Designation: D8373 – 21

Standard Guide for Cannabis/Hemp Flower Vaporizers[1]

This standard is issued under the fixed designation D8373; 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 guide is intended to define characteristics, functions, and technologies commonly present in cannabis/hemp flower vaporizers.

1.2 This guide shall apply to vaporizers used to consume the flowers of a cannabis plant regardless of the type of cannabis plant from which they where derived. For the sake of brevity, the term "cannabis" shall be used from now on to refer to any type of cannabis plant (cannabis/hemp).

1.3 This guide will provide clarity to the industry, government, consumers and the public to understand what different features and technologies can be present in cannabis flower vaporizers

1.4 This guide shall be used in conjunction with Classification D8357.

1.5 *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]

D8270 Terminology Relating to Cannabis

D8357 Classification for Cannabis/Hemp Flower Vaporizers

3. Terminology

3.1 *Definitions:*

3.1.1 For definitions of terms used in this guide, refer to Terminology D8270 and the terms developed by Subcommittee D37.91 on Terminology.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *activation method, n*—a physical, mechanical, electrical, or personal means for turning on a device.

3.2.1.1 *Discussion*—Activation methods include pushing a physical button on a device, engaging a mechanism on a device, sending an electrical signal from another device, or drawing air from the device with the mouth.

3.2.2 *air path, n*—the air intake pathway leading to the oven or vaporization chamber.

3.2.3 *contact material, n*—any material in the device that comes into direct contact with the product.

3.2.3.1 *Discussion*—The contact surface is any boundary of the contact material that touches the cannabis flower.

3.2.3.2 *Discussion*—For example, glass stem airpaths and quartz heating sources.

3.2.4 *desktop, n*—any personal consumption device that is designed to rest on a stable horizontal surface while in use.

3.2.5 *handheld, n*—any personal consumption device that is explicitly designed to be held in the user's hand.

3.2.6 *mouthpiece, n*—a component in the cannabis device that touches the end user and marks the end of the vapour path.

3.2.7 *oven, n*—a chamber integrated into or along with a cannabis device in which the desired material intended for vaporization is placed for heating.

3.2.7.1 *Discussion*—It is also known as the vaporization chamber or the heating chamber.

3.2.7.2 *Discussion*—For the basis of this guide, the material intended for vaporization is ground dried cannabis flower, or dried cannabis flower, or cannabis flower, or combination thereof.

3.2.8 *other "X", n*—any personal consumption device that is not handheld or desktop.

3.2.9 *vapour, n*—a substance or material which has experienced a phase change above its boiling point and is suspended or dispersed in the air.

3.2.9.1 *Discussion*—For the context of this guide, aerosol and vapour are synonymous

[1] This guide is under the jurisdiction of ASTM Committee D37 on Cannabis and is the direct responsibility of Subcommittee D37.08 on Cannabis Devices and Appliances.

Current edition approved Feb. 1, 2021. Published June 2021. DOI: 10.1520/D8373-21.

[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.

3.2.9.2 *Discussion*—Vapour (as it pertains to cannabis) is an aerosol consisting of cannabinoids in the particulate phase of the aerosol. The gas phase of the aerosol consists of some terpenes (the balance being in the particulate phase) as well as other minor plant constituents and thermal degradation products produced as a result of the heating process.

3.2.10 *vapour path, n*—the pathway leading from the vaporization chamber to the end user or open-air environment.

3.2.11 *vaporization, n*—the conversion of a solid or liquid into a vapour.

3.2.11.1 *Discussion*—Vaporization, (as it pertains to cannabis), is the state change of the principal constituents of interest, namely cannabinoids, terpenes, and other constituents, present in cannabis flower, induced by heating the material until evaporation and formation into a suspension, referred to as vapour, occurs.

3.2.11.2 *Discussion*—Vaporization temperatures play a crucial role in the evaporation or boiling of cannabinoids, terpenes, and other favorable cannabis elements or compounds. There is a distinct advantage to consumers when using a vaporizer versus traditional inhalation consumption methods. Traditional inhalation methods rely on combustion of the dried cannabis flower without control over temperature of the vapour intake. Combustion of any substance carries inherent risks associated with inhaling combusted material vapour. Vaporizers that control temperature accurately to the targeted setting, allow for a consistent consumer experience and ensure the cannabis material does not reach a state of combustion. In addition, vaporizers that have cleanable direct contact components, allow for regular cleanability by the end user, thereby improving longevity of the device and consistency during usage.

4. Significance and Use

4.1 This guide is intended to educate new and experienced users of cannabis flower vaporizers on the various characteristics that can be available in cannabis flower vaporizers.

4.2 This guide will outline characteristics of cannabis flower vaporizers, which include individual components, design elements, and basic universal functions.

4.3 This guide will categorize common characteristics using categories based on different technologies and describe in simple terms the details attributable to each category, but is not intended to be all inclusive.

4.4 The categories outlined in this guide are intended to identify, list, and group the characteristics germane to cannabis flower vaporizers. This guide and the categories created within will be used by subcommittee members of cannabis devices and appliances to further develop standards in the field of cannabis devices.

4.5 This standard guide will serve to provide clarity to industry, government, consumers and the public on terminology, and universal functions of cannabis flower vaporizers.

4.6 Reference to a type characteristic in this guide is not intended in any manner to denote endorsement or approval of said type by ASTM International.

5. Characteristics

5.1 The various characteristics of cannabis flower vaporizers appear in Table 1.

5.2 *Characteristic I: Configuration:*

5.2.1 *a. Handheld*—Handheld cannabis flower vaporizers are used as a tool for the personal and medicinal consumption of cannabis meant for inhalation. These configurations typically include an onboard rechargeable battery cell to power the device thus requiring an external plug in power source to charge the onboard battery. Additionally, these devices include an air path channel or orifice from the external atmosphere leading to the oven, an oven for the insertion and heating of the cannabis material to be consumed, and a vapour path which allows for the flow of vapour from the oven to the mouthpiece to the end user. Such vapour is then consumed through the user's mouth into the lungs through inhalation of the vapour produced.

5.2.2 *b. Desktop*—Desktop cannabis flower vaporizers are designed to rest on a stable horizontal surface while in use. These vaporizers are used as a tool for the personal or social and medicinal consumption of cannabis meant for inhalation. These configurations typically include an A/C power plug requiring an alternate source of energy to power the device. Additionally, these devices include an air path channel or orifice from the external atmosphere leading to the oven, an oven for the insertion and heating of the cannabis material to be consumed, and a vapour path allowing for the flow of vapour from the oven to the mouthpiece to the end user. Such vapour is then consumed through the user's mouth into the lungs through inhalation of the vapour produced. In some instances,

TABLE 1 Characteristics of Cannabis Flower Vaporizers

Characteristics	Categories				
I. Configuration	a. Handheld	b. Desktop	c. Other "X"		
II. Temperature / Wattage Setting	a. Precise Control	b. Rough Control	c. Hybrid Control	d. Without Temperature/ Wattage Control	
III. Information Readout	a. Digital	b. Analog	c. Haptic	d. No Information Readout	
IV. Design Intent	a. Built for Purpose	b. Adaptive			
V. Oven Material	a. Single Material	b. Combination of Materials			
VI. Activation Method	a. Manual	b. Digital	c. Sequence	d. Inhalation	
VII. Heating Type	a. Conduction	b. Convection	c. Induction	d. Radiant	e. Combination

desktop devices have an onboard fan that pushes the external air through the vapour-producing oven into a holding chamber. In these cases, the holding chamber is then disconnected from the device and shared in a social setting. This chamber often includes a mouthpiece that, when activated, allows the user to inhale the stored vapour from the chamber.

5.2.3 *c. Other "X"*—These are devices that may be conceived or derived from innovation, designed to be used for the personal and medicinal consumption of cannabis flower by inhalation. For example, consider "a cannabis flower vaporizing hat" analogous to "a beer-dispensing hat." This device could include alternate heat source as a method to vaporize cannabis flower, thus producing vapour. The vapour would then flow to the end user and be consumed through the user's mouth and inhaled into the lungs.

5.3 *Characteristic II: Temperature/Wattage Setting:*

5.3.1 *a. Precise Control*—A vaporizer with exact control of the temperature or wattage of the device. Typically, the device allows the user to set the temperature to the degree Celsius or Fahrenheit and the wattage to the Watt.

5.3.2 *b. Rough Control*—A vaporizer with selectable factory set temperature or wattage settings. Typically, the device allows the user to select a single setting from three or more options.

5.3.3 *c. Hybrid Control*—A vaporizer that may possess both precise control and rough control. Such vaporizers may provide precise control through an external application connected to the vaporizer, but also have rough control with pre-set temperatures/wattages through manual activation method.

5.3.4 *d. Without Temperature/Wattage Control*—A vaporizer without any temperature or wattage setting options. The device turns on to the one factory set temperature or wattage.

5.4 *Characteristic III: Information Readout:*

5.4.1 *a. Digital*—A vaporizer with an electronic display that provides the user with control or visual cues to temperature or device-specific options, or both. This includes vaporizers controlled through wireless communications, such as Bluetooth[3,4] through a smart device application.

5.4.2 *b. Analog*—A vaporizer with a visual identifier indicating a setting. This could include numbers inscribed on a panel, a flashing coloured light, or any type of analog identifier.

5.4.3 *c. Haptic*—A vaporizer with response identifiers that provide the user with cues to temperature or device-specific options, or both. This response is possible through tactile or motion sensor technology. Haptic identifiers can result in vibrations, or other motion feedback response to the user.

5.4.4 *d. No Information Readout*—A vaporizer without any visual display of settings.

5.5 *Characteristic IV: Design Intent:*

5.5.1 *a. Built for Purpose*—A vaporizer solely designed, manufactured, and intended for use with a single type of input. In this instance, the input is cannabis flower meant for inhalation.

5.5.2 *b. Adaptive*—A vaporizer designed, manufactured, and intended for use with multiple types of inputs. In this instance, inputs include both cannabis flower meant for inhalation and any other type of cannabis meant for inhalation, such as cannabis extract.

5.6 *Characteristic V: Oven Material:*

5.6.1 *a. Single Material*—An oven made from a single material, such as stainless steel or ceramic.

5.6.2 *b. Combination of Materials*—An oven made from a combination of materials, such as ceramic-coated steel.

5.7 *Characteristic VI: Activation Method:*

5.7.1 *a. Manual*—A vaporizer that activates from the physical engagement of a feature on the device. Examples of a manual activation methods are; A button on the device which activates when depressed.

5.7.2 *b. Digital*—A vaporizer that activates by means of an electronic signal from another device or an onboard signal. Examples of a digital activation methods are; Activation by means of cell phone over Bluetooth or NFC,[5] biometric print reader onboard, and facial recognition over another device, for example, a laptop computer.

5.7.3 *c. Sequence*—A vaporizer that requires multiple or a combination of actions to activate or turn on the device. Examples of sequence activation methods are; A user pressing two buttons simultaneously or holding a button while inhaling.

5.7.4 *d. Inhalation*—A vaporizer that activates or turns on upon a user drawing a breath from the mouthpiece.

5.8 *Characteristic VII: Heating Type:*

5.8.1 *a. Conduction*—A vaporizer that heats the cannabis through direct contact with a heat source. Typically, these devices consist of an electronic heating element that is in direct contact with the cannabis flower meant for vaporization and inhalation. The heating element permits decarboxylation of cannabinoids, generating a vapour that is pulled through a vapour path by means of a mouthpiece. The user draws on the mouthpiece allowing the inhalation of the vapour.

5.8.2 *b. Convection*—A vaporizer that heats the cannabis with hot air. Typically, this configuration utilizes ambient air pulled (or pushed) through a heating source. The heated air is directed through the cannabis flower meant for inhalation, creating a vapour that is pulled through a vapour path by means of a mouthpiece. The user draws on the mouthpiece allowing the inhalation of the vapour.

5.8.3 *c. Induction*—A vaporizer that heats the cannabis using eddy currents generated by a magnetic field. Typically, this configuration utilizes an electrically conducting metal cup (or other material), which the cannabis is placed into. When activated, the device uses a magnetic field generated by a coil, usually copper or other material, to heat up the cup and the cannabis material inside. The coil is housed inside the frame that holds the cup. The vapour generated during the heating of the cannabis is pulled through a vapour path by means of a mouthpiece. The user draws on the mouthpiece allowing the inhalation of the vapour.

[3] A trademark of Bluetooth SIG, Inc., in Kirkland, WA.

[4] Wikipedia. 2021. "Bluetooth." Last modified January 27, 2021. https://en.wikipedia.org/wiki/Bluetooth.

[5] Wikipedia. 2021. "Near-field communication." Last modified January 30, 2021. https://en.wikipedia.org/wiki/Near-field_communication.