TABLE OF CONTENTS

3 PRODUCT DESCRIPTION 3
3.1 Description and Formulation 3
3.1.1 General Description 3
3.1.1.1 Underlying Principles of the THS 5
3.1.1.2 Product Use 5
3.1.1.3 Product Properties 5
3.1.2 Brand Information 6
3.1.3 Description of Product Components and Formulation 6
3.1.3.1 Regular Tobacco Stick 6
3.1.3.1.1 General Form and Dimensions 6
3.1.3.1.2 List of Components, Ingredients and Additives 7
3.1.3.2 Menthol 1 Tobacco Stick 8
3.1.3.2.1 General Form and Dimensions 8
3.1.3.2.2 List of Components, Ingredients and Additives 8
3.1.3.3 Menthol 2 Tobacco Stick 8
3.1.3.3.1 General Form and Dimensions 8
3.1.3.3.2 List of Components, Ingredients and Additives 9
3.1.3.4 Tobacco Heating Device (THD) 16
3.1.3.4.1 Device – General Form and Functional Design 16
3.1.3.4.2 Device – Firmware 22

Confidentiality Statement

Confidentiality Statement: Data and information contained in this document are considered to constitute trade secrets and confidential commercial information, and the legal protections provided to such trade secrets and confidential information are hereby claimed under the applicable provisions of United States law. No part of this document may be publicly disclosed without the written consent of Philip Morris International.

TABLE OF TABLES

Table 1 Product Description 4
Table 2 Product Naming and Brand Names 6
Table 3 Tobacco Stick - Components 10
Table 4 Dimensions of the Device Elements 20
Table 5 List of Essential Accessories 21
Table 6 Firmware Architectural Design 22

TABLE OF FIGURES

Figure 1 THS: Charger with Closed Lid, Holder and Tobacco Stick 3
Figure 2 THD: Charger with Open Lid, Holder Inserted for Charging and Storage 4
Figure 3 Cross Section of a Tobacco Stick 7
Figure 4 Schematic Showing the Relationship between the Holder and the Charger 17
Figure 5 View of the Charger with One Side Removed 17
Figure 6 Schematic Exploded View Drawing of the Holder 19
Figure 7 Heating Blade 21
Figure 8 Device Accessories 22

APPENDICES

A3.1-1 Flavor Development
A3.1-2 Functional Design Specifications - Device
A3.1-3 Device Data Storage

Confidentiality Statement

Confidentiality Statement: Data and information contained in this document are considered to constitute trade secrets and confidential commercial information, and the legal protections provided to such trade secrets and confidential information are hereby claimed under the applicable provisions of United States law. No part of this document may be publicly disclosed without the written consent of Philip Morris International.

3 PRODUCT DESCRIPTION

3.1 Description and Formulation

Philip Morris International (PMI) is developing a range of products that have the potential to present less risk of harm to individuals than continued smoking conventional cigarettes and reduce population harm compared to conventional cigarettes. One such product is the Tobacco Heating System (THS), which is the subject of the present application and designed to reduce the production of harmful and potentially harmful constituents (HPHCs) in comparison to a conventional cigarette where tobacco is burned.

THS is a combination of a tobacco product, referred to as the Tobacco Stick, and a Tobacco Heating Device comprising the Charger and the Holder. The Holder electrically heats, but does not burn, the specially-designed Tobacco Stick containing a reconstituted cast leaf tobacco plug. The Tobacco Sticks are the non-combusted (filtered) cigarette tobacco product that exist in Regular and Menthol variants.

The Tobacco Stick is inserted into the Holder which operates as a heating unit. In use, the Holder heats the tobacco plug of the Tobacco Stick and produces an aerosol that is inhaled by the user. The aerosol contains nicotine at levels which are similar to conventional cigarettes, providing a sensory experience similar to conventional cigarettes. However, the HPHC levels of the Tobacco Stick are substantially reduced compared to conventional cigarettes.

3.1.1 General Description

The THS has three main components (as shown in Figure 1):

1. A Tobacco Stick, which is specifically designed to function with the Holder, and is the non-combusted (filtered) cigarette according to the FDA's tobacco product category and subcategory.
2. A Holder, a slim electrical heating unit in which a Tobacco Stick is inserted. It is used to heat the Tobacco Stick in a controlled manner, and store enough energy for a single experience.
3. A Charger, which holds enough energy to recharge the Holder for approximately 20 Tobacco Sticks and can be recharged from household power. The Charger stores the Holder when not in use, and provides a safe, secure environment for the cleaning process of the heating blade.

The Holder and the Charger, together with essential accessories, are collectively known as the Tobacco Heating Device (THD), or Device (as shown in Figure 2).



Figure 1 THS: Charger with Closed Lid, Holder and Tobacco Stick

Confidentiality Statement

Confidentiality Statement: Data and information contained in this document are considered to constitute trade secrets and confidential commercial information, and the legal protections provided to such trade secrets and confidential information are hereby claimed under the applicable provisions of United States law. No part of this document may be publicly disclosed without the written consent of Philip Morris International.



Figure 2 THD: Charger with Open Lid, Holder Inserted for Charging and Storage

Table 1 Product Description

Product Part	Description
Tobacco Stick	The Tobacco Stick is cigarette-like in form, but has different dimensions than a conventional cigarette and functions differently than a conventional cigarette. It is specifically designed to be used with the Holder. When it is inserted in the Holder and heated, it generates a filtered nicotine-containing aerosol, providing a taste and flavor similar to a conventional cigarette.
Holder	The Holder heats the tobacco using a ceramic blade, which is pushed into the tobacco plug by the act of inserting the Tobacco Stick into the Holder. The Holder has a small battery, which stores enough energy for a single experience (i.e. complete use of one Tobacco Stick). The power to the heating element is controlled by an embedded electronic system, which ensures that the temperature follows a pre-defined heating profile for each puff regardless of the user's puffing behaviors. The Holder needs to be recharged prior to each Tobacco Stick use. The Holder is activated by a simple button and its status is conveyed through an interface that includes a colored light-emitting diode (LED).
Charger (Main Unit)	The Charger is a pocket-sized recharging case for the Holder. It contains a larger battery and charging electronics, which recharges the Holder battery when placed inside. The Charger battery holds sufficient charge to recharge the Holder 20 times. Such recharging of the Charger occurs through an AC adaptor (accessory). When the Holder is inserted in the Charger it is possible to initiate the blade cleaning process. This procedure heats the blade to a higher temperature than during use of the Holder to facilitate the removal of deposits left by multiple inhalation experiences, and thus ensures consistent heating performance in normal use. The Charger status is conveyed and controlled through an interface that includes colored LEDs and two buttons.

(table continues)

Confidentiality Statement

Confidentiality Statement: Data and information contained in this document are considered to constitute trade secrets and confidential commercial information, and the legal protections provided to such trade secrets and confidential information are hereby claimed under the applicable provisions of United States law. No part of this document may be publicly disclosed without the written consent of Philip Morris International.

Product Part	Description
Firmware	The firmware controls and monitors the correct functioning of the Device, which includes the user experience, the cleaning of the holder, and safety features.
Accessories	AC Adaptor, Cleaning Brush, USB Charging Cable and User Guide.

For commercialization these items are also packaged individually.

3.1.1.1 Underlying Principles of the THS

During the burning and smoking of a conventional cigarette, the processes of heating, distillation, thermal decomposition, pyrolysis, and partial or incomplete combustion occur.

The underlying principle of THS is that by only heating tobacco rather than burning it, as in a conventional cigarette, it is possible to significantly reduce the levels of Harmful and Potentially Harmful Constituents (HPHCs) generated in the aerosol whilst retaining an acceptable sensory experience for the user.

In order to maintain controlled processes, both the Holder and the Charger contain microcontrollers and firmware. For the Holder, these control:

- The heating process (both during the inhalation experience and blade cleaning process),
- The safety mechanisms (e.g. overheating prevention, electronic hardware integrity by self-test, puff limitation), and
- The user interface.

For the Charger, these control:

- The Holder charging process,
- The Charger recharging process,
- The user interface, and
- The blade cleaning process.

3.1.1.2 Product Use

To use THS, the Tobacco Stick is inserted into the Holder. The heating of the Tobacco Stick is initiated by pressing the button on the Holder where a corresponding LED illuminates and indicates when the pre-heating process is completed.

Once the pre-heating is complete, the user draws on the Tobacco Stick to create an aerosol. During the inhalation experience, the heating of the Tobacco Stick follows a controlled and defined temperature profile. The heating profile is designed to provide a consistent experience throughout use.

The Holder and the Tobacco Stick deliver puffs over a period of about 6 minutes or 14 puffs (whichever comes first), with the LED indicating the end of the inhalation experience. Once this cycle is complete, the Holder must be recharged before a new Tobacco Stick can be used.

3.1.1.3 Product Properties

THS has two major sets of properties. The first set of properties relate to the chemical and physical characteristics of the aerosol that is produced. These include, but are not limited to:

Confidentiality Statement

Confidentiality Statement: Data and information contained in this document are considered to constitute trade secrets and confidential commercial information, and the legal protections provided to such trade secrets and confidential information are hereby claimed under the applicable provisions of United States law. No part of this document may be publicly disclosed without the written consent of Philip Morris International.

- A substantial reduction in the levels of HPHCs as compared to conventional cigarette smoke (see Section 3.3).
- A nicotine yield similar to conventional cigarette smoke.
- An aerosol droplet size distribution that is within the respirable range to ensure that pulmonary deposition and distribution will be similar to that for the smoke of a conventional cigarette.

The second set of properties relates to the likelihood that adult users will accept THS as a replacement for conventional cigarettes, and includes but is not limited to:

- Physical design which ensures minimum disruption to the smoking ritual (See Section 6.2).
- A use cycle which is similar to conventional cigarettes in terms of puff number and duration of a single Tobacco Stick use.

3.1.2 Brand Information

The naming conventions for the product, generically referred to as Tobacco Heating System (THS), are provided in Table 2.

THS is composed of a Tobacco Heating Device (Charger and Holder) and Tobacco Sticks. For commercialization, the Device will bear the brand name "*iQOS*." The Tobacco Sticks will be referred to as "*HeatSticks*" and will be sold under the *Marlboro* brand name.

Table 2 Product Naming and Brand Names

Submission Product	Product Component	Brand Name
THS (version 2.2)	Tobacco Stick	*Marlboro* (Designed for *iQOS*)
	Holder	*iQOS*
	Charger	
	Accessories	

3.1.3 Description of Product Components and Formulation

3.1.3.1 Regular Tobacco Stick

The consumable element of THS is the Tobacco Stick.

In appearance, it resembles a conventional cigarette but is shorter in length, and smaller in radius. This change in size reflects the fact that less tobacco is needed in a Tobacco Stick than in a conventional cigarette.

3.1.3.1.1 General Form and Dimensions

The Tobacco Stick consists of two significant parts: a tobacco part (tobacco plug) and a non-tobacco part. Its internal structure is different than that of a conventional cigarette, and is shown in Figure 3.

The Tobacco Stick comprises various components, including a tobacco plug made from reconstituted cast-leaf tobacco, a hollow acetate tube (HAT), a custom-designed polylactic acid (PLA) filter, an acetate mouthpiece filter (MPF) and various papers (see Section 3.2.2). The plugs are individually wrapped into a plug wrap paper. The tobacco plug, the HAT and

Confidentiality Statement

Confidentiality Statement: Data and information contained in this document are considered to constitute trade secrets and confidential commercial information, and the legal protections provided to such trade secrets and confidential information are hereby claimed under the applicable provisions of United States law. No part of this document may be publicly disclosed without the written consent of Philip Morris International.

the PLA filter are held together with a cigarette paper, and attached to a mouthpiece filter using a tipping paper.

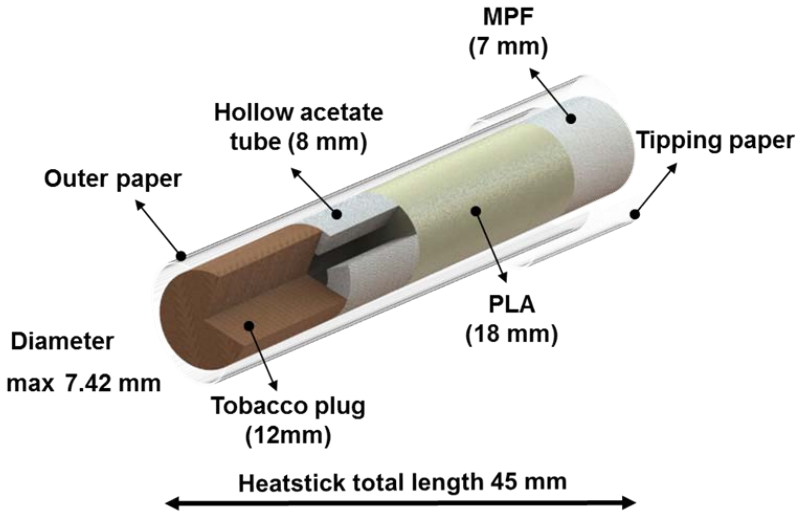


Figure 3 Cross Section of a Tobacco Stick

3.1.3.1.2 List of Components, Ingredients and Additives

Tobacco Stick Materials Overview

The detailed list of ingredients and their quantities are considered highly commercially sensitive, and as a result, these details are provided under separate cover (see Tobacco Product Master File, the authorization letter is provided in Module 1).

The Tobacco Plug

The tobacco content of the plug is comprised of a selection of tobacco lots, which are specifically processed for THS use (refer to Section 3.2.2.3). A flavor system is added to balance the overall flavor of the product (see Appendix A3.1-1).

In the case of THS, the tobacco blend selection contributes to the reduction of HPHCs and delivers consistent levels of nicotine. The detailed contents of the tobacco plug are provided in the Table 3.

Hollow Acetate Tube (HAT)

The purpose of the Hollow Acetate Tube (HAT) is to hold the tobacco plug in place, ensuring that the assembly of the Tobacco Stick is maintained upon its insertion into the Holder. It also acts as a separator between the tobacco plug and the Polylactic Acid (PLA) filter, preventing the PLA filter from overheating.

Polylactic Acid (PLA) Filter

The PLA filter is created by crimping a commercial PLA film and then shaping it into a filter.

The PLA filter condenses the water in vapor phase, thus reducing the perceived aerosol temperature as well as maintaining the mouth piece filter (MPF) integrity. The PLA filter components are detailed in Table 3.

Confidentiality Statement

Confidentiality Statement: Data and information contained in this document are considered to constitute trade secrets and confidential commercial information, and the legal protections provided to such trade secrets and confidential information are hereby claimed under the applicable provisions of United States law. No part of this document may be publicly disclosed without the written consent of Philip Morris International.

Mouth Piece Filter (MPF)

The mouth piece filter is a cellulose acetate filter designed to act as a mouth piece similar to the filter of a conventional cigarette.

Outer Paper

The outer paper is a selected cigarette paper which combines the individual components (Tobacco Plug, PLA and HAT) as shown in Figure 3.

Note: the outer paper is also referred to as cigarette paper.

Tipping Paper

The tipping paper is placed around the outer paper, in a similar way as a conventional cigarette. Its primary function is to attach the mouth piece filter to the Tobacco Stick. It also creates a similar feeling as a conventional cigarette, and prevents the Tobacco Stick from adhering to the lips of the user.

3.1.3.2 Menthol 1 Tobacco Stick

The second variant of the tobacco consumable of THS is the Menthol 1 Tobacco Stick.

3.1.3.2.1 General Form and Dimensions

The Menthol 1 variant is identical to the Regular variant in appearance, general form and dimensions, as shown in Figure 3.

3.1.3.2.2 List of Components, Ingredients and Additives

Tobacco Stick Materials Overview - Menthol

The detailed list of ingredients and their quantities are considered highly commercially sensitive, and as a result, these details are to be provided under separate cover (see Tobacco Product Master File, the authorization letter is provided in Module 1).

The components of the Menthol 1 variant of the Tobacco Stick are similar to those in the Regular variant (Section 3.1.3.1), with the differences described below:

Tobacco Plug Menthol 1 Variant

(b) (4)

Table 3) (b) (4)

(b) (4) .

Menthol Thread

(b) (4)

All components of the variant Menthol 1 are presented in Table 3.

3.1.3.3 Menthol 2 Tobacco Stick

3.1.3.3.1 General Form and Dimensions

The third variant is the Menthol 2 variant, which is identical to the Regular, and Menthol 1 variant in appearance, general form and dimensions, as shown in Figure 3.

Confidentiality Statement

Confidentiality Statement: Data and information contained in this document are considered to constitute trade secrets and confidential commercial information, and the legal protections provided to such trade secrets and confidential information are hereby claimed under the applicable provisions of United States law. No part of this document may be publicly disclosed without the written consent of Philip Morris International.

3.1.3.3.2 List of Components, Ingredients and Additives

Tobacco Stick Materials Overview – Menthol 2

The detailed list of ingredients and their quantities are considered highly commercially sensitive, and as a result, these details are to be provided under separate cover (see Tobacco Product Master File, the authorization letter is provided in Module 1).

The components of the Menthol 2 variant of the Tobacco Stick are similar to those in the Regular and Menthol 1 variant (Section 3.1.3.1), with the three differences described below:

Tobacco Plug Menthol 2 Variant

(b) (4)

(b) (4) in Table 3) (b) (4)
(b) (4)
.

Menthol Thread

(b) (4)

Mentholated Inner Liner

Additionally for the Menthol 2 variant, compared to Menthol 1 variant, the foil inner liner of the packaging is mentholated. A controlled amount of menthol is added to the inner side of the foil inner liner of the Tobacco Stick pack, prior to packaging of the product. The purpose of the mentholated inner liner is to provide additional menthol flavor to the Tobacco Sticks, prior to consumption.

All components of the variant Menthol 2 are presented in Table 3, with the menthol that is added to the inner liner described under Tobacco Ingredients.

Confidentiality Statement

Confidentiality Statement: Data and information contained in this document are considered to constitute trade secrets and confidential commercial information, and the legal protections provided to such trade secrets and confidential information are hereby claimed under the applicable provisions of United States law. No part of this document may be publicly disclosed without the written consent of Philip Morris International.

Table 3 Tobacco Stick - Components

Category	Ingredient Name	Regular Ingredient Quantity [mg/Unit]	Menthol 1 Ingredient Quantity [mg/Unit]	Menthol 2 Ingredient Quantity [mg/Unit]	Ingredient Function	Registration Number [CAS#]
Tobacco Ingredient	Tobacco	201.5	201.5	201.5	Tobacco	-
Tobacco Ingredient	Glycerol	52.3	52.3	52.3	Humectant	56-81-5
Tobacco Ingredient	Water	36.1	36.1	36.1	Processing Aid	7732-18-5
Tobacco Ingredient	Guar Gum	7.85	7.85	7.85	Binder	9000-30-0
Tobacco Ingredient	Cellulose	5.23	5.23	5.23	Fiber	9004-34-6
Tobacco Ingredient	Menthol	0.00	0.00	3.90	Flavor	2216-51-5
Tobacco Ingredient	Propylene Glycol	2.57	2.04	2.04	Humectant in Flavor	57-55-6
Tobacco Ingredient	Peppermint Oil	0.00	1.25	1.25	Flavor	8006-90-4
Tobacco Ingredient	Natural & Artificial Flavorings	0.156	0.243	0.243	Flavor	Various
Tobacco Ingredient	Ethanol	0.00	0.00	0.00	Processing Aid in Flavor	64-17-5
Tobacco Plug Wrap Paper	Cellulose	6.17	6.17	6.17	Fiber	65996-61-4
Tobacco Plug Wrap Paper	Calcium Carbonate	1.10	1.10	1.10	Filler	471-34-1

(table continues)

Confidentiality Statement

Confidentiality Statement: Data and information contained in this document are considered to constitute trade secrets and confidential commercial information, and the legal protections provided to such trade secrets and confidential information are hereby claimed under the applicable provisions of United States law. No part of this document may be publicly disclosed without the written consent of Philip Morris International.

Category	Ingredient Name	Regular Ingredient Quantity [mg/Unit]	Menthol 1 Ingredient Quantity [mg/Unit]	Menthol 2 Ingredient Quantity [mg/Unit]	Ingredient Function	Registration Number [CAS#]
Tobacco Plug Wrap Paper	Carboxymethylcellulose and its Sodium Salt	0.0735	0.0735	0.0735	Binder	9004-32-4
Tobacco Plug Adhesive	Ethylene-Vinyl Acetate Copolymer	0.319	0.319	0.319	Adhesive	24937-78-8
Tobacco Plug Adhesive	Starch and/or Modified Starches	0.0576	0.0576	0.0576	Adhesive	9005-25-8
Tobacco Plug Adhesive	Propylene Glycol	0.0108	0.0108	0.0108	Adhesive	57-55-6
Outer Paper	Cellulose	14.3	23.0	23.0	Fiber	65996-61-4
Outer Paper	Calcium Carbonate	7.6	19.2	19.2	Filler	471-34-1
Outer Paper	Epichlorhydrin Resin	1.66	0.00	0.00	Anti-Wetting Agent	25212-19-5
Outer Paper	Carboxymethylcellulose	0.071	0.256	0.256	Binder	9004-32-4
Outer Paper	Guar Gum	0.071	0.00	0.00	Binder	9000-30-0
Outer Paper Adhesive	Ethylene-Vinyl Acetate Copolymer	2.98	2.98	2.98	Adhesive	24937-78-8
Hollow Acetate Tube	Cellulose Acetate	56.0	56.0	56.0	Filtration Material	9004-35-7
Hollow Acetate Tube	Triacetin	10.7	10.7	10.7	Plasticizer	102-76-1
Hollow Acetate Tube	Titanium Dioxide	0.229	0.229	0.229	Color	13463-67-7

(table continues)

Confidentiality Statement

Confidentiality Statement: Data and information contained in this document are considered to constitute trade secrets and confidential commercial information, and the legal protections provided to such trade secrets and confidential information are hereby claimed under the applicable provisions of United States law. No part of this document may be publicly disclosed without the written consent of Philip Morris International.

Category	Ingredient Name	Regular Ingredient Quantity [mg/Unit]	Menthol 1 Ingredient Quantity [mg/Unit]	Menthol 2 Ingredient Quantity [mg/Unit]	Ingredient Function	Registration Number [CAS#]
Hollow Acetate Tube - Plugwrap Paper	Cellulose	4.48	4.48	4.48	Fiber	65996-61-4
Hollow Acetate Tube - Plugwrap Paper	Calcium Carbonate	0.741	0.741	0.741	Filler	471-34-1
Hollow Acetate Tube - Plugwrap Paper	Carboxymethylcellulose and its Sodium Salt	0.0529	0.0529	0.0529	Binder	9004-32-4
Hollow Acetate Tube - Adhesive	Polyvinyl Acetate	0.553	0.553	0.553	Adhesive	9003-20-7
Hollow Acetate Tube - Adhesive	Hydroxyethylene - Vinyl Acetate Copolymer	0.0165	0.0165	0.0165	Adhesive	25213-24-5
Polylactic Acid Filter	Poly Lactic Resin	214.8	214.8	214.8	Filtration Material	9051-89-2
Polylactic Acid Filter	Cellulose Acetate	0.00	20.9	20.9	Filtration Material	9004-35-7
Polylactic Acid Filter	Menthol	0.00	6.98	9.33	Flavor	2216-51-5
Polylactic Acid Filter	Calcium Carbonate	2.46	2.46	2.46	Filler	1317-65-3
Polylactic Acid Filter - Plug Wrap Paper	Cellulose	44.7	44.7	44.7	Fiber	9004-34-6
Polylactic Acid Filter - Plug Wrap Paper	Kaolin	0.980	0.980	0.980	Filler	1332-58-7
Polylactic Acid Filter - Plug Wrap Paper	Rosin	0.127	0.127	0.127	Sizing Agent	65997-04-8
Polylactic Acid Filter - Plug Wrap Paper	Optical Brightener	0.0074	0.0074	0.0074	Color	-

(table continues)

Confidentiality Statement

Confidentiality Statement: Data and information contained in this document are considered to constitute trade secrets and confidential commercial information, and the legal protections provided to such trade secrets and confidential information are hereby claimed under the applicable provisions of United States law. No part of this document may be publicly disclosed without the written consent of Philip Morris International.

Category	Ingredient Name	Regular Ingredient Quantity [mg/Unit]	Menthol 1 Ingredient Quantity [mg/Unit]	Menthol 2 Ingredient Quantity [mg/Unit]	Ingredient Function	Registration Number [CAS#]
Polylactic Acid Filter - Adhesive	Polyvinyl Acetate	0.934	0.934	0.934	Adhesive	9003-20-7
Polylactic Acid Filter - Adhesive	Ethylene-Vinyl Acetate Copolymer	0.320	0.320	0.320	Adhesive	24937-78-8
Polylactic Acid Filter - Adhesive	Hydrocarbon Resin	0.234	0.234	0.234	Adhesive	68132-00-3
Polylactic Acid Filter - Adhesive	Paraffin	0.230	0.230	0.230	Adhesive	8002-74-2 64742-60-5
Polylactic Acid Filter - Adhesive	Hydroxyethylene - Vinyl Acetate Copolymer	0.0278	0.0278	0.0278	Adhesive	25213-24-5
Polylactic Acid Filter - Adhesive	Polyisobutylene	0.0243	0.0243	0.0243	Adhesive	9003-29-6
Mouth Piece Filter	Cellulose Acetate	27.0	27.0	27.0	Filtration Material	9004-35-7
Mouth Piece Filter	Triacetin	2.22	2.22	2.22	Plasticizer	102-76-1
Mouth Piece Filter	Titanium Dioxide	0.173	0.173	0.173	Color	13463-67-7
Mouth Piece Filter - Plug Wrap Paper	Cellulose	17.9	17.9	17.9	Fiber	9004-34-6
Mouth Piece Filter - Plug Wrap Paper	Rosin	0.0511	0.0511	0.0511	Sizing Agent	65997-04-8
Mouth Piece Filter - Plug Wrap Paper	Optical Brightener	0.0029	0.0029	0.0029	Color	-
Mouth Piece Filter - Plug Wrap Paper	Kaolin	0.393	0.393	0.393	Filler	1332-58-7

(table continues)

Confidentiality Statement

Confidentiality Statement: Data and information contained in this document are considered to constitute trade secrets and confidential commercial information, and the legal protections provided to such trade secrets and confidential information are hereby claimed under the applicable provisions of United States law. No part of this document may be publicly disclosed without the written consent of Philip Morris International.

Category	Ingredient Name	Regular Ingredient Quantity [mg/Unit]	Menthol 1 Ingredient Quantity [mg/Unit]	Menthol 2 Ingredient Quantity [mg/Unit]	Ingredient Function	Registration Number [CAS#]
Mouth Piece Filter - Adhesive	Polyvinyl Acetate	0.510	0.510	0.510	Adhesive	9003-20-7
Mouth Piece Filter - Adhesive	Ethylene-Vinyl Acetate Copolymer	0.387	0.387	0.387	Adhesive	24937-78-8
Mouth Piece Filter - Adhesive	Hydrocarbon Resin	0.283	0.283	0.283	Adhesive	68132-00-3
Mouth Piece Filter - Adhesive	Paraffin	0.279	0.279	0.279	Other	64742-60-5 8002-74-2
Mouth Piece Filter - Adhesive	Polyisobutylene	0.0294	0.0294	0.0294	Adhesive	9003-29-6
Mouth Piece Filter - Adhesive	Hydroxyethylene - Vinyl Acetate Copolymer	0.0150	0.0150	0.0150	Adhesive	25213-24-5
Tipping Paper	Cellulose	12.2	12.2	12.2	Fiber	65996-61-4
Tipping Paper	Calcium Carbonate	2.33	2.33	2.33	Filler	471-34-1
Tipping Paper	Kaolin	3.00	3.00	3.00	Filler	92704-41-1 1332-58-7
Tipping Paper	Titanium Dioxide	1.34	1.34	1.34	Color	13463-67-7
Tipping Paper	Starch and/or Modified Starches	0.503	0.503	0.503	Binder	65996-62-5
Tipping Paper	Alkylketene Dimer	0.0419	0.0419	0.0419	Sizing Agent	84989-41-3
Tipping Paper	Epichlorhydrin Resin	0.0210	0.0210	0.0210	Processing Aid	25212-19-5

(table continues)

Confidentiality Statement

Confidentiality Statement: Data and information contained in this document are considered to constitute trade secrets and confidential commercial information, and the legal protections provided to such trade secrets and confidential information are hereby claimed under the applicable provisions of United States law. No part of this document may be publicly disclosed without the written consent of Philip Morris International.

Category	Ingredient Name	Regular Ingredient Quantity [mg/Unit]	Menthol 1 Ingredient Quantity [mg/Unit]	Menthol 2 Ingredient Quantity [mg/Unit]	Ingredient Function	Registration Number [CAS#]
Tipping Paper	Pigments	<1	<1	<1	Color	-
Tipping Paper - Adhesive	Ethylene-Vinyl Acetate Copolymer	7.26	7.26	7.26	Adhesive	24937-78-8
Tipping Paper - Adhesive	Hydroxyethylene - Vinyl Acetate Copolymer	0.147	0.147	0.147	Adhesive	25213-24-5

Confidentiality Statement

Confidentiality Statement: Data and information contained in this document are considered to constitute trade secrets and confidential commercial information, and the legal protections provided to such trade secrets and confidential information are hereby claimed under the applicable provisions of United States law. No part of this document may be publicly disclosed without the written consent of Philip Morris International.

3.1.3.4 Tobacco Heating Device (THD)

The THD is comprised of:

- The Charger
- The Holder
- The accessories (AC adaptor, USB charging cable, cleaning brush and user guide)

3.1.3.4.1 Device – General Form and Functional Design

The THD consists of the heating unit called the Holder into which the Tobacco Stick is inserted, a charging unit, which is called the Charger, to facilitate easy recharging of the Holder, and accessories including a Universal Serial Bus (USB) cable and an AC adaptor. In use, the Holder heats the Tobacco Stick to produce an aerosol that is inhaled by the user. The Holder and the Charger are collectively referred to as the "Device."

The user interface of the Charger comprises two low-profile buttons and 6 colored light emitting diodes (LEDs). These allow the user to:

- Switch the device (Holder and Charger) off and on.
- Monitor charging of the Holder battery from the Charger battery.
- Monitor charging of the Charger battery.
- Initiate and monitor the heating blade cleaning process.
- Request a status diagnostic of the Charger and the Holder (e.g. Charger battery remaining capacity, Charger and Holder integrity check).

The user interface on the Holder comprises a low-profile button and a LED. These allow the user to:

- Switch the Holder off and on.
- Initiate the heating process and determine when the device is ready for use (i.e. when pre-heating is complete).
- Determine when the inhalation experience is about to finish.
- Determine when the Holder needs charging.
- Request a status diagnostic of the Holder (e.g. Holder battery recharged / not recharged, Charger and Holder integrity check).
- Interrupt the inhalation experience at any time by manual action on the switch.

The relationship between the Charger and the Holder is illustrated in a schematic way in Figure 4.

Confidentiality Statement

Confidentiality Statement: Data and information contained in this document are considered to constitute trade secrets and confidential commercial information, and the legal protections provided to such trade secrets and confidential information are hereby claimed under the applicable provisions of United States law. No part of this document may be publicly disclosed without the written consent of Philip Morris International.

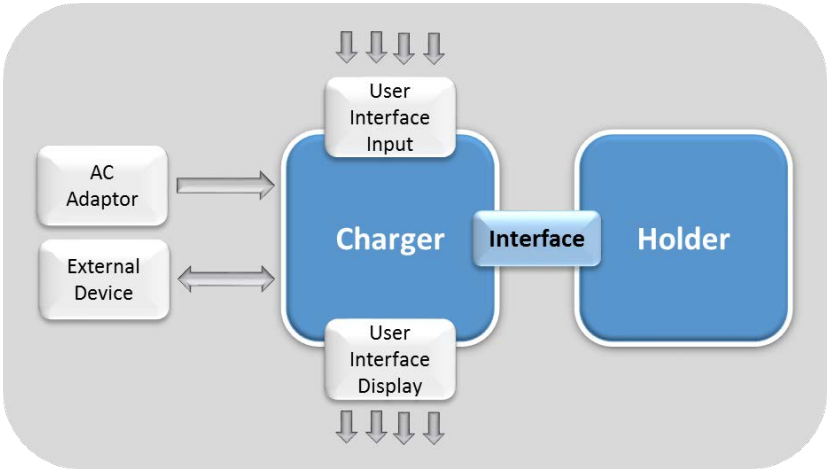


Figure 4 Schematic Showing the Relationship between the Holder and the Charger

The Charger

The Charger includes the following functional components:

- The electronics to control charging of the Charger battery from the AC adaptor or an external device; this includes a micro-USB interface providing both a 5-Volt power source and a serial communications capability.
- The electronics to control the charging of the Holder battery from the Charger battery.
- The Charger battery.
- A cradle for the Holder in which it must sit during the blade cleaning process and Holder battery charging, and which can be used as a simple storage location for the Holder when the device is not in use.

The Charger is illustrated with one cover removed in Figure 5. Dimensions of the Charger can be found in Table 4.

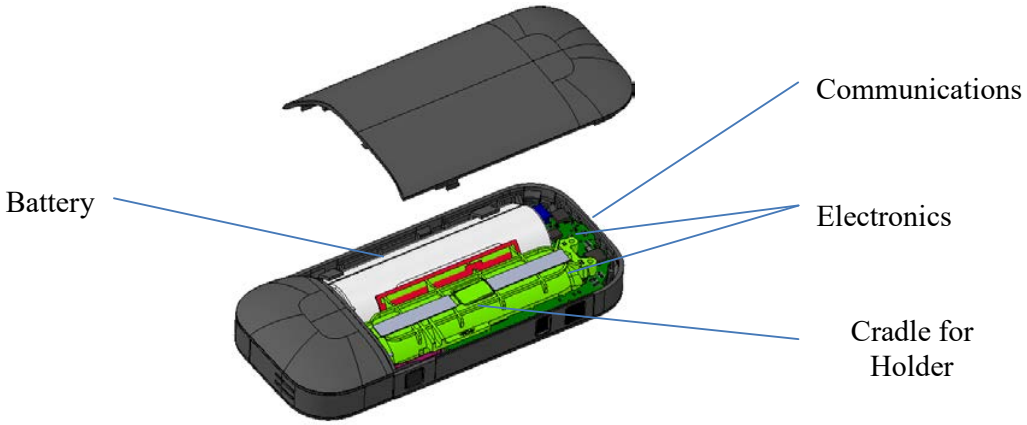


Figure 5 View of the Charger with One Side Removed

Confidentiality Statement

Confidentiality Statement: Data and information contained in this document are considered to constitute trade secrets and confidential commercial information, and the legal protections provided to such trade secrets and confidential information are hereby claimed under the applicable provisions of United States law. No part of this document may be publicly disclosed without the written consent of Philip Morris International.

Functional Design of the Charger

The complete Functional Design Specification for the Charger is provided in Appendix A3.1-2. The key requirements are expressed below.

The Charger must:

- Be capable of recharging from a normally discharged state to a fully charged state in (b) (4).
- Recharge the Holder when its presence is detected and when the Charger is on.
- Be capable (when fully charged) of recharging the Holder(b) (4) (b) (4).
- Recharge the Holder in (b) (4).
- Cause the Holder to go into a 'Locked' state if the Charger is switched off while the Holder is in it.
- Provide cleaning functionality of the blade in the Holder.
- (b) (4)
- (b) (4) (see Appendix A3.1-3).
- (b) (4).
- Have a user interface capable of:
  - Permitting the user to switch the unit off and on. The off state will disable circuitry (b) (4).
  - (b) (4).
  - Indicating the current working status of the Holder and the Charger.

Key Design Features of the Charger

In addition to the functional design requirements, the Charger has the following key design features:

- (b) (4)
- (b) (4)

The Holder

The Holder includes the following functional components:

- The ceramic blade with a platinum element (heater) which heats the tobacco plug.
- The electronics to monitor the temperature ((b) (4)) and controls the temperature regulation of the heater by switching on/off the power to the heater.
- The Holder battery which supplies power for the electronics and the heater.
- (b) (4).
- The casing and mechanical support components which hold the electronics, the battery, the contacts, the heating blade, and the user interface components in place, and which guide the Tobacco Stick when it is inserted into the Holder.
- The extracting mechanism to allow the removal of Tobacco Sticks.

Confidentiality Statement

Confidentiality Statement: Data and information contained in this document are considered to constitute trade secrets and confidential commercial information, and the legal protections provided to such trade secrets and confidential information are hereby claimed under the applicable provisions of United States law. No part of this document may be publicly disclosed without the written consent of Philip Morris International.

- (b) (4)

The Holder will turn off the heating process in the event that overheating is detected by the thermal monitoring system.

The Holder (shown with part of the casing removed in Figure 6) is designed to hold the Tobacco Stick and heat it upon user initiation in a controlled and repeatable manner. The size and weight ensure that it can be comfortably held by the user. Dimensions of the Holder can be found in Table 4.

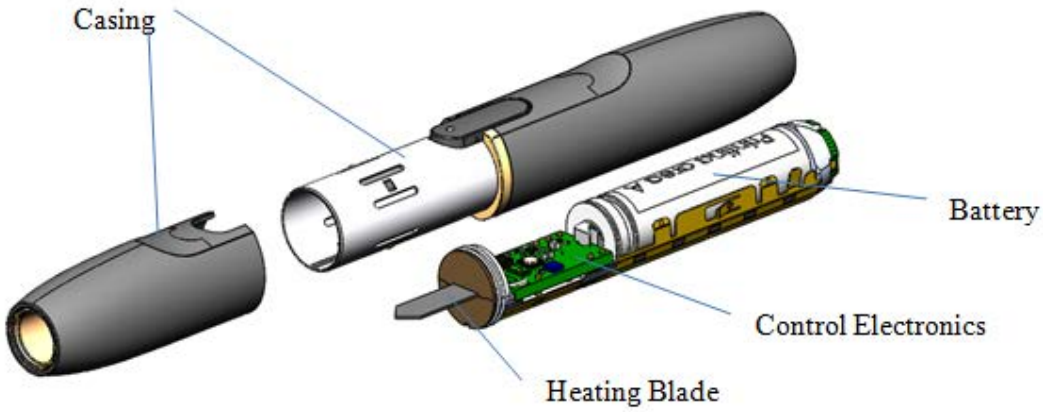


Figure 6 Schematic Exploded View Drawing of the Holder

Functional Design of the Holder

The complete Functional Design Specification for the Holder is provided in Appendix A3.1-2. The key requirements are expressed below. The Holder must:

- Store the sufficient energy for the use of a Tobacco Stick (b) (4) (b) (4)
- Be recharged by the Charger in (b) (4) (b) (4).
- Control the temperature of the heater, ensuring that a pre-defined temperature profile is followed throughout the consumption of each Tobacco Stick.
- Maintain the heater temperature within (b) (4) of the temperature defined in the heating profile (see Section 3.2.1.1).
- (b) (4).
- Perform the cleaning process when initiated by the Charger or manually by the user.
- Maintain the heater temperature during cleaning within (b) (4) of the cleaning temperature profile.
- (b) (4) (see Appendix A3.1-3).
- (b) (4).
- Permit the user to start the Tobacco Stick use.
- Permit the user to terminate the Tobacco Stick use at any point in time.

Confidentiality Statement

Confidentiality Statement: Data and information contained in this document are considered to constitute trade secrets and confidential commercial information, and the legal protections provided to such trade secrets and confidential information are hereby claimed under the applicable provisions of United States law. No part of this document may be publicly disclosed without the written consent of Philip Morris International.

- Perform a self-test and display the result of the self-test to the user, as described in the user guide.
- Hold the Tobacco Stick, while allowing the user to draw through the mouth piece filter.
- (b) (4)
- Have a minimum operating life (b) (4) (b) (4)
- Operate under a temperature range (b) (4)
- (b) (4)
- Not exceed an outer body temperature of (b) (4) according to IEC 60335-1 "Household and similar electrical appliances – Safety".

Key Design Features of the Holder

In addition to the functional design requirements, the Holder has the following key design features:

- The actual heater temperature is measured (b) (4).
- The power delivered to the heater is regulated (b) (4) (b) (4)
- The firmware incorporates a cut-off which is triggered if (b) (4)
- The design provides the capability to (b) (4).
- (b) (4)
- Measures are taken to prevent (b) (4)
- The design prevents (b) (4) (b) (4)
- Cleaning is performed by (b) (4) (b) (4). This can only be performed when the Holder is securely held in the Charger, preventing the user from using the cleaning mode in any way to heat a Tobacco Stick.

Table 4 Dimensions of the Device Elements

Holder	Length (mm)	93.60
	Diameter (mm)	(b) (4)
		(b) (4)
Charger	Length (mm)	112.50
	Width (mm)	51.20
	Thickness (mm)	21.86

Confidentiality Statement

Confidentiality Statement: Data and information contained in this document are considered to constitute trade secrets and confidential commercial information, and the legal protections provided to such trade secrets and confidential information are hereby claimed under the applicable provisions of United States law. No part of this document may be publicly disclosed without the written consent of Philip Morris International.

The Heating Blade of the Holder

The blade is the component that heats the Tobacco Stick. It is mainly ceramic and has a characteristic V-shape to facilitate insertion into the tobacco plug of the Tobacco Stick.

The blade contains a platinum element which serves as both a heating and a temperature measurement element. When power is applied to the platinum element, it heats up which results in an energy and heat transfer into the tobacco plug.

(b) (4)

The heating blade is comprised of three main areas, as shown in Figure 7.

- Platinum element (heater): where the heat is generated, measured and controlled through firmware (i.e. heater control).
- Insertion point: V-shaped point that impales the tobacco plug during insertion.
- Connecting area: where the electrical contact is made to the heating element.

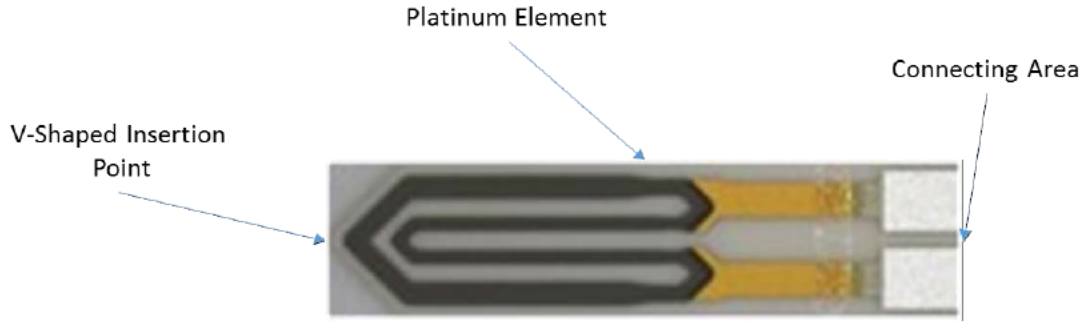


Figure 7 Heating Blade

Accessories

Each THS is supplied with a set of accessories (see Figure 8). A list of essential accessories is provided in Table 5.

Table 5 List of Essential Accessories

Description	Position in Figure 8
AC adapter with USB po110 – 240 V / 50-60 Hz AC adaptor (US power plug) with USB outlet for the Charger	Left
Cleaning brush to clean the blade and surrounding area	Middle
USB Cable which is used to connect the Charger to a USB port	Right

Confidentiality Statement

Confidentiality Statement: Data and information contained in this document are considered to constitute trade secrets and confidential commercial information, and the legal protections provided to such trade secrets and confidential information are hereby claimed under the applicable provisions of United States law. No part of this document may be publicly disclosed without the written consent of Philip Morris International.



Figure 8 Device Accessories

3.1.3.4.2 Device – Firmware

Both the Charger and the Holder have their own firmware. (b) (4) . The firmware consists (b) (4) (b) (4) , as shown in Table 6.

Table 6 Firmware Architectural Design

Design Pattern	Description
(b) (4)	

The architecture of the THD firmware enables the Device to:

- Control the heater temperature in real-time,
- (b) (4)
- Detect user interaction,
- Clean the blade,
- Enforce safety features.

Confidentiality Statement

Confidentiality Statement: Data and information contained in this document are considered to constitute trade secrets and confidential commercial information, and the legal protections provided to such trade secrets and confidential information are hereby claimed under the applicable provisions of United States law. No part of this document may be publicly disclosed without the written consent of Philip Morris International.

The external interface components are listed below:

- Heating blade controller: switching on/off the power to the heater.
- (b) (4)
- The button and LED for the user interaction: detecting the button status and controlling the LEDs that show the Device state.

The THD firmware includes functionalities that control system initialization and shut down, monitor the Device performance, (b) (4) (see Appendix A3.1-3), enforce safety and prevent misuse of the Device.

Firmware Key Components

Heater Control

Based on the heating profile and the (b) (4), the heater control prevents tobacco from overheating during the inhalation experience. This controls main components that are required to handle the heating regulation are the (b) (4) (b) (4).

- (b) (4)

The Device uses (b) (4) to control the temperature against a predefined heating profile. (b) (4) (b) (4)

- (b) (4)

The (b) (4) is the functionality that regulates the temperature and (b) (4) The (b) (4) is applied to the heater (b) (4)

- (b) (4)

(b) (4).

- Heating Profiles

The heater can adjust to either a heating profile to heat the Tobacco Stick or a cleaning profile to clean residual material from the blade. The firmware therefore uses two distinct profiles to define and to regulate the temperature evolution in a preset range of the heating element (blade).

Cleaning

The cleaning cycle is used to remove potential Tobacco Stick residues from the blade. It uses the cleaning profile. The cleaning is automatically requested by the Holder after 20 consecutive inhalation experiences.

The Holder, inserted into the Charger, indicates to the Charger that a cleaning cycle is due. During this process, the Charger main tasks are to store energy to recharge the battery of the Holder, to initiate the cleaning process upon request and to recharge the battery of the Holder once the cleaning process is fully completed.

Confidentiality Statement

Confidentiality Statement: Data and information contained in this document are considered to constitute trade secrets and confidential commercial information, and the legal protections provided to such trade secrets and confidential information are hereby claimed under the applicable provisions of United States law. No part of this document may be publicly disclosed without the written consent of Philip Morris International.

Puff Detection

The Device detects a puff when (b) (4) (b) (4) . The device puff detection module (b) (4) (b) (4) It detects puffs based on (b) (4)

Blade Calibration

(b) (4) The heater acts as a resistor and a sensor.

Mechanism to Prevent Misuse

The puff detection mechanism is used to detect and prevent the user from taking an excessive amount of puffs. It ensures consistent aerosol deliveries for all types of smoking regimes while reducing the risk of generating increased amounts of HPHCs. This mechanism is based on the rules set in the heating profile (b) (4) .

The Holder counts the number of puffs drawn during the inhalation experience. The puff detection mechanism detects (b) (4) (b) (4)

(b) (4)

The purpose of the (b) (4) (see Appendix A3.1-3). (b) (4) (b) (4)

(b) (4)

Confidentiality Statement

Confidentiality Statement: Data and information contained in this document are considered to constitute trade secrets and confidential commercial information, and the legal protections provided to such trade secrets and confidential information are hereby claimed under the applicable provisions of United States law. No part of this document may be publicly disclosed without the written consent of Philip Morris International.