

### 5.1 Specimens

Unless otherwise stated in the test methods described hereafter, test specimens shall consist of new, complete, normally fuelled lighters and shall be initially free of mechanical damage.

### 5.2 Flame height measurement

#### 5.2.1 Apparatus

**5.2.1.1 Vertically supported non-flammable board** marked horizontally in 5 mm increments. The board shall be fitted with a stand-off at the base point, to position the lighter at least 25 mm from the board.

**5.2.1.2 Draught-free chamber** constructed from suitable non-flammable materials.

#### 5.2.2 Procedure

Tests shall be conducted inside the draught-free chamber.

- a) Stabilize all test specimens at  $(23 \pm 2)$  °C for at least 10 h prior to each flame height measurement.
- b) Place a specimen against the stand-off so that the flame will be directed vertically upward.
- c) Ignite the specimen lighter and determine the flame height, as defined in 2.10, to the nearest 5 mm by means of the marks on the board behind the lighter, during a 5 s burn.

## 5.3 Spitting, sputtering and flaring test

### 5.3.1 Procedure

- a) Stabilize all test specimens at  $(23 \pm 2)$  °C for at least 10 h prior to each spitting, sputtering and flaring test.

If the lighters are adjustable, as defined in 2.4, adjust the flame to its maximum height.

- b) Ignite a lighter and observe for spitting or sputtering, as defined in 2.16, during a 5 s burn in any hand-held attitude.

**Failure:** Any evidence of spitting or sputtering constitutes a failure. If the lighter does not fail, restabilize for a minimum of 5 min at  $(23 \pm 2)$  °C before continuing with procedures c) and d).

Pipe lighters, as defined in 2.6, shall be excluded from the following procedures c) to g).

- c) Ignite the lighter with the flame directed vertically upward.

- d) Observe the flame height and rotate the lighter to an inverted position (see figure 5), again observing the average or steady-state flame height during the procedure. Extinguish the lighter and return it to the vertical position.

**Failure:** At any time, an increase in flame height of more than 50 mm above the steady-state flame-height during a total elapsed time of 5 s, or a maximum flame height exceeding the maximum values stated in 3.2, constitutes a failure. If the lighter does not fail, restabilize for a minimum of 5 min at  $(23 \pm 2)$  °C before continuing with procedures e), f) and g).

- e) Invert the lighter for a period of 10 s.

- f) Return the lighter so that the flame will be directed vertically upward and ignite it.

- g) Observe the flame height during a 5 s burn.

**Failure:** Any variation of flame exceeding 50 mm or exceeding the maximum values stated in 3.2 constitutes a failure.

NOTE 6 If different lighters are used to conduct the above tests, stabilize these in accordance with 5.3.1 a).

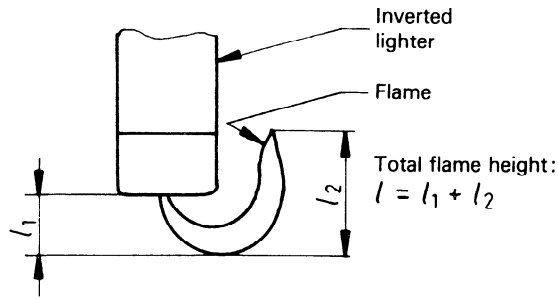


Figure 5 — Flame height measurement for the flaring test described in 5.3.1

### 5.4 Flame extinction test

#### 5.4.1 Apparatus

As described in 5.2.1.

#### 5.4.2 Procedure

It is recommended that the test be conducted under subdued lighting conditions.

- a) Stabilize all test specimens at  $(23 \pm 2)^\circ\text{C}$  for at least 10 h.
- b) Place a lighter against the flame height measurement apparatus so that the flame will be directed vertically upward.
- c) Ignite and adjust to the flame height specified in 3.5 a) or 3.5 b) as appropriate.
- d) Extinguish and allow to cool for 1 min.
- e) Ignite for the period(s) of time specified in 3.5 a) or 3.5 b), and extinguish in the normal manner.
- f) Measure and record any burning occurring after the extinguishing action.

**Failure:** Afterburns (i.e. continuous burning) in excess of the period of time specified in 3.5 constitute a failure.

### 5.5 Fuel compatibility test

The purpose of the test is to determine whether lighter components coming into contact with the fuel

recommended by the manufacturer deteriorate in any fashion.

Lighters used in testing for the requirements of 3.1 to 3.5 inclusive may be used for this compatibility test.

#### 5.5.1 Apparatus

##### For fluid lighters:

A **container** capable of being hermetically sealed.

An **enclosure**, ventilated to prevent the accumulation of gas or vapour, capable of maintaining a temperature of  $(40 \pm 2)^\circ\text{C}$ .

##### For gas lighters:

A **device for measuring temperature**, accurate to  $\pm 1^\circ\text{C}$  within the range  $35^\circ\text{C}$  to  $45^\circ\text{C}$ .

A **balance** sufficiently sensitive to measure gas escape over the elapsed period of time chosen.

#### 5.5.2 Procedure

##### For fluid lighters:

- a) Fuel the specimens according to the method, and with the fuel, recommended by the manufacturer.
- b) Place them in the container, with their covers and closures in the open position.
- c) Fill the container with the fuel recommended by the manufacturer so that the specimens are submerged in the fuel. Seal the container.
- d) Stabilize the enclosure at  $(40 \pm 2)^\circ\text{C}$ .

##### For gas lighters:

- a) Stabilize the enclosure at  $(40 \pm 2)^\circ\text{C}$ .
- b) Place the specimens in the enclosure for 28 days.
- c) After 28 days, remove the specimens from the enclosure.
- d) Stabilize the specimens at a temperature of  $(23 \pm 2)^\circ\text{C}$  for at least 10 h.

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