

Discover more



Qube 384

HIGH-THROUGHPUT AUTOMATED PATCH CLAMP SYSTEM





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

The Qube 384 is a complete stand-alone platform with specially developed technology and components designed to support its functions and meet your evolving needs. The third generation of Qube 384 is more advanced than ever, offering a range of new features and options that drive 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 traditional patch clamping, the Qube 384 will increase 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 and no need for constant monitoring, you can collect data faster, shorten project timelines, and achieve more consistent, reproducible results.

The 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 at once, 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 384 platform overview & content

Liquid handling unit

The unit makes sure the right amount of liquid is added at the right time and cleans up between tests to make sure the next test isn't affected by the previous one. The unit can also be used as a separate liquid handler.

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High-fidelity amplifiers

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

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Temperature control unit

Regulation ranging from 10–42°C with high precision and accuracy of $\pm 0.5^\circ\text{C}$ ensures higher repeatability and reproducibility, as well as testing under physiological conditions.

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Cell preparation unit

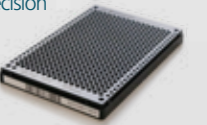
Automatic cell preparation, integrated into the instrument, ensures that cells are always fresh, leading to the highest success rates in automatic patch clamping.

Page 9

Microflow-based QChip consumables

Sophion's architecture includes microfluidic channels and 384 individual electrode pairs, providing maintenance-free, high-precision recordings.

Page 17

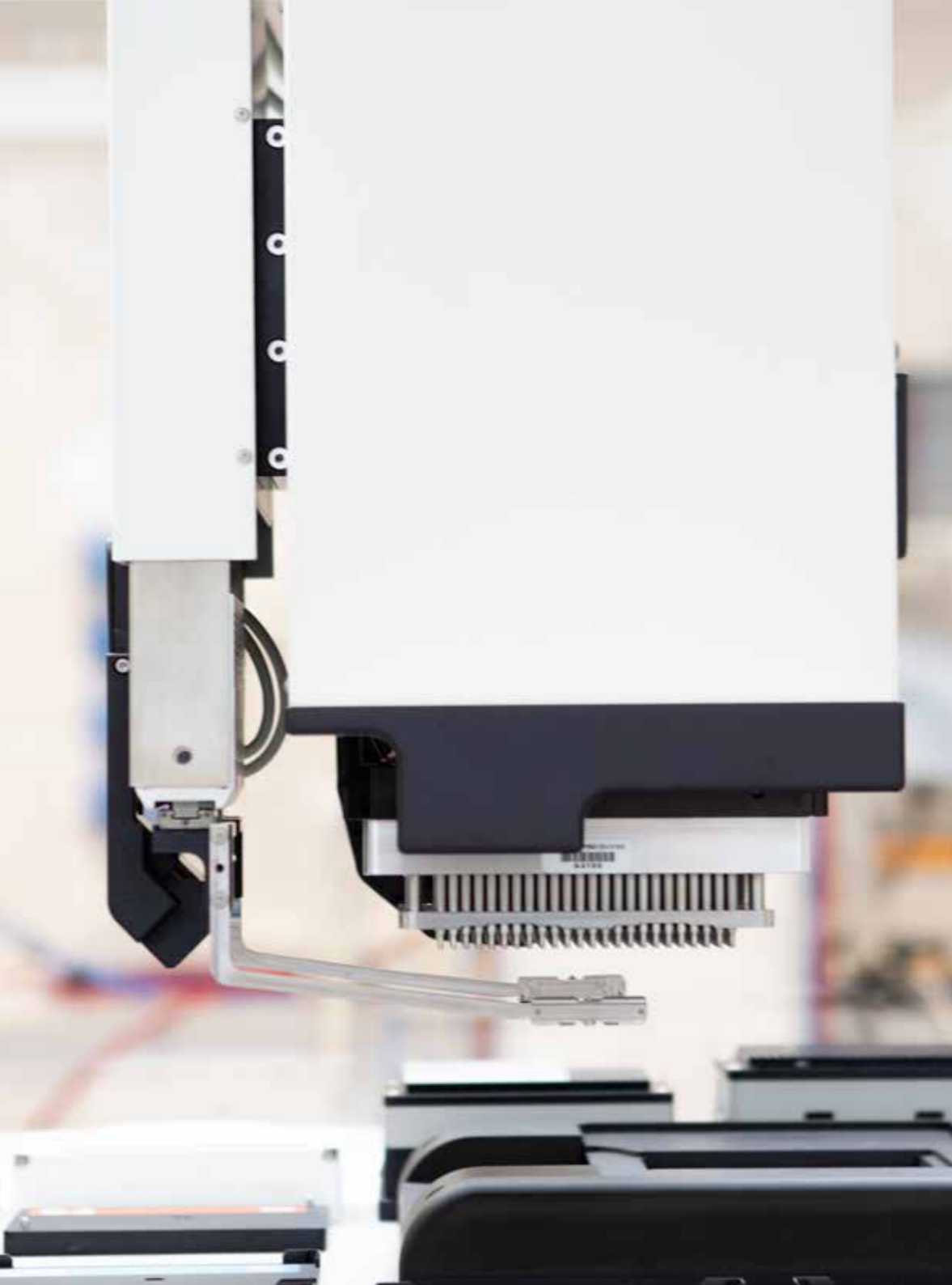


Sophion software suite

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

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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 in- and outlets on QChip
connected by microfluidic channels**

**Separate pipetting robot available for
compound plate preparation**

**Exchange of IC during experiment with
as little as 22 μ L per column**

Integrated liquid handler

1,536 precision, linear motors and
gripper ensures accuracy and speed.



Qube cell preparation unit
**Intelligent and fully automated
cell preparation**

**Prepares and delivers fresh cells
precisely when required**

**Simplifies workflow and saves
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.

It is possible to reach very low cell consumption, e.g. for iPSC and primary neuron preparations, with the narrow cell transfer plate and partial QChip execution.

The Qube stacker

**True walk-away solution offering
8 hours of unattended operation**

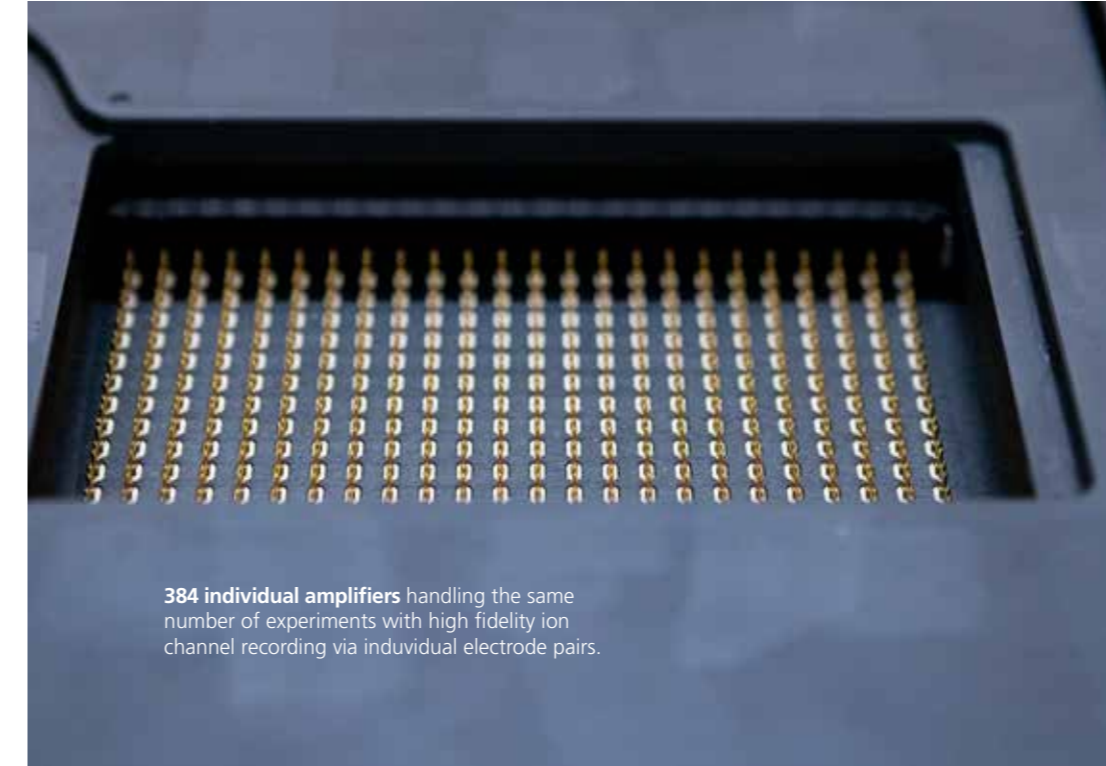


With the true walk-away operation, you can efficiently utilize laboratory resources to meet demanding timelines, save valuable time, while ensuring the highest success rates for your drug discovery and ion channel research.



Qube high-fidelity amplifiers New ever evolving features

Qube high-fidelity amplifiers Designed to remove clamp artifacts with up to 100%



Increase patch clamp accuracy

Up to 100% R_s compensation using patented algorithms

Execute differentiated protocols across the same QChip, both pressure and voltage/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

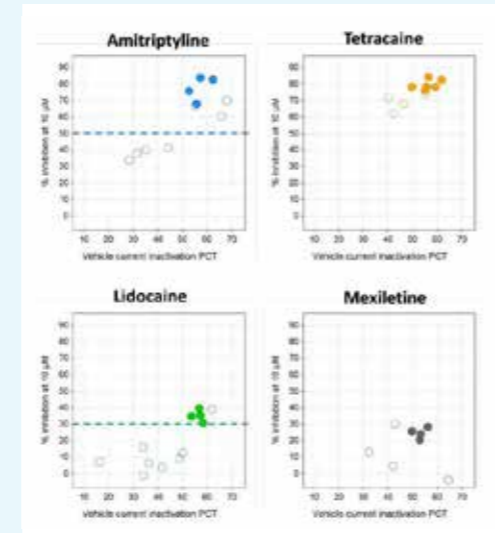
Online parameter quality control and R_s compensation

No data loss if Boltzmann fit is poor

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 for each cell's biophysical properties. Optimize voltage clamp protocols individually for each cell's electrical 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 X% of the receptor population or the voltage that keeps X% of the cells in an inactivated state.



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

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/current clamp recordings in the same sweep

Adaptive current clamp to obtain individual resting membrane potential and I_{rtheo}

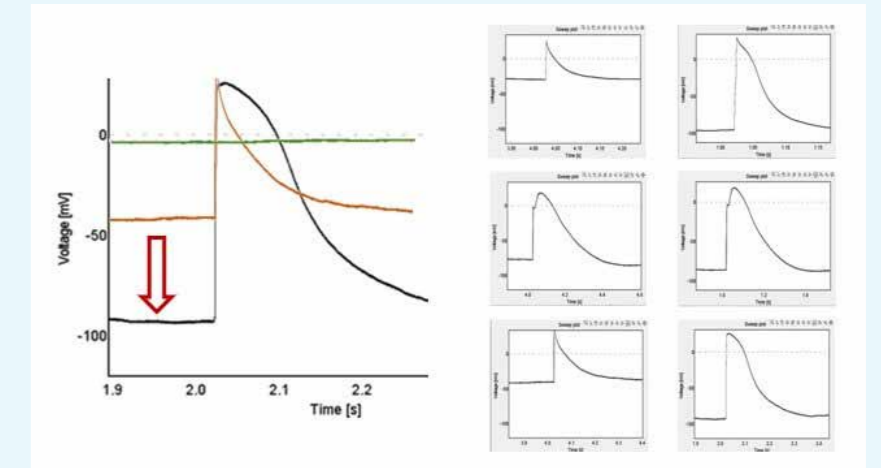
Adaptive current clamp is a unique feature of Sophion amplifiers. The main challenge with current clamp on automated patch clamp platforms is the variation in sealing and resting membrane potential from cell to cell. This makes it impossible to design one current clamp protocol to work on all cells. 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 – or choose to set the holding potential manually.

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 automated 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-based - the original data is protected so no one can change it

Sophion Thor® - store, exchange and share data in the cloud

You can access your data from anywhere using the internet

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

Easy to use, with intuitive pre-made forms to help you focus on core task



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' that can happen using open well technology

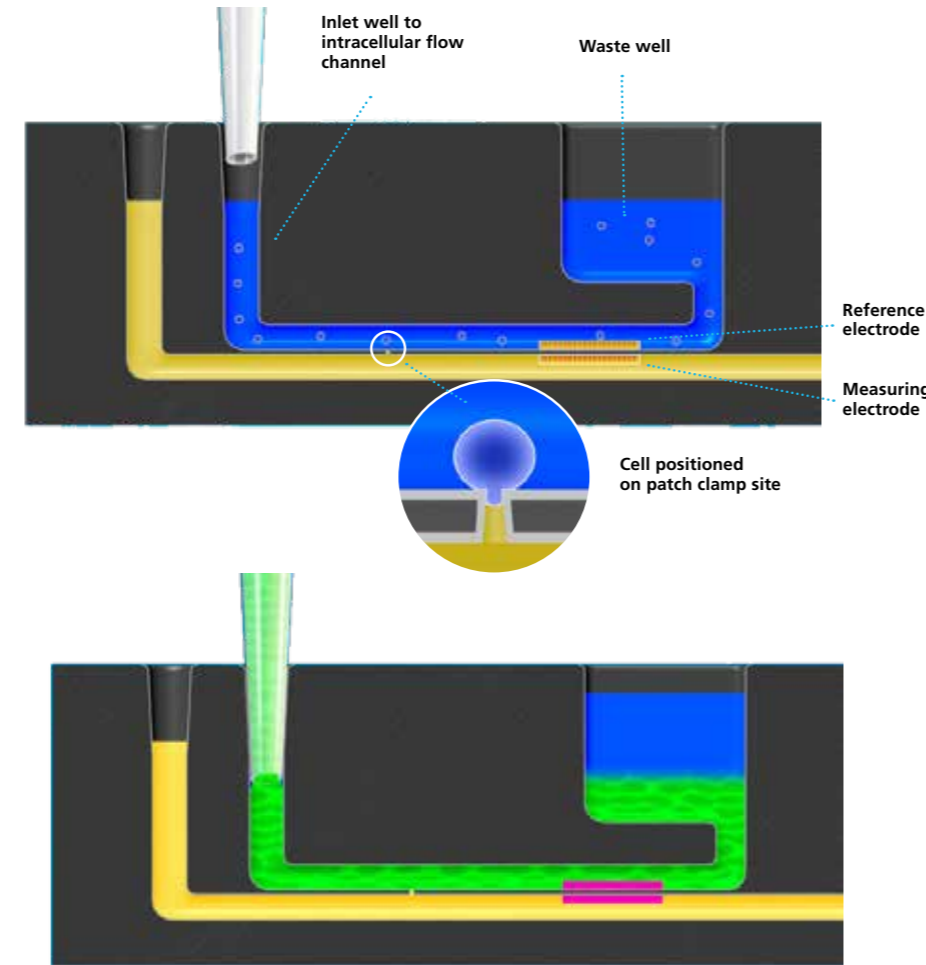
1 or 10 holes, each with 2 M Ω resistance is standard. Smaller and larger resistances as well as other number of holes are available

Less cell-consumption due to low volume in the QChip, only 4 μ L per site

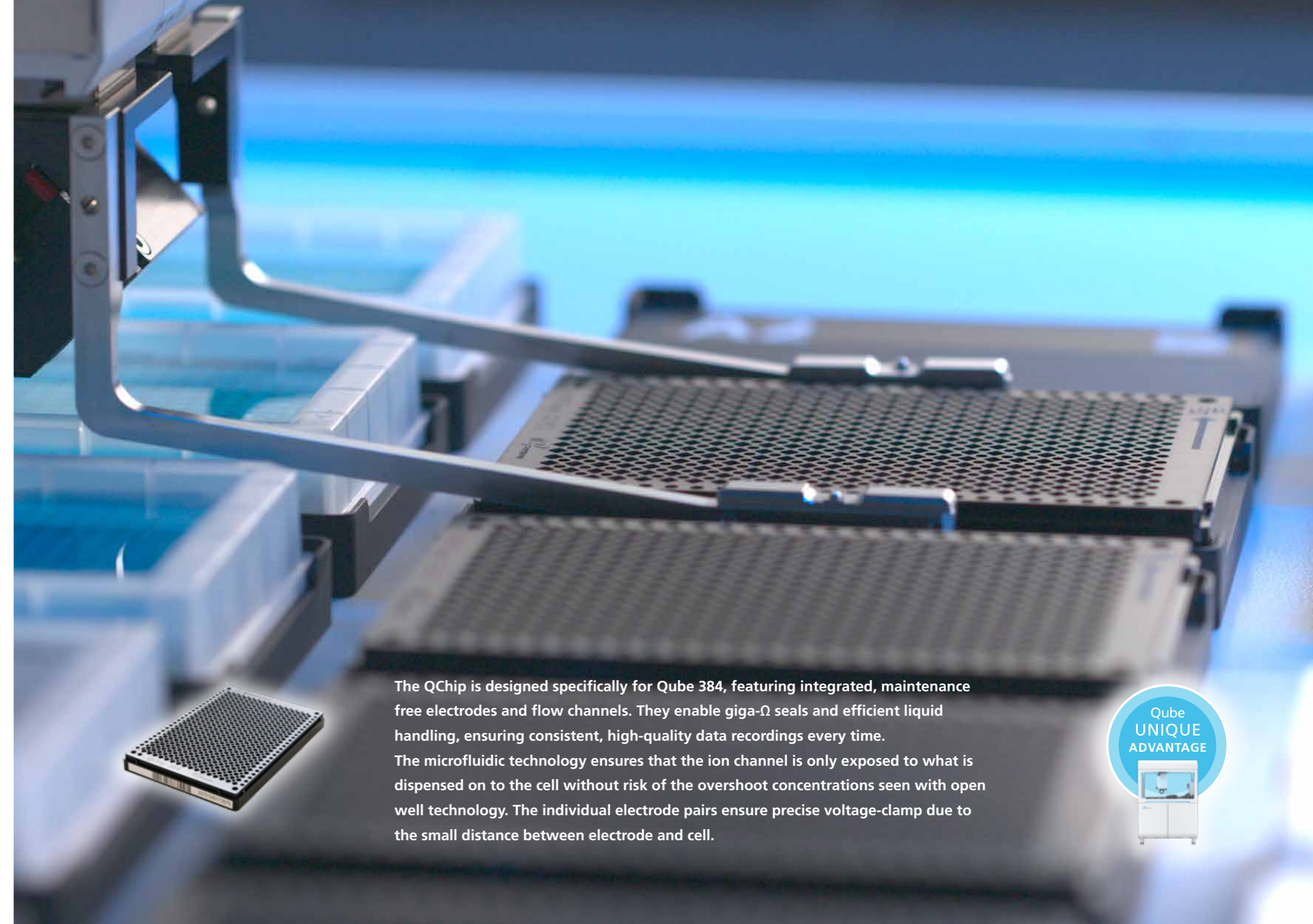
Non-drifting recording ensured by the 384 embedded and maintenance free electrode pairs

Partial QChip use

Voltage-gated, ligand-gated, light-gated, mechano-gated and current clamp recordings can be combined



Micrfluidic flow channels ensure 100% complete liquid exchange



The QChip is designed specifically for Qube 384, featuring integrated, maintenance free electrodes and flow channels. They enable giga- Ω seals and efficient liquid handling, ensuring consistent, high-quality data recordings every time. The microfluidic technology ensures that the ion channel is only exposed to what is dispensed on to the cell 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.



Temperature control unit is standard

Extremely accurate and consistent temperature regulation

Extremely accurate temperature regulation

Higher repeatability and reproducibility

Perform experiments at controlled physiological temperatures

With the temperature control, 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 $\pm 0.5^\circ\text{C}$. 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.



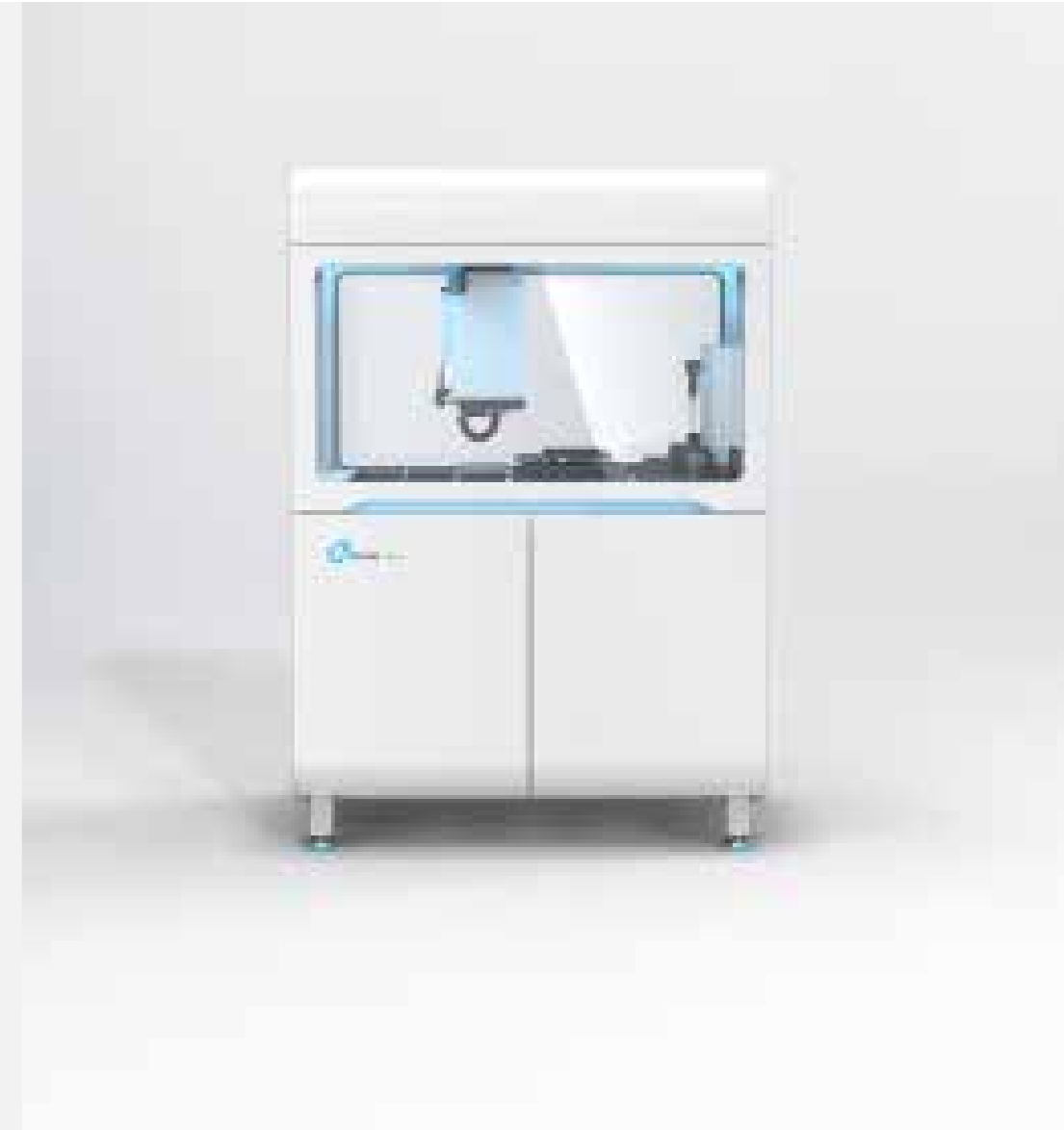
Range	10 - 42°C
Accuracy	$\pm 0.5^\circ\text{C}$
Temperature variation across plate	$\pm 0.2^\circ\text{C}$ (10 - 30°C) $\pm 0.4^\circ\text{C}$ (42°C)
Temperature variation over time	$\pm 0.1^\circ\text{C}$
Instrument-to-instrument variation	$\pm 0.25^\circ\text{C}$



Qube 384 specifications

Qube 384 specifications

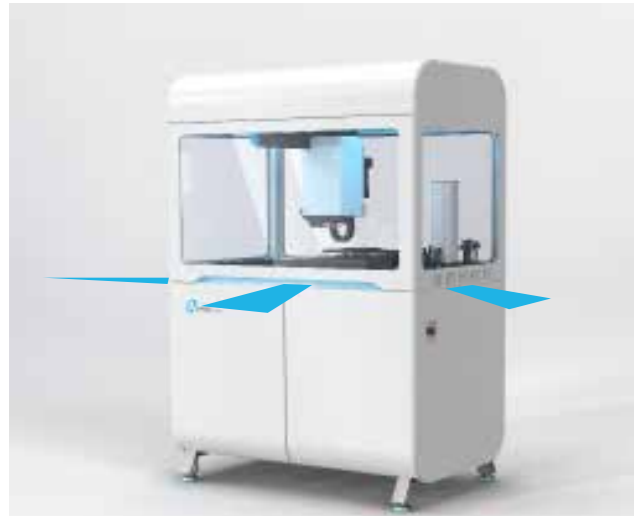
Average whole-cell stability	>30 min.
Successful whole-cell recordings	Up to 95%
Throughput	20,000 data points/day
Seal resistance	>1 G
Series resistance	<10 M
Perfusion time constant	3 M
Minimum exposure time	<50 ms
Liquid handling robot	Integrated
Amplifier channels	384
Number of Pipettes	384
Temperature control	10 - 37 C
Current clamp	Standard
Voltage clamp	Standard



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 camera monitoring and documenting tests



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

No static charge
De-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 de-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



Very orderly arrangement of all components make service easier and quicker - to provide you with less down time.

Intuitive lighting assists the operator on a daily basis



Integrated status light to see if Qube is running or has unexpectedly stopped. The communication with light can be software controlled and there is also working light to assist in circumstances of dim ambient light.

The answer to all your patch clamping is in the Q



QPatch Compact
Semi-automated

Designed for tailored ion channel research and education.



QPatch 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

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