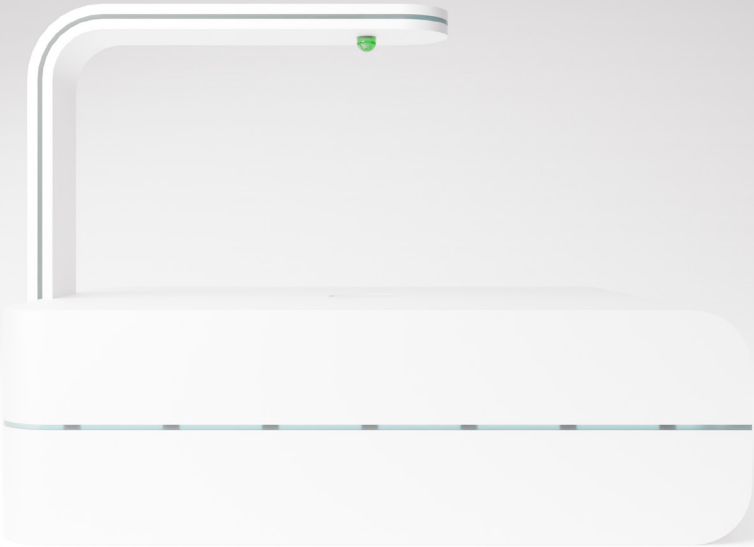
Lux2

Miniature microscope for time-lapse cell imaging



World's smallest live-cell imager

Live-cell imaging has become a desired analytical tool in many cell biology laboratories focusing on e.g. pharmacological research, regenerative medicine and tissue engineering. Live-cell imaging is generally a difficult task, because it requires large, costly, high-end devices that are difficult to operate. The CytoSMART® Lux2 is a compact inverted microscope microscope that makes brightfield live-cell imaging easy and affordable so it can be used by every biological laboratory, even in routine cell culture processes.

The CytoSMART® Lux2 offers:

- Compact It fits in any cell culture incubator
- Easy No training is needed to set up your experiment
- Cost effective Affordable for every biological laboratory

Monitor cells in their optimized environment

Tight control of the environment (e.g. temperature, CO_2) is one of the most critical factors determining the success or failure of a live-cell imaging experiment. When using a conventional microscope equipped with an incubation box, it can be quite a challenge to maintain the cells in a healthy state and functioning normally while being imaged for a longer period of time.

The CytoSMART® Lux2 operates at low-voltage and is designed for safe use in a regular CO_2-incubator. This enables you to minimize environmental changes, giving you more reliable and repeatable experiments for less work.

Easy data storage and image analysis

The CytoSMART® Lux2 can be set to record images at specific intervals (between 5 min - 12 h) for minutes, hours and days. In fact, it is one of the few systems that can run for weeks. The recorded images are sent to the CytoSMART® Cloud where they are analyzed using our custom, cloud-based, image analysis software. You can select the appropriate image analysis algorithm, such as confluence detection, according to the experiment you are performing. The image analysis data is represented in the images as well as graphically in a dashboard.

Furthermore, alerts can be set for confluency, meaning you will receive an automatic notification once your cell culture has reached a certain confluency and is ready for splitting or for use in an experiment, such as transfection.

Easy access. Anywhere. Anytime.

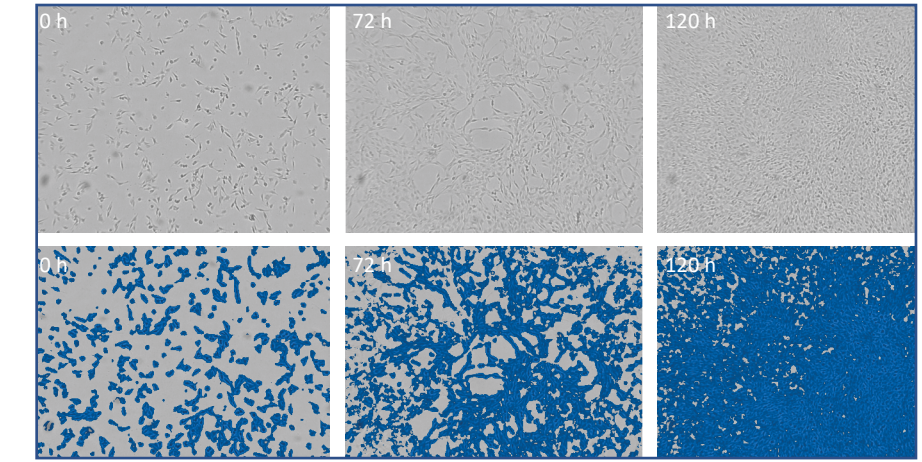
Thanks to cloud-based data storage and image analysis you can access your recording and view the cell culture in almost real-time from anywhere on any pc, laptop, tablet or mobile phone with internet access. All the recorded data such as images (.jpg and .tiff files), time-lapse video (.mp4 files) or image analysis data (.xlsx files) can be downloaded for further processing. In case you have set a notification, our email alerts will keep you up-to-date on confluence levels or long-term temperature drops.

Applications

With the CytoSMART® Lux2 you have a big advantage over your colleagues and competitors. With our cloud-based solution, you have access to the following applications anywhere and anytime you need it:

- Monitor cell division
- Monitor cell growth and confluence (Fig. 1)
- Analyze cell migration and wound healing (scratch assays) (Fig. 2)
- Time-lapse imaging
- Study chemotaxis (Fig. 3)
- Study cells cultured inside microfluidic devices (Fig. 4)
- Study stem cell differentiation
- Cell culture quality control

However, you are not limited to these applications or the CytoSMART® image analysis software. All images and movies can be downloaded from the CytoSMART® Cloud environment so you can use other (custom) image analysis algorithms if necessary.



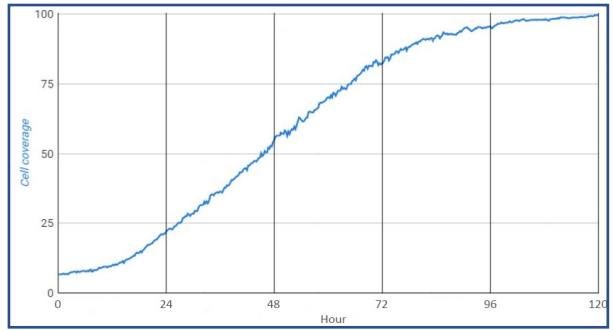
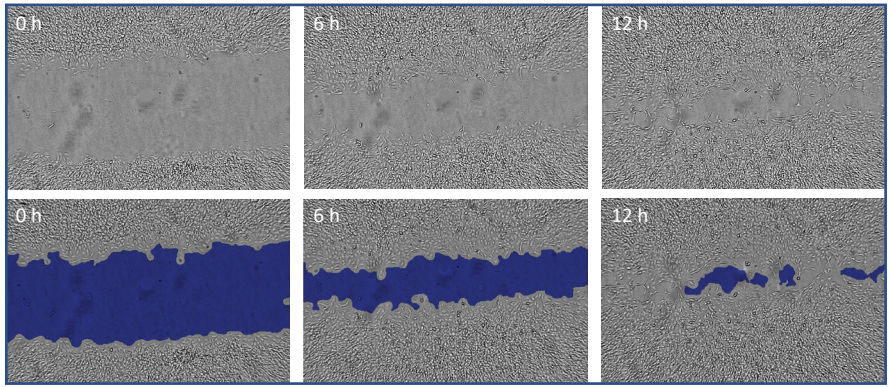
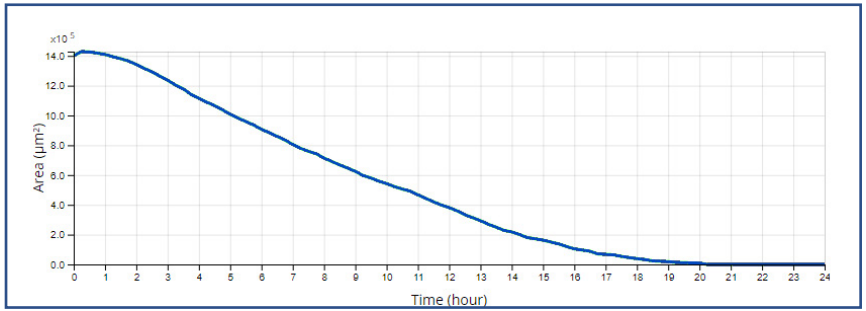


Fig. 1. a) Images of the growth of C6 cells after 0, 72, and 120 h after seeding. b) Corresponding confluency analysis of the cell growth over time.



a



b

Fig. 2. a) Images of a scratch assay performed with C6 cells after 0, 6, and 12 h with the corresponding image analysis overlay. b) Corresponding analysis of the scratch area over time.

Fig. 3. Human neutrophils navigate their way through a microscopic size maze (total maze size is 0.8 mm) towards a reservoir with chemoattractant on the right. Colored arrowheads indicate the same neutrophils at different timepoints. The speed and directionality of neutrophil movement towards the chemoattractant is followed using the CytoSMART® Lux2.

Images courtesy of Dr. Daniel Irimia, Massachusetts General Hospital & Harvard Medical School, Boston, USA.

Fig. 4. The open design of the CytoSMART® Lux2 enables easy monitoring of cells cultured inside microfluidic devices. In this case, the flow and attachment of cells within a microfluidic chip is monitored.

Images courtesy of Michelle Vis, M.Sc, Bioengineering Bone group, Orthopaedic Biomechanics, Eindhoven University of Technology, Eindhoven, the Netherlands.

How it works
As simple as 1-2-3

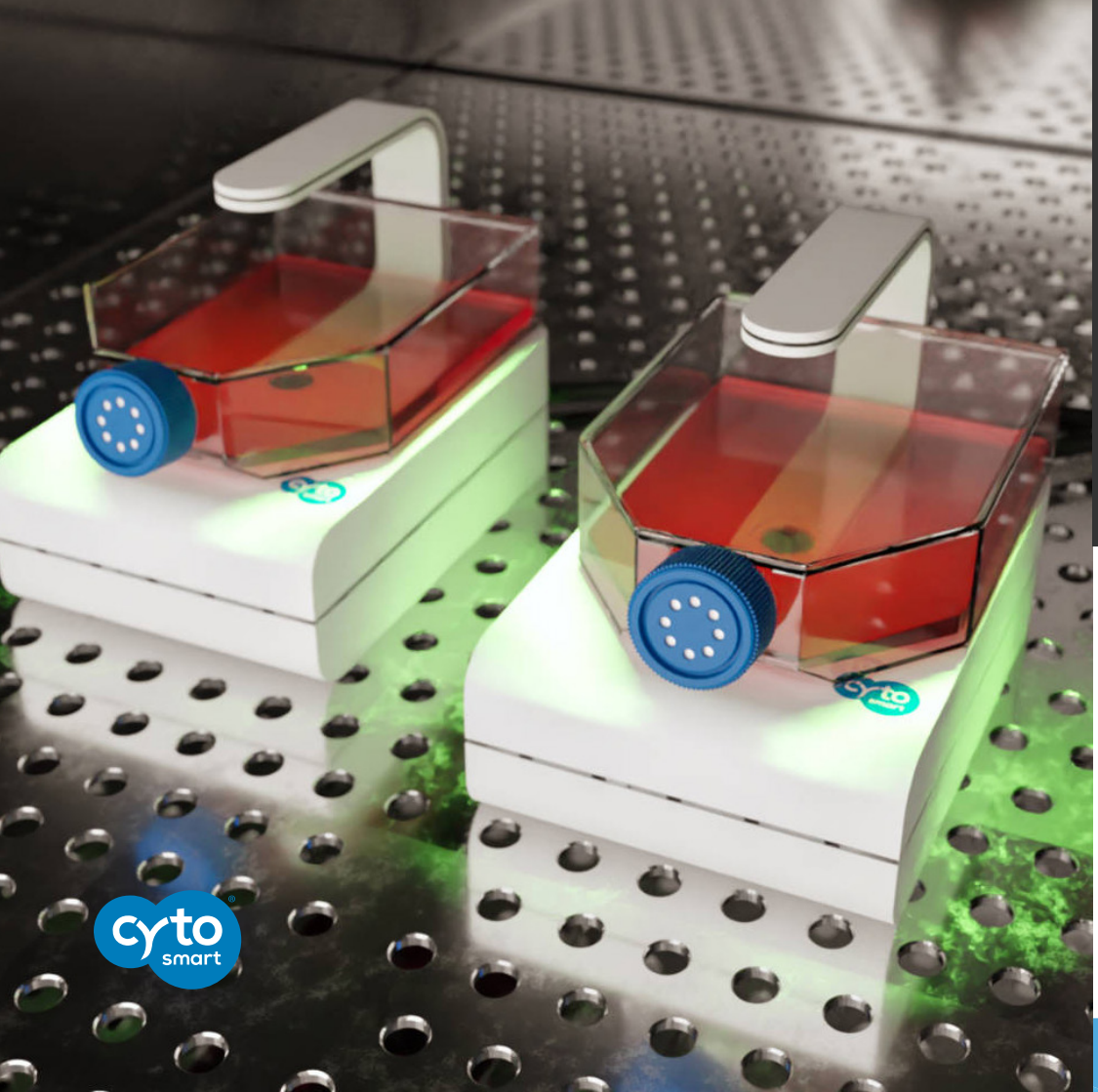
Place the CytoSMART® Lux2 in the incubator. The cable can be run either through a port in the back of the incubator or along the rubber sealing of the door.

Connect the CytoSMART® Lux2 to the laptop.

Start the laptop. You're set to go. You can now start recording a time-lapse of your cell culture.

Use the desired culture vessel for your cells

The CytoSMART® Lux2 can image cells cultured in a wide range of culture vessels including T-flasks, Petri dishes, well plates, culture slides and microfluidic chips. You can simply monitor cell growth in a T-flask or conduct an experiment in another culture vessel or microfluidic chip.



```
from setuptools import setup, find_packages

with open("README.md") as readme_file:
    readme = readme_file.read()

with open("HISTORY.rst") as history_file:
    history = history_file.read()

with open("LICENSE") as license_file:
    license = license_file.read()

requirements = [
    "pillow>=6.2.2, <9",
    "requests>=2.24.0, <3",
    "websocket>=0.2.1, <0.3",
    "websocket-client>=0.57.0, <0.59",
]

setup_requirements = ["pytest-runner"]
```

Take lab automation a step further

The CytoSMART® Lux2 can not only be controlled via the graphical user interface of the app, but also via the CytoSMART® Lux Open API. By adjusting this Python™-based open application programming interface (API) to your lab automation system, you can easily incorporate the CytoSMART® Lux2 into your automated setup.

Flexible imaging solutions for large labs

Improved CytoSMART technology makes it possible to connect up to four devices to one single computer. This allows you to either run one extensive comparison study (Fig. 5) or four individual experiments simultaneously. All users are flexible to start and stop their experiment independent of other experiments, improving lab efficiency. The CytoSMART® Cloud offers remote access to experimental data and automated image analysis, ensuring effective data organization and storage for all research group members.

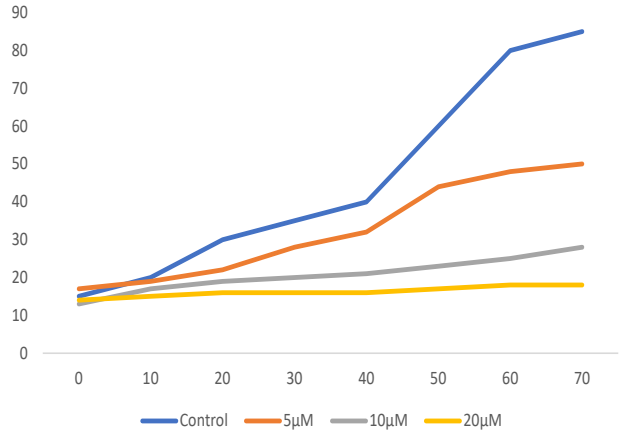


*Fig.5 Cell coverage over time. Confluency level (%) of the mytomycin C treated cells and the control group over a period of 72 hours. *Data acqired using Multi Lux*

Frequently Asked Questions

Q: What is the CytoSMART® Lux2?

A: The CytoSMART® Lux2 is a multi-functional mini microscope that is designed to be placed inside an incubator to monitor cell cultures. Images are analyzed almost real-time using image analysis software to provide insights into the cell confluency.

Q: What are the dimensions of the CytoSMART® Lux2?

A: The dimensions are 13.3 x 9.0 x 10.0 cm (5,2" x 3,5" x 3.9") and it weighs 0.5 kg (1.1 lb).

Q: What type of microscopy technique does the CytoSMART® Lux2 use?

A: The CytoSMART® Lux2 uses inverted brightfield microscopy. The sample is illuminated from the top and observed from below.

Q: Which culture flasks and dishes are CytoSMART® Lux2 compatible?

A: The CytoSMART® Lux2 allows monitoring of a wide range of different culture dishes and flasks, such as: T-flasks, well plates, flat tubes, Petri dishes, (chamber) slides, microfluidic chips. An adapter plate may be required for stable positioning of larger flasks. This plate can be purchased at CytoSMART®.

Q: Do I need to calibrate the CytoSMART® Lux2?

A: No calibration by the user is needed for the device to operate.

Q: What is the CytoSMART® Lux2 magnification?

A: The CytoSMART® Lux2 comes with a fixed 10x objective and 20x digital zoom.

Q: How do I clean the CytoSMART® Lux2?

A:The device is easy to clean using lint-free wipes and ethanol (70%) or isopropyl alcohol (IPA). Do not use acetone to clean the device. The device cannot be autoclaved.

Q: Can the CytoSMART® Lux2 be used in a cleanroom?

A: Yes, after sterilizing with ethanol or IPA the device can be used in a cleanroom.

Q: Do I need an internet connection to operate the CytoSMART® Lux2?

A: No, you can use the CytoSMART® Lux2 without an internet connection, however, in that case data storage is limited to the storage capacity of the laptop and you are not capable to make movies. When the CytoSMART® Lux2 is connected to internet, the CytoSMART® Cloud can be accessed for online storage and analysis of your data.

Q: How much project data can I collect?

A: For the CytoSMART® Lux2 you need a cloud license (either 1 year or lifespan) which allows you access to unlimited cloud storage for that period.

Q: Can I use a fluorescence dye?

A: The CytoSMART® Lux2 is a brightfield microscope. It cannot detect fluorescent dyes. For fluorescence live-cell imaging the CytoSMART® Lux3 FL can be used.

Q: Can I specify the recording interval?

A: At the start of an experiment, you can specify the interval rate between 5 min - 12 h.

Q: What is the field of view of the optics?

A: The device has a field of view of 1.84 mm x 1.84 mm (3.4 mm^2).

Interested?

September 2021

Ordering information

Article number: JAB-1004
Product: CytoSMART® Lux2
Request quote: cytosmart.com

CytoSMART® Cloud license options

1 year: ONA-1002
Lifespan of device: VXA-1003

Specifications

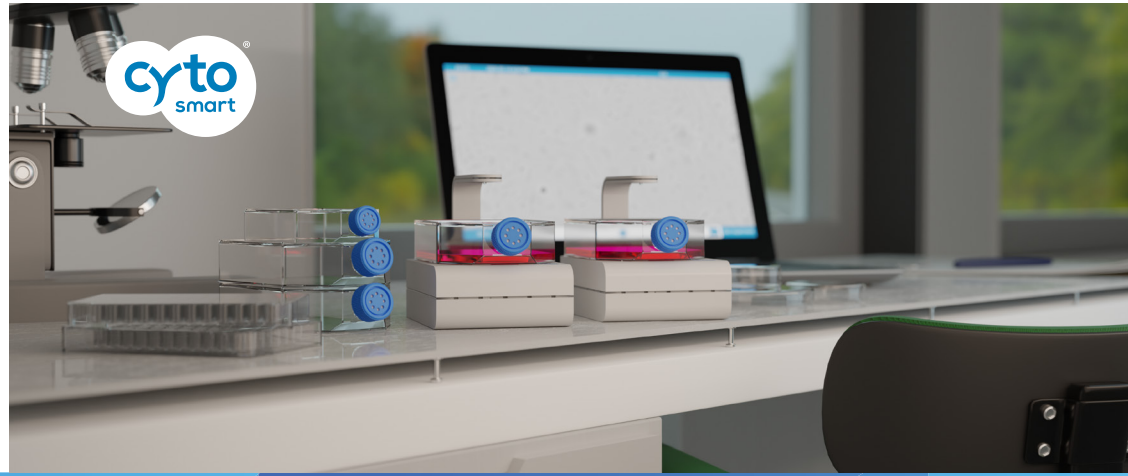
Optics	Brightfield with digital phase contrast
Magnification	10X fixed objective, 2X digital zoom
Light source	LED
Camera	5 MP CMOS
Image size	960 x 960 pixels
Field of view	1.84 x 1.84 mm
Culture vessels	Flasks, well-plates, petri dishes, slides
Dimensions	133 x 90 x 100 mm (L x W x H)
Weight	0.5 kg (1.1 lb)
Operating conditions	5 - 40 °C, 20-95% humidity
Warranty	1-year parts and labor
System requirements	Windows 10, USB 3.0, Internet
Data storage	Unlimited Cloud storage
Support	Via mail and live chat

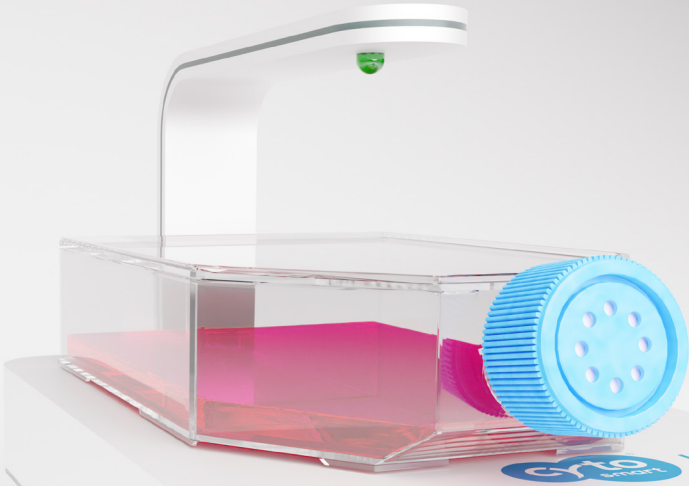
About CytoSMART

CytoSMART® Technologies is a specialist in development and manufacturing of smart microscope systems for life science labs. The company was founded in 2012 by a team of biologists and engineers who were convinced that a new generation of miniaturized microscopes, powered by artificial intelligence for image analysis, would allow biologists to make discoveries more efficiently and at a larger scale.

In 2018 CytoSMART® was selected by Microsoft for its prestigious Scale Up program.

CytoSMART®'s microscopy solutions are used in over a thousand laboratories around the world.





CytoSMART® Technologies BV
Emmasingel 33
5611 AZ Eindhoven
The Netherlands

Phone: +31 (0)88 20 32 200
Email: info@cytosmart.com