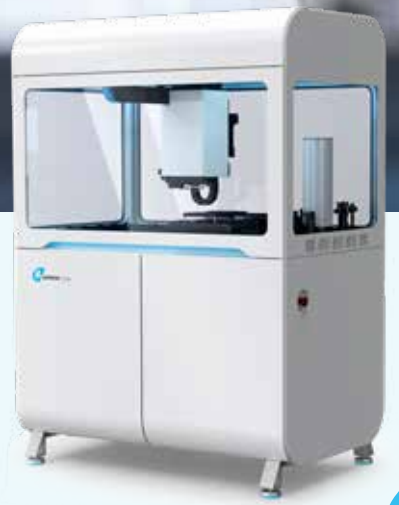
Discover more



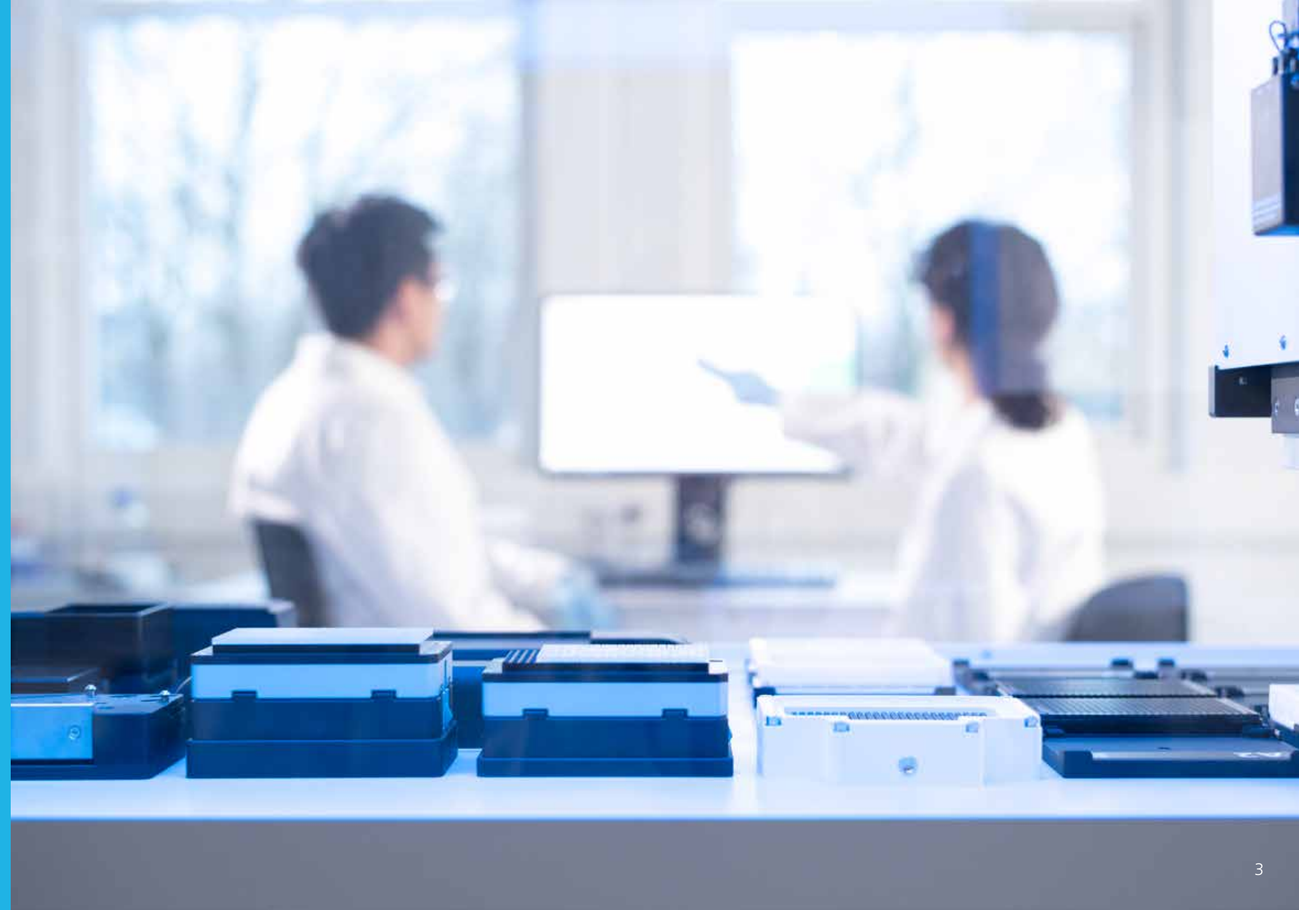
Qube® 384

HIGH-THROUGHPUT AUTOMATED PATCH CLAMP SYSTEM

SOPHION
BIOSCIENCE

Our most advanced automated patch clamp instrument, designed to discover more

Qube 384 is a dedicated, bespoke platform building on over twenty five years of proven technology and components developed by Sophion to empower the next generation of researchers. The third generation of Qube 384 is more advanced than ever, offering a range of new features to enable new discoveries in ion channel research.



Better drugs, faster, at a reduced cost per data point

The ability to test thousands of compounds simultaneously greatly enhances the screening of potential drug candidates. Compared to manual patch clamping, the Qube 384 increases efficiency significantly, allowing experiments to run with minimal supervision while preserving the high fidelity that is a hall mark of this discipline.

With autonomous operation, you can collect data faster, shortening the traditional pre-clinical drug development by up to 33 months.

Qube 384 also lowers the overall cost of drug screening. Early identification of promising compounds helps reduce expenses related to later-stage failures in development.

Additionally, the advanced data analysis tools provide in-depth and full insights into ion channel behavior.

Qube 384 benefits

Maximum throughput

Reduced development time

Consistency and accuracy

Reduced cost per data point

Decreased reliance on manual labor

Increased throughput for broader academic research scope and capability for complex experiments

The Qube 384 enables experiments on many cells in parallel, allowing the study of multiple ion channel types, conditions, or compounds in less time. This expands the scope of research and supports high-impact studies.
The platform reduces the need for specialized skills and saves time, so researchers can focus on data analysis and experimental design instead of manual tasks.

Automation minimizes variability and improves reproducibility, ensuring consistent and unbiased results that can be easily replicated by others.

Advanced Sophion® data analysis tools provide real-time feedback and deep insights into ion channel behavior, helping researchers quickly spot biophysical mechanisms, enhancing understanding of ion channels in health and disease.

The Qube 384 is easy to use for students and junior researchers and promotes collaboration between labs, making data sharing and large-scale studies easier.

Qube 384 benefits

Broader research scope

Reduced reliance on manual processes

Improved reproducibility and consistency

Un-biased test results

Advanced data analysis tools

Complex experiment features

Qube Dynamic Platform:

Proprietary, flexible platform prepared for your future research demands

We believe continuous improvement is better than delayed perfection

That's why Qube is designed to evolve with your changing needs in ion channel research. Intelligent software upgrades, part of our commitment to innovation and your service agreement with Sophion, ensure you always have access to the latest advancements.

With the ability to integrate new, critical features, Qube 384 is a future-proof investment. Built on proven, proprietary technology developed in-house by Sophion, it is designed for continuous improvement, shaped by valuable feedback from Qube users worldwide.

Let's meet to discuss the exciting roadmap of the Qube Dynamic platform.

Qube Dynamic Platform

Ongoing software updates

Proprietary technology prepared for feature upgrades

Ongoing enhancements in consumable efficiency

Easy adaption to future research demands

Guaranteed up-to-date investment

Qube Dynamic Platform
The future proof investment

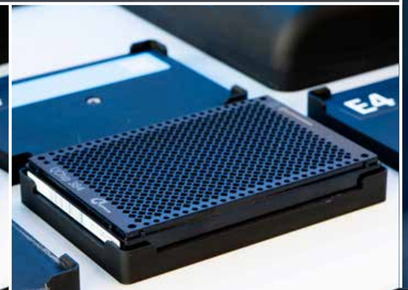
All-new and improved platform:

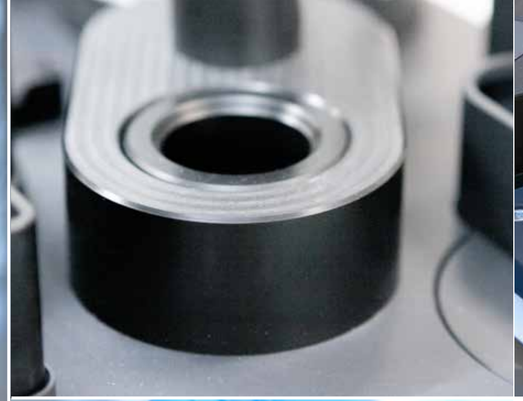
The sum of all improvements makes this our most versatile and user-friendly instrument yet

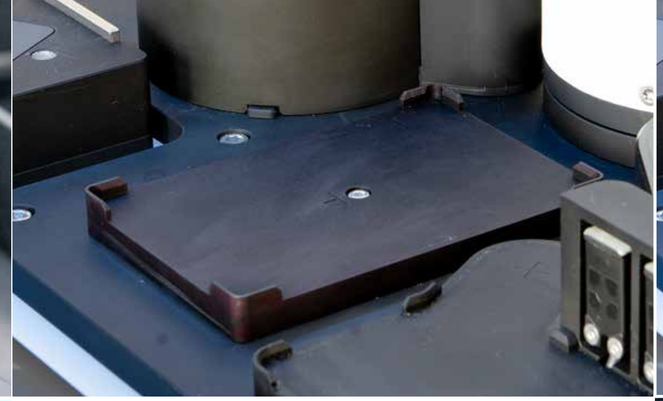
10 Years of Innovation, Shaped by You

A decade of continuous innovation, driven by user feedback and close collaboration. We don't just meet demands, we anticipate future needs. The seamless integration between the mounting plate and the operating system interface is just one example of the thoughtful design behind the all-new Qube 384.

The uniquely designed bed guarantees precise QChip placement every time



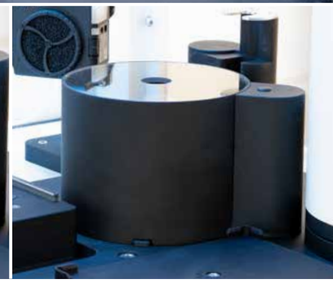




A new level of user-friendliness and ergonomics

We've taken automated patch clamping a step further, virtually eliminating the risk of human error. Assembly and preparation are foolproof - every component fits logically into place.
We believe automation should simplify, not complicate. That's why we've designed our system with the user in mind, ensuring effortless adaptation so researchers can dedicate their time to groundbreaking ion channel studies. Every day, the Qube 384 will make your work easier and more efficient.

A precision sensor ensures the centrifuge is securely and correctly mounted, eliminating setup errors



Innovative bed design optimizes reservoir positioning for seamless operation

Qube 384 platform overview & content

Qube 384 Dynamic Platform

Liquid handling unit
ensures that a precise amount of liquid is added at exactly the specified time and cleans up between tests to ensure the next experiment isn't affected by the previous. The unit can also be used as a stand-alone liquid handler.

Page 14

High-fidelity amplifiers
384 individual amplifiers, designed by Sophion, with high resolution, accurate compensation, and low noise.

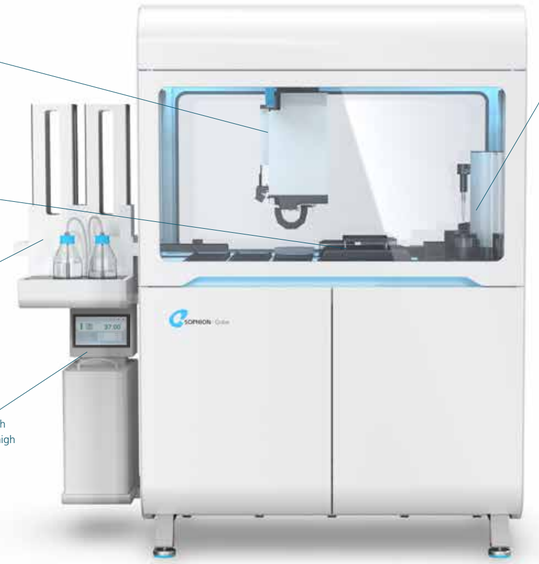
Page 18 - 21

Automation package
Allows you to load compounds and QChips, while the onboard cell hotel supplies cells for hours of unattended operation.

Page 16 -17

Temperature control unit
Regulation ranging from 10–42°C with high precision and accuracy of ±0.5°C ensures high repeatability and reproducibility, as well as testing under physiological conditions.

Page 26



Cell preparation unit
integrated into the instrument ensures that cells arealways fresh, leading to the highest success rates in automated patch clamp.

Page 15

Microflow-based QChip consumables
Sophion's patented architecture includes microfluidic channels and 384 individual electrode pairs, providing maintenance-free, high-precision recordings due to complete liquid exchange

Page 24 - 25

Sophion software suite
for running and analyzing experiments. It provides comprehensive project analysis and QC filtering to ensure efficient and manageable use of large data sets.

Page 22 - 23

Qube liquid handling unit

Designed for ultra precision and reliability for years to come

No desensitization and reduced agonist exposure due to stacking in tips

Ultra-precise concentration control, due to separate inlets and outlets on QChip connected by microfluidic channels

Pipetting robot available for compound plate preparation

Exchange of IC during experiment with as little as 22 µL per column

Integrated liquid handler
1,536 precision, load by force, barcode reader linear motors and gripper ensures ensures accuracy, speed and full traceability

Qube cell preparation unit

Intelligent and fully automated cell preparation

Prepares and delivers fresh cells precisely when required

Simplifies workflow and saves time and resources

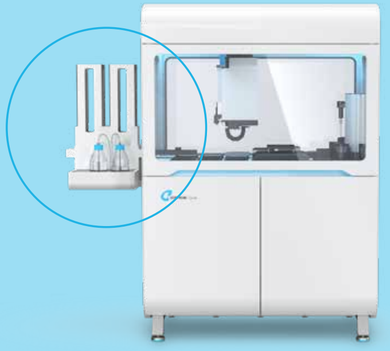
Extremely low cell consumption

The hallmark of the Qube automation is cell handling, which has been designed for >8 hours unattended operation. With the true walk-away operation, you can efficiently utilize laboratory resources to meet demanding timelines, save valuable time, while ensuring the highest success rates for your drug discovery and ion channel research. With the ability to use a low volume cell transfer plate and partial QChip execution, extremely low cell consumption is attainable, e.g. for iPSC and primary cell preparations.

The Qube automation package

True walk-away solution offering 8 hours of unattended operation

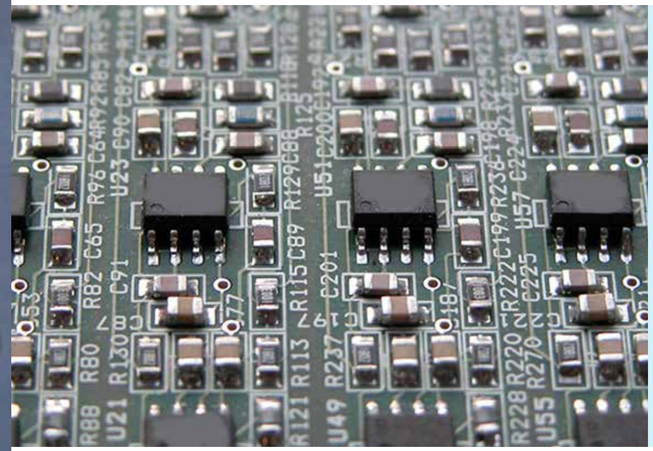
With the true walk-away operation, you can efficiently utilize laboratory resources to meet demanding timelines, save valuable time, while ensuring the highest success rates for your drug discovery and ion channel research.



384 individual amplifiers handling the same number of experiments with high fidelity ion channel recording via individual electrode pairs.

Qube high-fidelity amplifiers

Designed to remove artifacts with up to 100% success rate



Increase patch clamp accuracy

Up to 100% R_s compensation using patented algorithms

Execute differentiated protocols across the same QChip, both pressure and voltage and current clamp, to maximize the output

All Sophion's patch-clamp amplifiers utilize a patented technology enabling up to 100% R_s compensation and are equipped with automatic clip detection to avoid loss of cells due to fatal oscillations. Thereby, increasing data throughput while maintaining high-quality recordings.

At Sophion we develop our own amplifiers. We were the first to develop adaptive voltage- and current clamp protocols as well as fast leak and capacitance compensation. We don't stop and future developments will also become available for Qube 384.

Qube high-fidelity amplifiers

Adaptive voltage protocols for extremely tight data spread

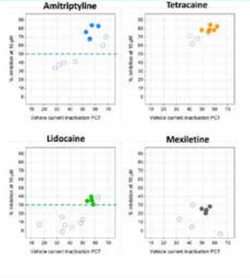
Automated cell-specific Boltzmann fit

Clamping to the cell-specific biophysics

Activation and inactivation protocols

Online parameter quality control and Rs compensation

No data loss if Boltzmann fit is poor



From the Application Report "Vhalf adaptive protocols on Qube" authored by Juha Kammonen from Charles River Laboratories.

Voltage clamping is a technique used to control the membrane potential of a cell while measuring the ionic currents that pass through its membrane. This technique can be applied to whole cells or to isolated sections of the membrane.
Adaptive voltage clamp is a unique feature of Sophion amplifiers, which optimizes voltage clamp protocols individually to each cell's biophysical properties. The Qube 384 system will automatically perform Boltzmann fits for each cell online. This is to estimate the cell-specific voltage needed to activate XX% of the receptor population or the voltage that keeps XX% of the cells in an inactivated state.

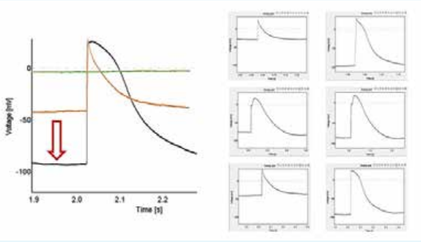
Qube high-fidelity amplifiers

One protocol to capture physiological responses from all 384 cells simultaneously

Automated cell-specific current clamp analysis

Current clamp or mixed voltage and current clam recordings in the same sweep

Adaptive current clamp to obtain individual resting membrane potential and Irheo



Adaptive current clamp is a unique feature of Sophion amplifiers. The main challenge with current clamp on automated patch clamp platforms is the variation in sealing and resting membrane potential from cell to cell.

This makes it impossible to design one current clamp protocol to work on all cells. We have solved that with our unique Adaptive Current Clamp feature.

With Sophion's automated current clamp, you can either choose the adaptive current clamp feature and evaluate the resting membrane potential individually and set the holding potential accordingly.

Adaptive current clamp can correct the resting membrane potential for each cell in parallel improving AP phenotype and increasing success rates. Left panel: Detailed view. Right panel: Examples of cell without adaptive current clamp (left) and with adaptive current clamp (right), which gives much more physiological responses.

Sophion's adaptive current clamp utilizes an advanced feedback regulation technique that generates the voltage needed to inject the requested current into the cell, as defined in the assay setup software.

The electrical cell-chip parameters are measured for each measurement site before an experiment, to increase measurement stability. The results are used to make individual adjustments to the feedback loop. This advanced regulation and control on individual measurement sites are only possible since we have developed amplifiers specifically for automated patch clamp.

Sophion software

Easy setup of experiments and precise analysis of large data sets

Simple and efficient handling of extremely large amounts of research data

Database ensures the original data is protected so no one can change it

Enabled for Sophion Thor® - store and share data in the cloud

Access your data from anywhere using the internet

Tracks every change to give audit trails and full traceability for GLP

Easy to use with Sophie® - your digital assistant

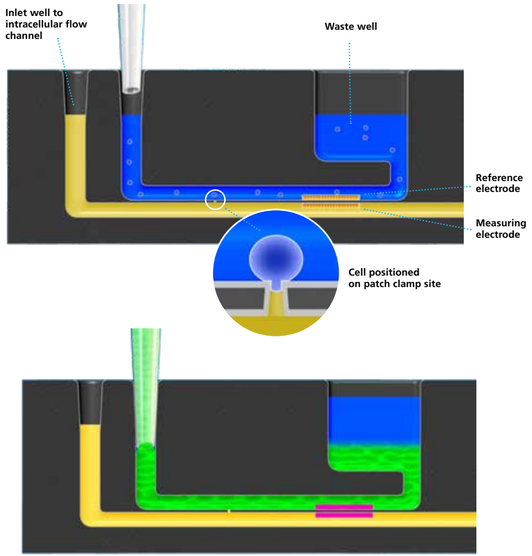
Pre-made project templates make it easy to focus on your core tasks

Automated patch clamping quickly generates vast data sets, requiring efficient data handling. Sophion Analyzer is the analysis software for all Sophion platforms and it provides advanced analysis of thousands of experiments at once, preserving the detail typical of patch clamp data. Automatic project analysis frees up time for planning the output of the results, discussing lead profiles with the chemist and discover new biophysical characteristics.

Qube 384 QChip consumables

Unique technology ensures complete liquid exchange

- No risk of ‘overshoot concentrations’ common when using open well technology
- 1 or 10 holes, each with 2 MΩ resistance as standard. Smaller and larger resistances as well as other number of holes are available
- Less cell-consumption due to low volume in the QChip, only 4 µL per site
- Non-drifting recording ensured by the 384 embedded and maintenance free electrode pairs
- Partial QChip use
- Voltage-gated, ligand-gated, light-gated, mechano-gated and current clamp recordings can be combined



Microfluidic flow channels ensure 100% complete liquid exchange

The QChip is designed specifically for the Qube 384, featuring integrated, maintenance free electrodes and flow channels, enabling giga-Ω seals and efficient liquid handling, ensuring consistent, high-quality data recordings every time. The microfluidic technology ensures cells are only exposed to the compound concentration that is dispensed without risk of the overshoot concentrations seen with open well technology. The individual electrode pairs ensure precise voltage-clamp due to the small distance between electrode and cell.

Qube UNIQUE ADVANTAGE

Temperature control unit

Extremely accurate and consistant temperature regulation

Extremely accurate temperature regulation

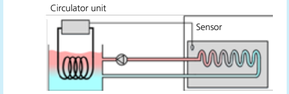
Higher repeatability and reproducibility

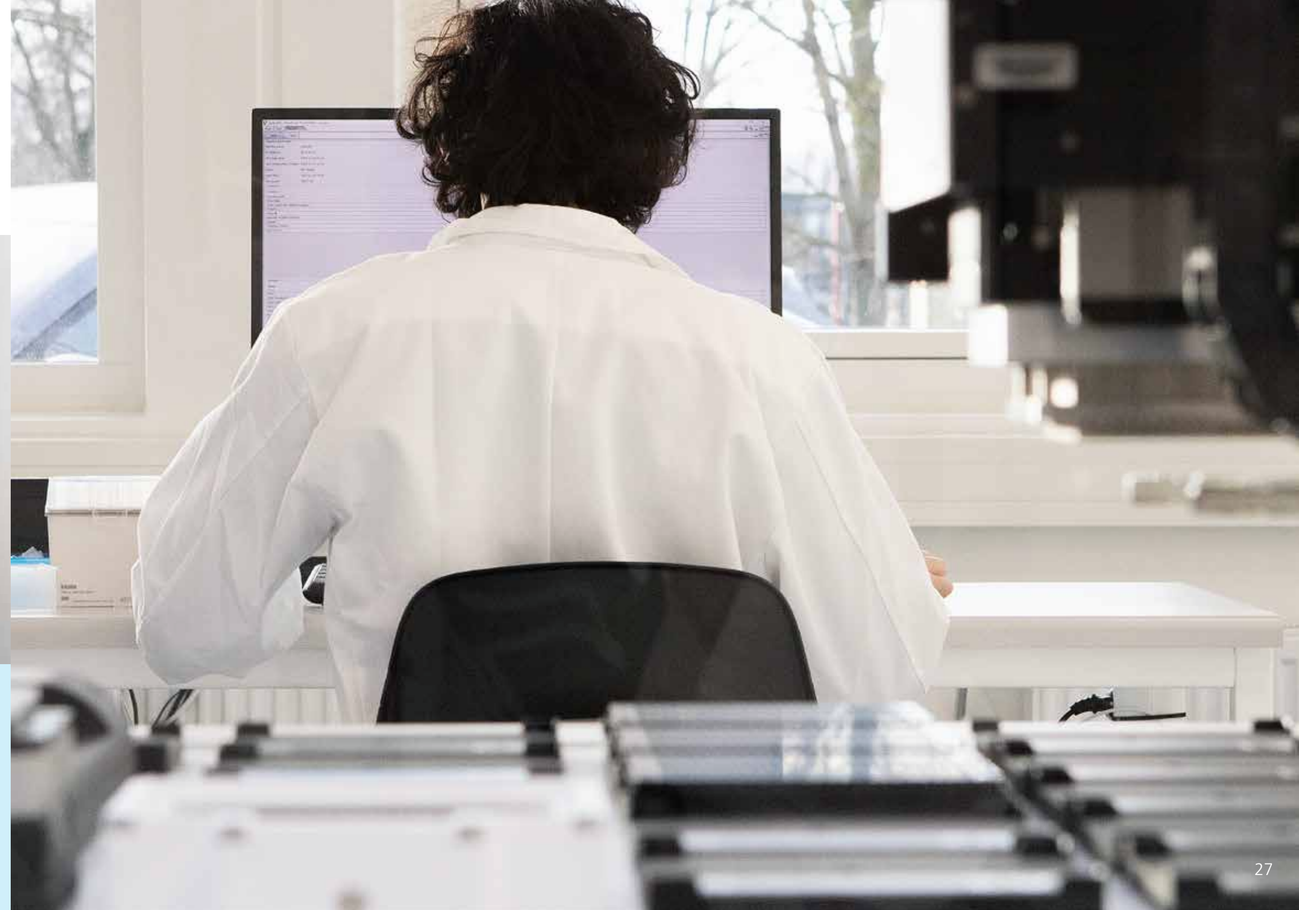
Perform experiments at controlled physiological temperatures

Sophion's precise temperature control allows for both heating and cooling of the experiment. You can perform experiments at controlled temperatures and both cool and heat the experiment. This reduces fluctuations caused by temperature changes in your laboratory environment and thus ensuring higher repeatability and reproducibility

With our temperature control modules, we allow for accurate and rapid temperature regulation ranging from 10-42°C with high precision and accuracy of ±0.5°C. Temperature measurement and feedback are taken directly from the bed-of-nails (BON) beneath the measurement sites. The temperature regulation is performed using circulating water in the BON. It is not a straightforward engineering task to integrate liquid flow in the BON. However, temperature control must be performed very close to the measurement sites to ensure precise control with minimum fluctuations. If not, laboratory and cabinet temperature will influence the accuracy significantly.

Range	10 - 42°C
Accuracy	±0.5°C
Temperature variation across plate	±0.2°C (10 - 30°C) ±0.4°C (42°C)
Temperature variation over time	±0.1°C
Instrument-to-instrument variation	±0.25°C

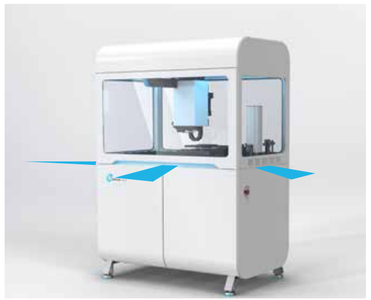




Operational features

Designed for efficiency and ease of use

Unidirectional and free airflow ensures constant, accurate temperature



Based on Sophion extensive experience with automated patch clamp equipment and because we design and assemble everything ourselves, the temperature management is optimized to limit impact on the experiments and energy consumption.

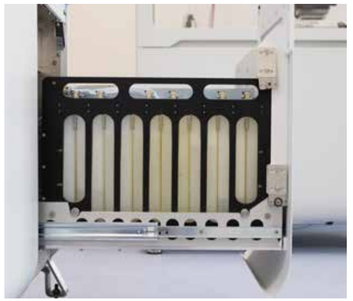
Two cameras monitoring and documenting tests

Black box cameras to document events on the work plane. With future planed upgrades the use of the camera will be expanded to proactively warn the user if something is not prepared correctly.

No static charge - Ionizer to combat static charge problems in dry environment

Exchanging pipette tips in dry environment is a challenge due to static charge build up. The ionizer will ensure that the pipette tips behave in a controlled manner.

Front loaded liquid management for easier access and monitoring



The cell-waste drawer is designed just like a stretcher-slider in ambulances, in order to carry high loads smoothly - with soft close. The see-through carve-outs makes it easy to visually monitor liquid levels - in addition to sensors.

Simplified and easy service management

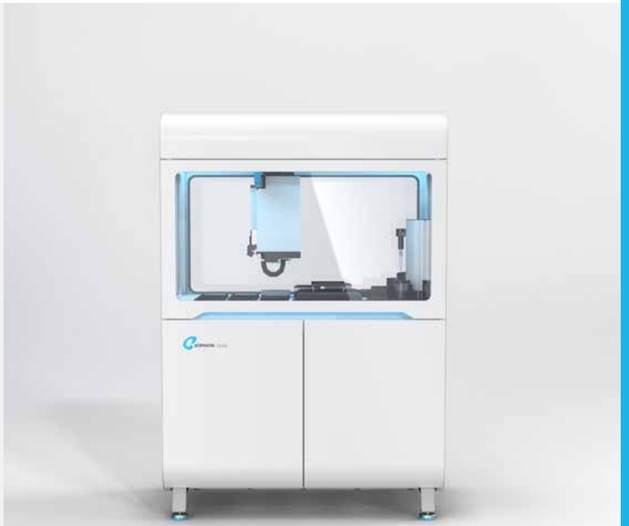
Orderly arrangement of all components make service easier and quicker - because all operations during a preventive maintenance is accessible from the front. Future upgrades will provide self diagnosis to further reduce the down time.

Intuitive lighting assists the operator on a daily basis

An integrated and software controlled status allows you to see if the Qube is running or is waiting for your action. Additional working lights in the cabinet assist in circumstances of dim ambient light.

Qube 384 specifications

Recording configuration	**Whole cell / Perforated patch**
Cell types applicable	**Cell lines / Stem cells /Neurons**
Target throughput per month	**100.000 – 400.000**
Success rate	**Up to 100%**
Number of extracellular additions	**∞**
R_s compensation	**Up to 100%**
Shortest voltage segment	**0.1 ms**
Liquid exchange rate	**< 40 ms**
Number of intracellular solutions	**Up to 24**
Agonist exposure time	**0.8 – 10.0 s**
Number of amplifiers	**384**
Number of pipettes	**384**
Smallest fraction of QChip use	**2 columns**
Temperature control	**10 - 42°C**
Adaptive protocols	**V_{xx} I_{adapt} I_{rheo}**
User maintenance	**None**
Storage capacity	**2 x 12 TB**



The answer to all your patch clamping is in the Q

QPatch Compact
Semi-automated

Designed for tailored ion channel research and education.

QPatch 8X, 16X, 48X
Automated

The benchmark solution for efficient, high-quality ion channel studies in physiological solutions

Qube 384
Automated

High-performance & high-throughput ion channel characterization and screening

Discover more at **Sophion.com**
Please email us at **info@sophion.com**

SOPHION | Discover more

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