

# Advanced in vitro exposure systems

VITROCELL® VC 1 SMOKING MACHINE



## Options for e-cigarettes

- square puff profiles
- higher puff volumes
- button actuator

# VITROCELL® VC 1 SMOKING MACHINE

Manual smoking machine with high tech features



## Objective

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

Optimal when researching side- and mainstream smoke, it offers significant advantages over other commercial smoking machines.

### Generation of smoke with the shortest distance to cell cultures

For the success of an experiment with mainstream tobacco smoke it is vital

that the distance between the smoke generation (cigarette holders) and the VITROCELL® cell exposure system is as short as possible to avoid aging and to guarantee authentic smoke-composition.

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

The VC 1 machine is designed to allow easy access to all tubes, filters and the pumping system. Additional analytical equipment relevant to the experiment can be easily and individually installed.

### Freely programmable parameters

The computer system facilitates highly flexible programming of the smoking process. All parameters of the smoking process 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 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 machine is divided into 2 major components: computer, control box with smoking platform.

### All components are easy to clean

In particular the work with unfiltered mainstream smoke demands frequent cleaning of all machine parts which come into contact with smoke. Cleaning must take place after each experiment to avoid any residual product contamination with 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 machine can be integrated with and connected to other lab systems, e.g. analytical systems.

### Compliance with ISO 3308:2012

The VC 1 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 machine meets the requirements of 55 ml/30 sec puff frequency for smoking combustion as well as electronic cigarettes.

### Quality

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

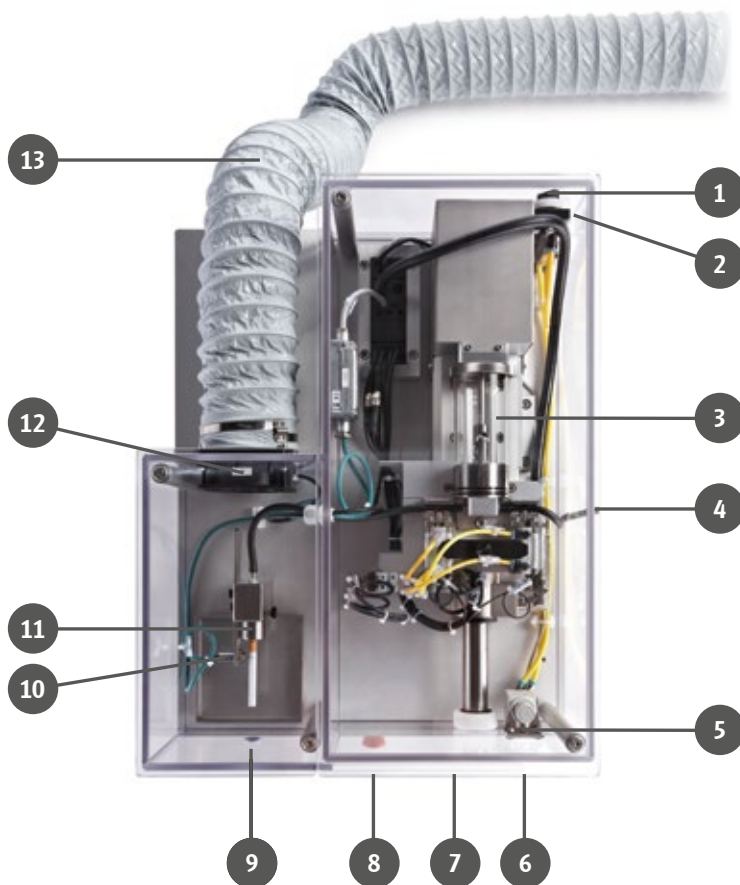
### Software Control

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

### Scalability

Pooling to multiple machines possible.

## Components Top View



- 1 Main Switch and Power Supply
- 2 Compressed Air Connector
- 3 Piston Pump Unit
- 4 Smoke Exhaust
- 5 Manometer
- 6 System Off Button
- 7 System On Button
- 8 Emergency Stop
- 9 Smoking Start Button
- 10 Butt Length Sensor
- 11 Cigarette Holder
- 12 Smoke Extraction Fan
- 13 Exhaust Tube

## VITROCELL® Holder System for e-cigarettes

### Secure and tight connection of any puff-actuated device to Smoking Machine

New designs of ENDS (Electronic Nicotine Delivery Systems) products lead to a large variety of different shapes which make the insertion into conventional holders with labyrinth seals impossible.

VITROCELL® has developed a new holder system which is flexible to adjust to different shapes. It is compatible with all VITROCELL® Smoking Machines & Robots. In most cases the exchange of the inner sealing is sufficient to adjust for a specific shape.



## VITROCELL® Vapestarter

### For automatic button activation of e-cigarettes



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.

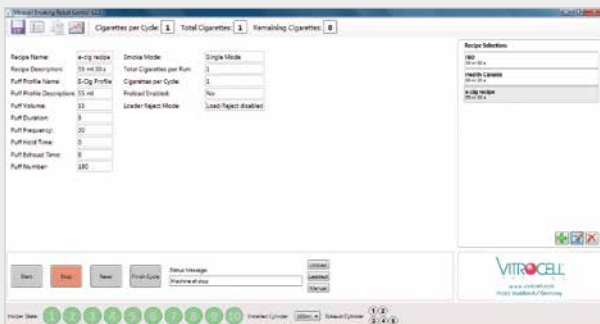


The Vapestarter unit for different dimensions of tank products

### Features

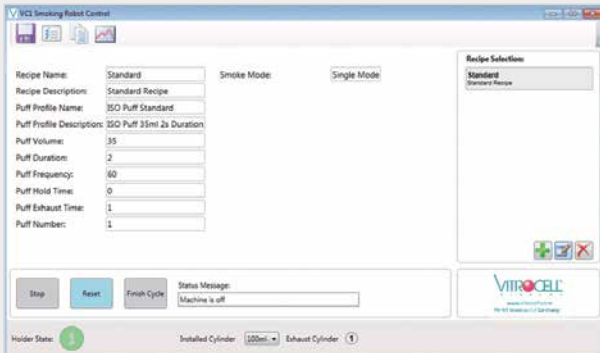
- Integration into software of VC 1, VC 1 S-TYPE, VC 1/7, VC 10® and VC 10® S-TYPE Smoking Machines
- Vapestarters available for all sizes of tank products
- Inclination angle from 0-90°
- Quick-change mechanism for easy exchange of test products

## 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

Dimensions:	605 x 455 x 533 mm (L x W x H)
Voltage:	1 x 208-240 V, 50/60 Hz, 4 A
Compressed air:	4 bar (58 psi) min.
Remote service module:	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

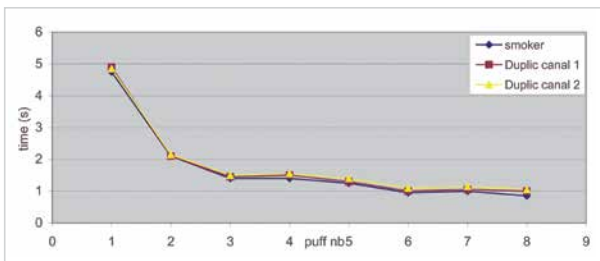
### Direct Reading from Puff Analyzer Data Files



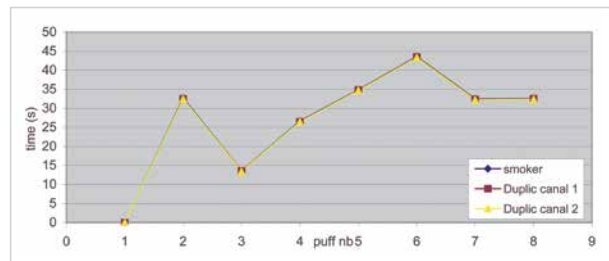
#### Human puff profile capability

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.

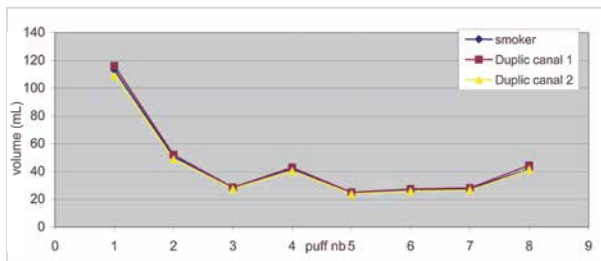
#### Puff time – precision of replication \*



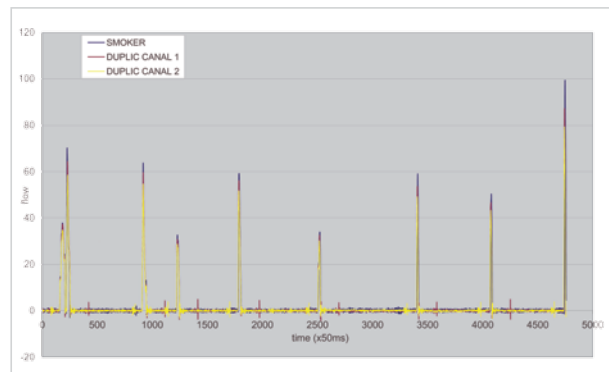
#### Inter puff time – precision of replication \*



#### 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
<b>1</b>	Smoking Ports	1	Up to 5	Up to 8	10	10
<b>2</b>	Loading	Manual	Manual	Manual	Automatic/Option: Manual	Automatic/Option: Manual
<b>3</b>	Lighting	Manual	Manual	Manual	Automatic by plate	Automatic by hot air
<b>4</b>	Butt Extraction	Manual	Manual	Manual	Automatic	Automatic
<b>5</b>	Butt Length Sensor	Yes	Yes	Yes	Yes	Yes
<b>6</b>	Cylinder Volume	200 ml	200 ml	200 ml	100 ml	200 ml
	Option 1	300 ml	-	-	50 ml	100 ml
	Option 2	600 ml	-	-	200 ml	-
<b>7</b>	Puff Exhaust Exits	1	Up to 3	7 and 8	1	5
	Option 1	-	-	-	2	10
	Option 2	-	-	-	4	15
	Option 3	-	-	-	5	-
<b>8</b>	Cambridge Filter for Gas Phase	Yes	Yes	Yes	Yes	Yes
<b>9</b>	Puff Profile	ISO/Bell/Square Shaped	ISO/Bell/Square Shaped	ISO/Bell/Square Shaped	ISO/Bell/Square Shaped	ISO/Bell/Square Shaped
	Human Puff Profiles	Option	Option	Option	Option	Option
<b>10</b>	Smoke Recipe Storage	Yes	Yes	Yes	Yes	Yes
<b>11</b>	Purging after last puff	Option	Option	Option	Option	Option
<b>12</b>	Chemcontrol	-	-	-	Option	-
<b>13</b>	Puffs parameter logging	Yes	Yes	Yes	Yes	Yes
<b>14</b>	Platform concept	-	-	-	-	Yes
<b>15</b>	Docking stations	-	-	-	-	Yes
<b>16</b>	Size cigarette magazine	-	-	-	20/50	300
<b>17</b>	Holders for e-cigarettes	Yes	Yes	Yes	Yes	Yes
<b>18</b>	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
<b>19</b>	Heated smoke path	Option	Option	Option	-	Yes
<b>20</b>	Max. syringe drives	1	1	7 or 8	1	3
<b>21</b>	Cleaning procedure	very easy	very easy	very easy	easy	very easy

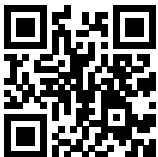
## About VITROCELL®

**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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