

# Advanced in vitro exposure systems

VITROCELL® VC 1 S-TYPE SMOKING MACHINE



# VITROCELL® VC 1 S-TYPE SMOKING MACHINE

Manual smoking machine for chemical analysis  
and *in vitro* experiments

**Optimized for  
e-cigarettes and NGP's**

- square puff profiles
- higher puff volumes
- button actuator
- up to 5 channels



## Objective

The manual smoking machine VC 1 S-TYPE is specifically designed and manufactured to fulfill the requirements of chemical characterization and *in vitro* experiments. Suitable for conventional and electronic cigarettes.

Optimal when researching whole aerosol, it offers significant advantages over other commercial smoking machines.

### Generation of aerosol with the shortest distance to cell cultures or analysing equipment

For the success of an experiment with whole aerosol it is vital that the distance between the aerosol generation (product holders) and the VITROCELL® cell exposure system or to e.g. impingers is as short as possible to guarantee authentic aerosol-composition.

### Open and flexible system / incorporation of other analytical tools

The VC 1 S-TYPE machine is designed to allow easy access to all tubing, filters and the pump system. Additional analytical equipment relevant to the experiment can be easily and individually installed.

### Freely programmable parameters

The control system facilitates highly flexible programming of the puffing process. All parameters like puff duration, puff volume, puff frequency and exhaust duration can be defined according to experiment requirements.

### High flexibility for all smoking regimes

ISO, Health Canada Intense, Massachusetts, Square and Human Puff



- 1 Control Box with Syringe Drive
- 2 Filter Holders
- 3 Examples of e-cigarettes
- 4 Integrated Button Actuators
- 5 Laptop or computer/monitor



Profile regimes (option) can be smoked. An upgrade for Shisha smoking is available.

#### Statistics

Smoking process data are logged into an Excel® sheet for further processing.

#### Machine dimensions are suitable for constrained lab workplaces

The VC 1 S-TYPE machine is divided into 4 major components: computer, control box with syringe drive platform, impinger and device rack.

#### All components are easy to clean

In particular the work with unfiltered whole aerosol demands frequent cleaning of all machine parts which come into contact with aerosol. Cleaning must take place after each experiment to avoid any residual product contamination to subsequent experiments. Easy access to all component parts ensures quick and efficient cleaning.

#### Human puff profile capability

This optional feature offers the possibility to upload human puff-

profile data registered by Smoking Puff Analyzers to the machine controls.

#### Compatibility with existing lab systems

The VC 1 S-TYPE machine can be integrated with and connected to other lab systems, e.g. analytical instruments.

#### Compliance with ISO 3308:2012

The VC 1 S-TYPE machine meets the requirements of ISO 3308:2012 which assures compatibility with data generated for quality assurance purposes on other smoking machines.

#### Compliance with Health Canada / CRM 81 Conditions

The VC 1 S-TYPE machine meets the requirements of 55 ml/30 sec puff

frequency for puffing combustion as well as electronic cigarettes.

#### Quality

The VC 1 S-TYPE machine is built to the highest standards using reliable and durable components. Precision of the process is ensured by a linear motor drive for the piston.

#### Service

All VC 1 S-TYPE machines are designed to be exceptionally service-friendly and have a secure internet-based remote servicing module.

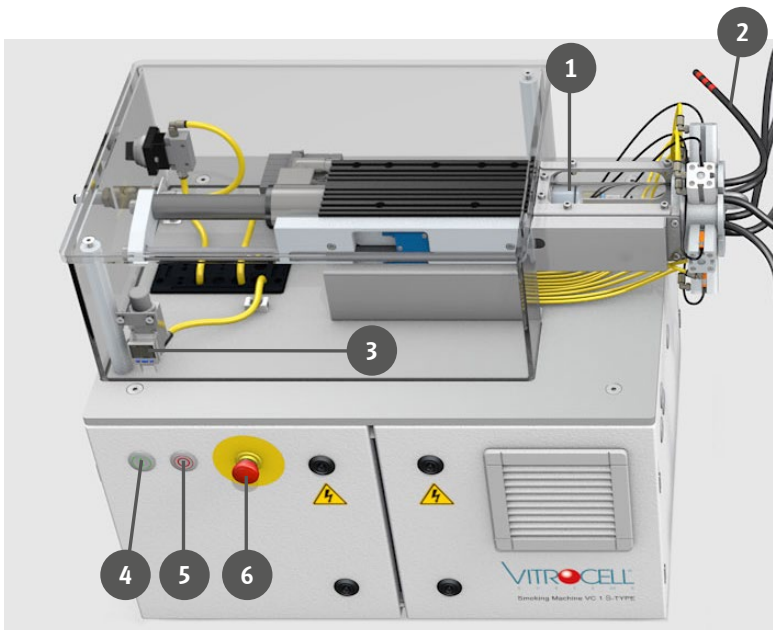
#### Software Controls

Input is communicated via PC with monitor or laptop (part of delivery).

## Features

- Max. of 5 ports for e-cigarettes, NGP's and conventional cigarettes
- For chemical analysis and *in vitro* applications
- No cross-contamination in product change due to change parts and very easy cleaning
- Capable of all current regimes ISO, HCI, CRM 81 and up to 300 ml puff volume
- Small dead volumes
- Integrated button actuators

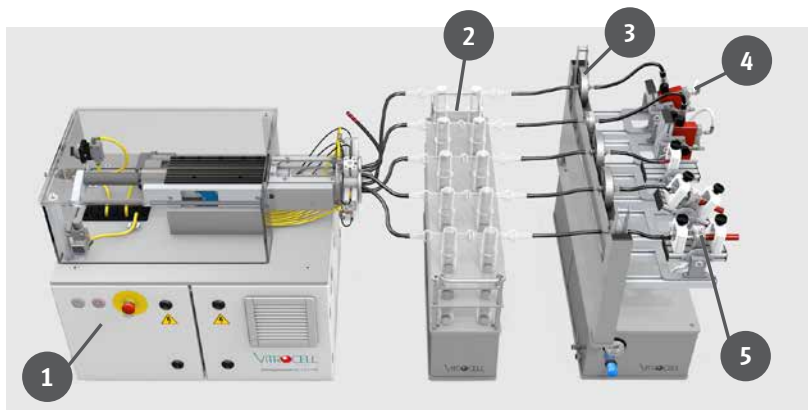
## Components Top View



- 1 Piston Pump Unit
- 2 Aerosol Exhaust
- 3 Manometer
- 4 Smoking Start Button
- 5 System off Button
- 6 Emergency Stop
- 7 Laptop or computer/monitor

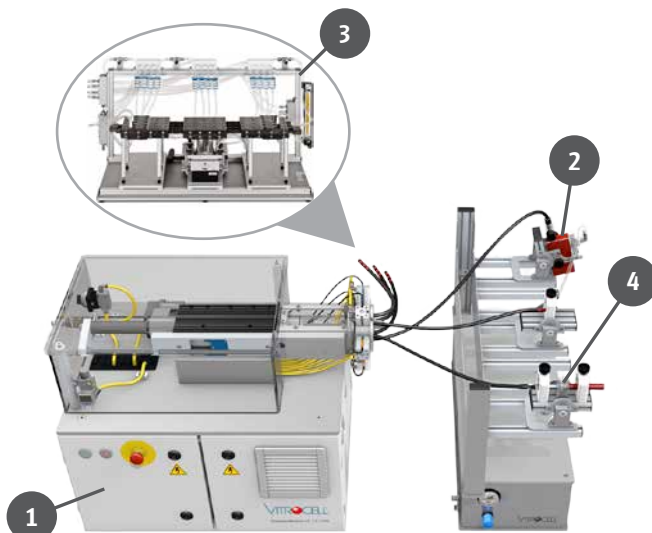


## Configuration 1: chemical analysis „e-cigarettes / NGP’s“



- 1 Control Box with Syringe Drive
- 2 Impinger Rack
- 3 Filter Holders
- 4 Examples of e-cigarettes / NGP's
- 5 Integrated Button Actuators

## Configuration 2: *in vitro* „e-cigarettes / NGP’s“



### Special Holder System

Secure and tight connection of any puff-actuated device.



- 1 Control Box with Syringe Drive
- 2 Examples of e-cigarettes / NGP's
- 3 *In vitro* Exposure System
- 4 Integrated Button Actuators

## Integrated VITROCELL® Vapestarter

For automatic button activation of e-cigarettes



The Vapestarter unit for different dimensions of tank products

This automated solution is designed to press the button in a precise manner and synchronized with the puff regime. The trigger function is controlled by the software of the smoking machine. The

system consists of an e-cigarette holder and different Vapestarter units which are tailor-made to fit tank products having different diameters as well as square shapes.

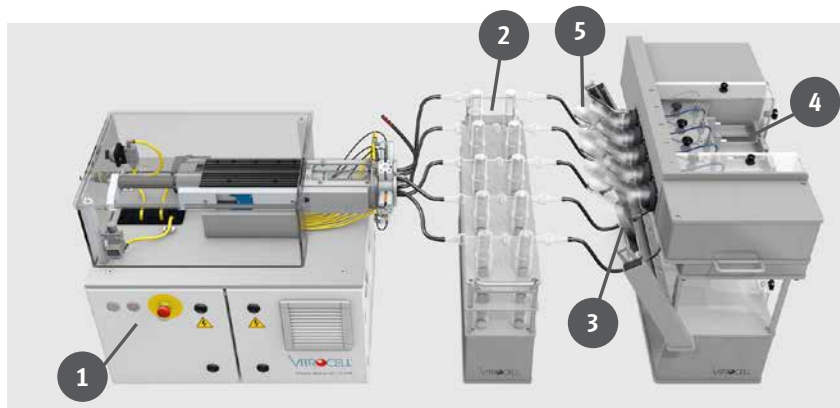
### Features

- Integration into software of VC 1 S-TYPE
- Vapestarters available for all sizes of tank products
- Inclination angle from 0-90°
- Quick-change mechanism for easy exchange of test products



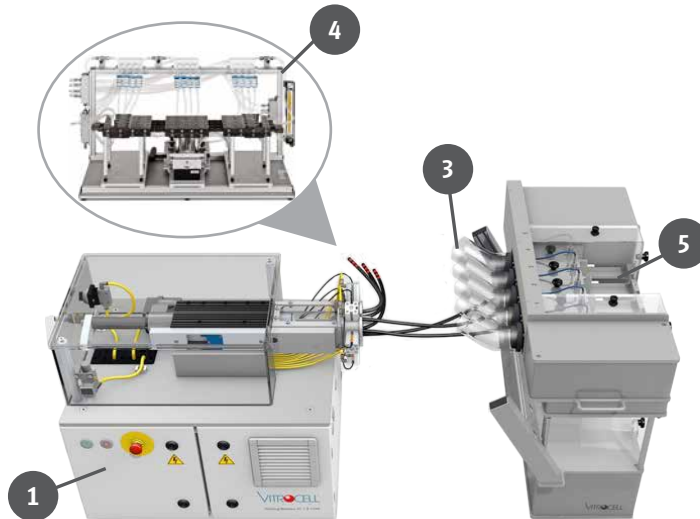


## Configuration 3: chemical analysis „Conventional Cigarettes“



- 1 Control Box with Syringe Drive
- 2 Impinger Rack
- 3 Filter Holders
- 4 Smoking Box
- 5 Sidestream Exhaust Tubes

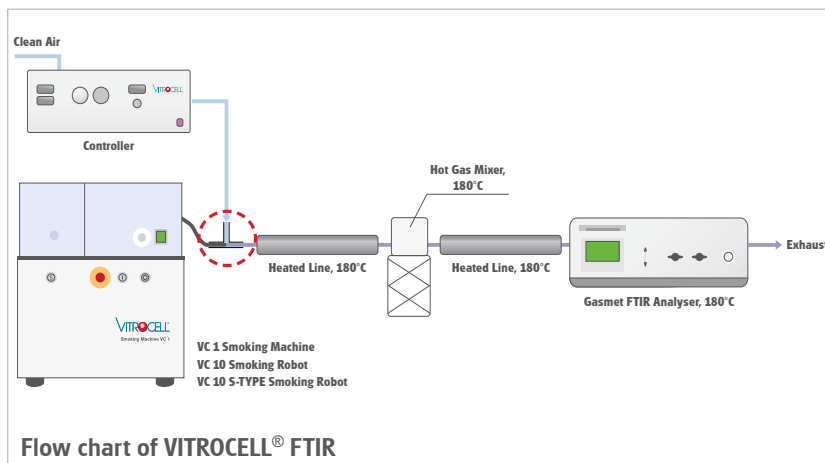
## Configuration 4: *in vitro* „Conventional Cigarettes“



- 1 Control Box with Syringe Drive
- 2 Smoking Box
- 3 Sidestream Exhaust Tubes
- 4 *In vitro* Exposure System

## Option: VITROCELL® FTIR

### On-line gas analysis of electronic cigarettes



### Gasmet™ FTIR – Analytics – Calcmeter™ Software

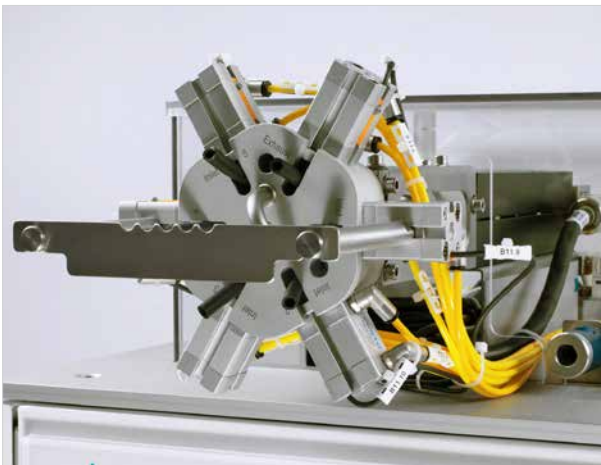
Application library can be customized:

- Add flavor components
- Proprietary ingredients

## Key features



Standardized holder system  
for ENDS products



Unique 6-port valve system. Freely programmable  
for configurations 1-4.

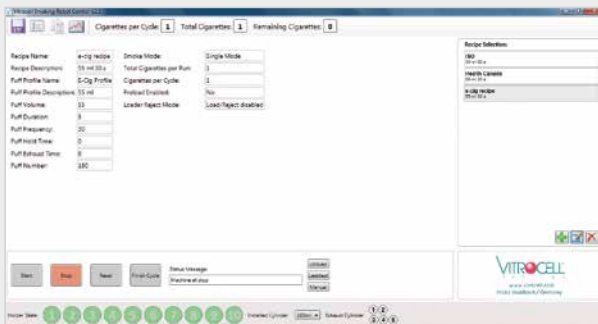


## Powerful linear motor syringe drive

- Proven linear motor drive
- Software platform from VC 1 / VC 1 S-TYPE / VC 10® / VC 10® S-TYPE

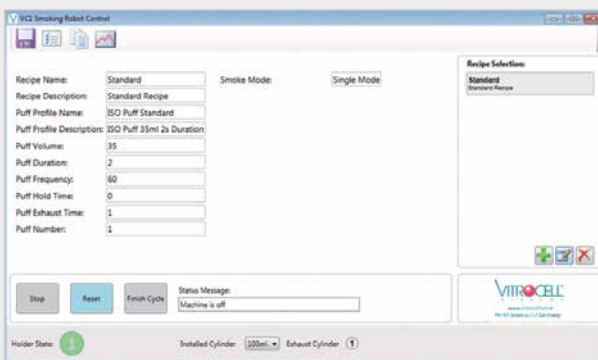


## State of the art controls for highest precision



## Software & Controls

The operation is controlled by Beckhoff software in conjunction with Microsoft Windows 10®. This setup offers extensive possibilities for integration with common Microsoft Office® applications and the exchange of data with Excel®-sheets.



## Smoking parameters

The following parameters can be adjusted according to the needs of the experiment:

- Puff and exhaust duration
- Puff frequency
- Puff volume
- Puff profile
- Flow rate
- Clearing puff number
- Puff duration hold time
- Butt length via sensor

## Technical Data

<b>Dimensions without racks:</b>	605 x 455 x 533 mm (L x W x H)
<b>Voltage:</b>	1 x 208-240 V, 50/60 Hz, 4 A
<b>Compressed air:</b>	4 bar (58 psi) min.
<b>Remote service module:</b>	Included / Internet access mandatory

# Human Puff Profiles

For Smoking Machine VC 1 / VC 1 S-TYPE and  
Smoking Robots VC 10<sup>®</sup> / VC 10<sup>®</sup> S-TYPE

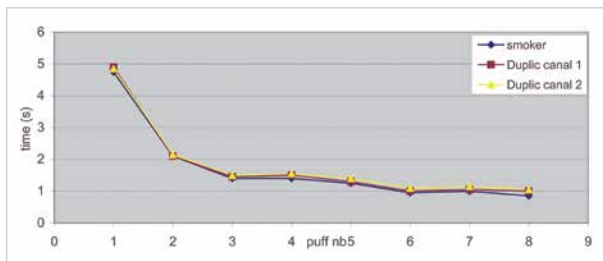
Direct Reading from Puff Analyzer Data Files



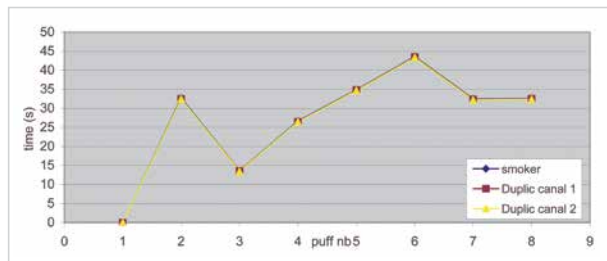
## Human puff profile capability

This optional feature for the VC 1 and VC 1 S-TYPE smoking machine, VC 10<sup>®</sup> and VC 10<sup>®</sup> S-TYPE smoking robots offers the possibility to feed data of human puff profiles registered by Smoking Puff Analyzers to the machine controls.

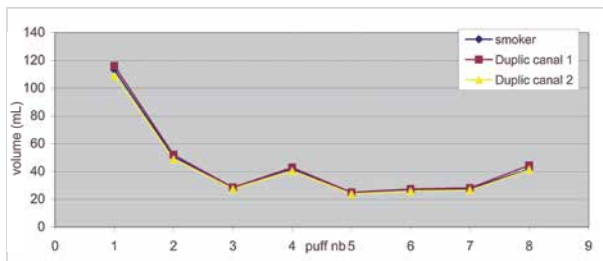
Puff time – precision of replication \*



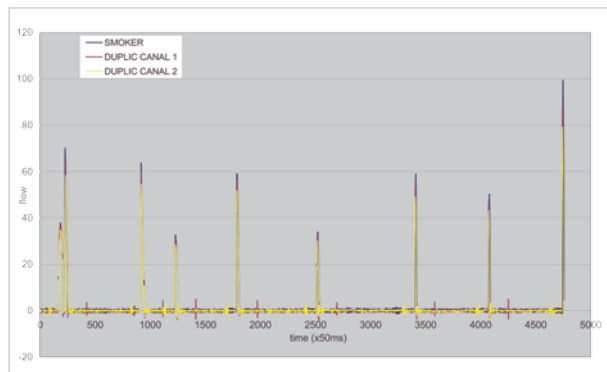
Inter puff time – precision of replication \*



Puff volume – precision of replication \*



Flow versus time – precision of replication \*



\*) Data from smoker compared with 2 channels of VC 10<sup>®</sup> smoking robot (VC 1 is using same technology).



# COMPARISON VITROCELL® SMOKING MACHINES

#	Criteria	Smoking Machine VC 1	Smoking Machine VC 1 S-TYPE	Smoking Machine VC 1/7 and VC 1/8	Smoking Robot VC 10	Smoking Robot VC 10 S-TYPE
1	Smoking Ports	1	Up to 5	Up to 8	10	10
2	Loading	Manual	Manual	Manual	Automatic/Option: Manual	Automatic/Option: Manual
3	Lighting	Manual	Manual	Manual	Automatic by plate	Automatic by hot air
4	Butt Extraction	Manual	Manual	Manual	Automatic	Automatic
5	Butt Length Sensor	Yes	Yes	Yes	Yes	Yes
6	Cylinder Volume	200 ml	200 ml	200 ml	100 ml	200 ml
7	Option 1	300 ml	-	-	50 ml	100 ml
	Option 2	600 ml	-	-	200 ml	-
	Puff Exhaust Exits	1	Up to 3	7 and 8	1	5
	Option 1	-	-	-	2	10
	Option 2	-	-	-	4	15
8	Option 3	-	-	-	5	-
	Cambridge Filter for Gas Phase	Yes	Yes	Yes	Yes	Yes
9	Puff Profile	ISO/Bell/Square Shaped	ISO/Bell/Square Shaped	ISO/Bell/Square Shaped	ISO/Bell/Square Shaped	ISO/Bell/Square Shaped
10	Human Puff Profiles	Option	Option	Option	Option	Option
	Smoke Recipe Storage	Yes	Yes	Yes	Yes	Yes
	Purging after last puff	Option	Option	Option	Option	Option
11	Chemcontrol	-	-	-	Option	-
12	Puffs parameter logging	Yes	Yes	Yes	Yes	Yes
13	Platform concept	-	-	-	-	Yes
14	Docking stations	-	-	-	-	Yes
15	Size cigarette magazine	-	-	-	20/50	300
16	Holders for e-cigarettes	Yes	Yes	Yes	Yes	Yes
17	Button actuator option	for 1 e-cigarette	for 5 e-cigarettes	for 7 or 8 e-cigarettes	for 1 e-cigarette	for 10 e-cigarettes
18	Heated smoke path	Option	Option	Option	-	Yes
19	Max. syringe drives	1	1	7 or 8	1	3
20	Cleaning procedure	very easy	very easy	very easy	easy	very easy

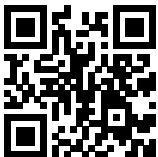
## About VITROCELL®

**VITROCELL® exclusively concentrates on the developing, producing, installing, training and servicing of advanced *in vitro* exposure systems.**

The VITROCELL® Systems' team is driven by their vision for new in-vitro standards through state-of-the-art technology, highly qualified workmanship and absolute client dedication. VITROCELL® has successfully collaborated with clients from leading research institutes, contract research organizations, regulatory authorities or industrial laboratories across the world. Working with our team experts, all modules have been tailored to create durable and complete turnkey-systems for *in vitro* inhalation toxicology. Gases, environmental atmospheres, nano particles and complex mixtures are analyzed on lung cells at the air/liquid interface using these systems. VITROCELL® technologies are also applicable to solutions for skin research.

Over a decade of devotion to research in this specific field has given our team of design & precision manufacturing specialists the opportunity to mentor highly diversified and complex projects **from conception to completion**. We strive to become a constructive member of each research team, providing support when it is needed, advice when it is required and modules of the highest quality, which are even polished by hand before leaving here to be integrated into your workspace. Every piece of our German engineered equipment is manufactured to the highest of standards – yours.

For more information  
please scan the QR-Code:



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