CloneSelect Imager
CloneSelect Imager FL

High-speed fluorescence and white light imaging, intelligent data analysis, and monoclonality report generation
A label-free imaging solution for the assurance of monoclonality and automated confluence across diverse cell types

CloneSelect® Imager estimates cell confluence and cell number.
- Automatically scans every well in every plate
- Generates growth curves for each well
- Enables viewing and tracking of every well in every plate
- Reveals additional information on cellular morphology and an understanding of growth characteristics

Conventional technique: subjective, time-consuming
Inconsistent results: cannot determine whole well confluence — well after well

CloneSelect Imager: objective, automatic
Quantitative, whole well cell confluence for every well

Key benefits
- Assess cell confluence objectively and quantitatively
- Streamline workflow: image, analyze, report
- Image every well anytime to track colony formation and verify monoclonality
- Validation IQ/OQ services enable compliance
Streamlined workflow

1 Image

Seed one cell per well and image at any point.

- **Optimize clonal outgrowth**—The system is particularly useful for optimizing clonal outgrowth strategies when platform approaches are not suitable, e.g. when investigating new cell lines or variants
- **Diverse cell types**—Compatible with adherent or settled suspension cell types such as CHO, HEK, hybridomas, iPSCs, and many other cell types

“CloneSelect Imager has become an essential system for verification of monoclonality within our cell line development workflow.”

—Dr. Howard Clarke, Senior Staff Scientist in Process Development, CMC ICOS Biologics Inc., USA
2 Analyze

Track colony growth over time.

- Fluorescence applications

Well selection

Cell distribution is highlighted by software overlay

Cell confluence & cell number estimation for each well displayed

Repeated over several days

Growth curves calculated and displayed

Electronically track and store plate data: cell confluence, cell number estimation, and growth curve

View every growth curve in every well
Assess cell growth objectively and quantitatively

Rapid determination of the growth of cell lines is important for a number of processes, such as optimization of cell culture conditions and verification of monoclonality. However, conventional techniques are time-consuming, subjective, and may risk interference with cell growth: Tracking cell growth in 96-well plates is challenging and labor-intensive.

Produce consistent results – in less time

Save time and produce objective, quantitative, and consistent results by using the CloneSelect Imager to overcome the challenges associated with conventional techniques.

- Growth rates accurately determined in every well of a single-well or multi-well plate
- Cell confluence and cell number estimation displayed for each well
- Growth curves calculated and displayed

Fluorescence applications with the CloneSelect Imager FL

Perform comparative confluence assays (red vs green) to identify and verify CRISPR edits.
**Optimize cell culture conditions**

CloneSelect Imager has been used to rapidly screen culture variables to identify optimal culture conditions for low density or clonal outgrowth.

![Base-case – Day 7 data](image)

Additional information gained on cellular morphology and understanding of growth characteristics.

- Identify multiple nucleation points versus “edge only” growth
- Identify sub-optimal environmental conditions or “edge-effects”

**Assess cell viability**

Replace cumbersome colorimetric MTT assays with a non-invasive technique that enables monitoring over time.*

- Compare growth rates and colony size increase/decrease well to well
- Track changes in cell density in response to various cellular manipulations or treatments to calculate dose response curves and IC₅₀
- Screen one microplate within three minutes
- Label-free detection, no staining required. Avoid costly colorimetric kits

*Accurate non-invasive image-based cytotoxicity assays for cultured cells, Marques-Gallego et al., BMC Biotechnology 2010, 10:43
Report
Make confident, image-driven decisions throughout plate history

Verify monoclonality

After initial seeding, CloneSelect Imager can image every well, at any time point, using a ‘loci of growth’ functionality to highlight those wells that contain a single colony.

- Focus on wells with a single loci of growth and view image history to verify monoclonality with the CloneSelect Imager using white light
- Automatically verify monoclonality from day zero with fluorescense on the CloneSelect Imager FL

![Image showing the progression of colony development from Day 0 to Day 11.](image)

Day 0
Day 3
Day 9
Day 11

White light
Fluorescence

Yes!
View image history of colony development
Is colony monoclonal?

Demonstrated IND success

With a few simple clicks, the Monoclonality Report feature on the CloneSelect Imager objectively organizes the supporting image evidence needed to establish clonality into an easily shareable report, saving researchers hours typically required to do the same process manually. The Monoclonality Report is an audit-ready document that supports filing for an Investigational New Drug (IND) Application with the FDA (21 CFR Part 312).

- Easily identify and select single-cell and artifact regions to include in report
- Export high-resolution images of single cells, artifacts, and entire well (optional)
- Automatically identify single cells with the CloneSelect Imager FL on day zero
- Publish Monoclonality Report in PDF or Word format

Example pages from the Monoclonality Report
The reporting feature automatically generates the following data in a presentable format

Monitor cell line development over time
To characterize the growth from a single cell to a colony, cell regions can be designated and adjusted for each time point in a series.

Monoclonal

A single cell on Day 0 and two cells on Day 1 confirm monoclonality.

Not Monoclonal

Two cells are visible on Day 0, confirming that the cell line is not monoclonal.

Not Monoclonal

Four cells have developed on Day 1, confirming that the cell line is not monoclonal.

View entire well at final time point
Quickly determine clonality of a cell line by visually inspecting the presence of multiple colonies in a single well.

Monoclonal

Wells captured on Day 10. The well on the left shows one colony while the well on the right shows two colonies.
Divide an entire well into individual images

Export an entire well into 81 separate images to objectively confirm the absence of another cell.

An image of a well is divided into regions, and a selected region is displayed over time.

Highlight regions to review non-cell objects

Selectively highlight parts of a well to differentiate cells from ambiguous objects.

A selected artifact region and its corresponding images over time is shown here.

“Maximize success rate for serum-free colony outgrowth in chemically-defined media by prior optimization of growth conditions.”

—Ben Hughes, Senior Bioprocess Engineer, NCRIS Biologics Facility, Australian Institute for Bioengineering & Nanotechnology (AIBN), University of Queensland
Accelerate cell line development with a range of Molecular Devices platforms

**ClonePix 2 Mammlian Colony Picker**

Automatically screen more clones in less time than conventional techniques, select cells with optimal expression levels, and pick colonies with accuracy with the ClonePix™ 2 System. ClonePix systems are now used in over 100 laboratories around the world to increase workflow productivity, leaving more time to better characterize target proteins and run new projects.

**QPix 400 Series Microbial Colony Picker**

The QPix™ 400 series of microbial colony pickers offer you the unique option to simultaneously detect colonies and quantify fluorescent markers in a prescreening step before picking. QPix systems are used worldwide in over 600 installations in research institutes, biotech, and pharmaceutical companies. QPix robotics developed a famous reputation for reliability and accuracy in sequencing centers during the Human Genome project.

**SpectraMax i3x Multi-Mode Microplate Reader**

The SpectraMax® i3x Multi-Mode Microplate Reader measures spectral-based absorbance, fluorescence, and luminescence with the added functionality of modular upgrades for western blot, imaging, and fast kinetics with injectors.

Automate with robotic solutions

Electronic data tracking ensures control of high-throughput processes

**CloneSelect Imager integrated with robotics from Beckman Coulter**

Photo courtesy of Beckman Coulter Corp., shows first generation CloneSelect Imager

**Process up to 75 lidded plates in a single run**

automate-it scara robot is recommended and supplied through Molecular Devices – optimized for CloneSelect Imager
Unrivalled solutions based on exceptional imaging and intelligent image analysis

Our products offer scientists unrivaled solutions that utilize imaging and intelligent image analysis to support basic research, pharmaceutical, and biotherapeutic development. The systems continue to establish industry standards in areas such as picking microbial colonies for genomic studies or screening, and selection of mammalian cell lines. Other systems use imaging platforms to monitor cell growth, evaluate cellular responses, and quantify protein production. Through our expertise in robotics, cell and molecular biology, image analysis and interpretation, and supported by a strong IP portfolio, we are committed to the continual development of innovative solutions for life science applications.

### CloneSelect Imager specifications

<table>
<thead>
<tr>
<th>Imaging</th>
<th>CloneSelect Imager</th>
<th>CloneSelect Imager FL</th>
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</thead>
<tbody>
<tr>
<td><strong>Software</strong></td>
<td>Software dedicated imaging software preinstalled on a high specification PC, Microsoft Windows 10</td>
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</tr>
<tr>
<td><strong>Light source</strong></td>
<td>White light imaging, trans-illumination Source: Xenon flash lamp (5 Watts)</td>
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</tr>
<tr>
<td></td>
<td>Fluorescence: No fluorescence</td>
<td>Multichannel fluorescence (GFP/RFP) Source: AURAIII light engine (LED)</td>
</tr>
<tr>
<td><strong>Camera</strong></td>
<td>High-resolution CMOS camera</td>
<td>High-resolution CMOS camera</td>
</tr>
<tr>
<td><strong>Imaging speed</strong></td>
<td>96-well microplate: 90 sec</td>
<td>White light: 96-well/ 384 well microplate: &lt;2 min</td>
</tr>
<tr>
<td></td>
<td>Fluorescence: 96-well/ 384 well microplate: &lt;8 min</td>
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<tr>
<td><strong>Objective</strong></td>
<td>4X</td>
<td>4X</td>
</tr>
<tr>
<td><strong>Resolution</strong></td>
<td>Standard: 3.6 micron</td>
<td>High resolution: 1.8 micron</td>
</tr>
<tr>
<td></td>
<td>Standard: 3.6 micron</td>
<td>Standard: 3.6 micron</td>
</tr>
</tbody>
</table>

**Instrumentation**

<table>
<thead>
<tr>
<th>Source plate type</th>
<th>Range of 6-, 12-, 24-, 96-well SBS microplates</th>
<th>Range of 96, 384-well SBS microplates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source plate capacity</td>
<td>1 x plates</td>
<td>1 x plates</td>
</tr>
<tr>
<td>Instrument dimensions</td>
<td>45.4 cm (17.9 in) x 574 cm (22.6 in) x 72.4 cm (28.5 in)</td>
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</tr>
<tr>
<td></td>
<td>External light source: 16.3 cm (6.4 in) x 12.5 cm (4.9 in) x 26.3 cm (10.8 in)</td>
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</tr>
<tr>
<td>Instrument weight</td>
<td>45 kg (99 lbs)</td>
<td>45 kg (99 lbs)</td>
</tr>
<tr>
<td></td>
<td>External light source is an additional 3.6 kg (8 lbs)</td>
<td></td>
</tr>
</tbody>
</table>

**Regulatory approval**

<table>
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<tr>
<th>Compliance</th>
<th>CE</th>
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**Automation compatibility**

API suite available for robotic integration. Please contact us for details.