



ImageXpress HCS.ai Advanced Duo

High-Content Screening System

High-throughput imaging with dual-camera acquisition and intelligent analysis to accelerate screening from image to insight.

Accelerate the path from image to insight.

The ImageXpress® HCS.ai Advanced Duo High-Content Screening System brings rapid dual-channel fluorescence acquisition, high-contrast TL Plus transmitted light imaging, intelligent image analysis, and screen-level evaluation together in a connected workflow built for demanding cell-based screening.

From image acquisition through analysis and evaluation, the ImageXpress HCS.ai Advanced Duo system helps screening teams capture complementary views of cellular biology, navigate complex data, identify meaningful biological responses, and prioritize what warrants further investigation.

Key capabilities



Simultaneous dual-channel acquisition

Capture two compatible fluorescent channels in parallel with dual high-sensitivity sCMOS cameras to reduce acquisition time across multiple experiments.



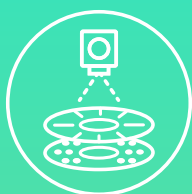
AI-enabled image analysis

Transform complex images into quantitative biological measurements with advanced image and data analysis, analysis, machine learning, and AI-enabled tools in IN Carta® Image Analysis Software.



Screen-level evaluation

Explore and interpret large screening datasets with IN Screen Software, powered by Genedata Screener®, to identify meaningful responses and prioritize what moves forward.



Flexible high-content imaging

Move between widefield, spinning disk confocal, and deep-tissue imaging to support diverse assays across 2D and complex 3D biology.



Enhanced transmitted light imaging

Combine high-intensity transmitted light imaging with fluorescence to visualize unstained cells and cellular structures across a broader range of high-content applications.



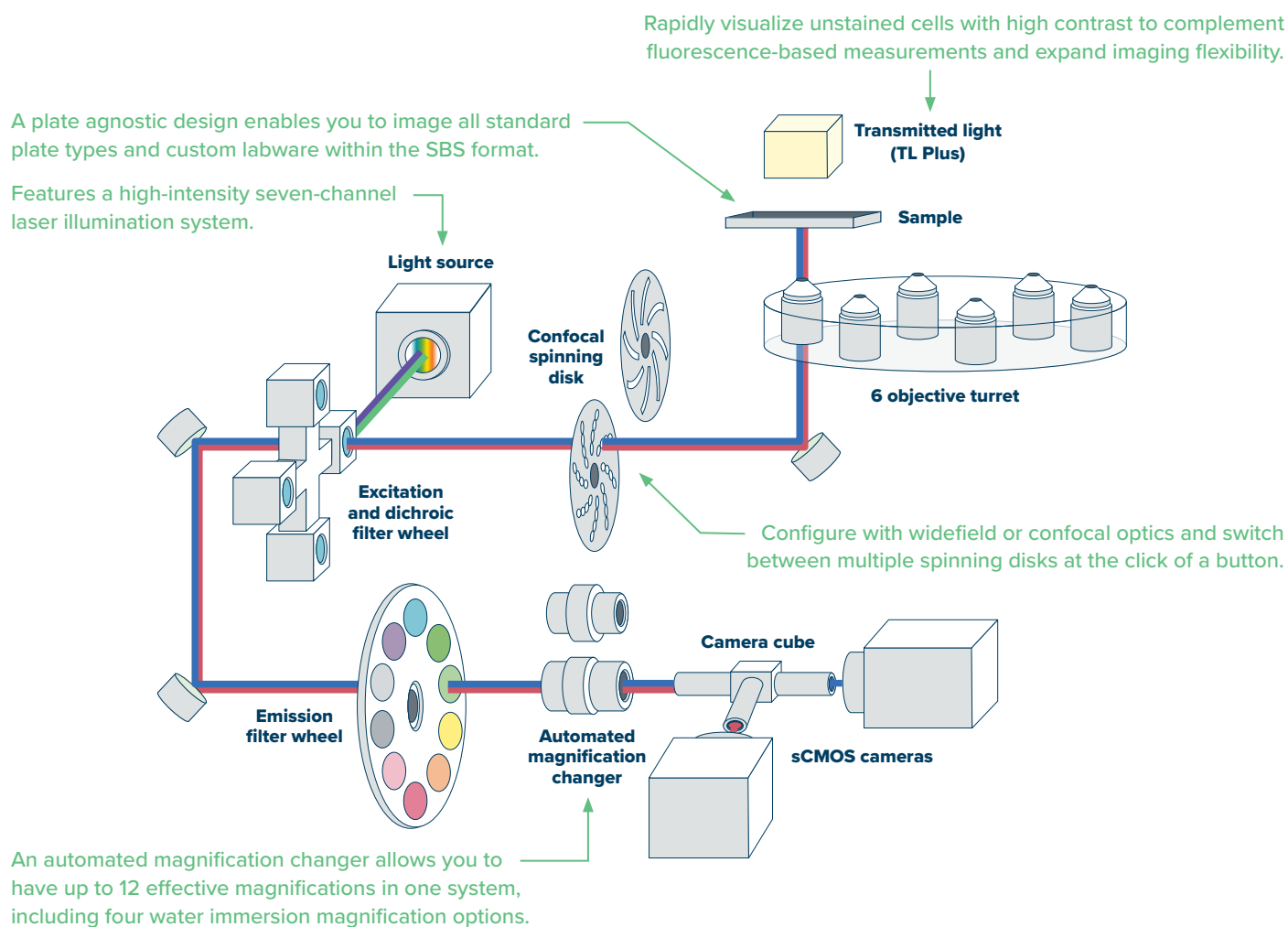
Automation-ready workflows

Integrate imaging into automated laboratory environments to support high-throughput screening and reduce manual intervention.

Acquire more. Wait less.

Dual high-sensitivity sCMOS cameras enable simultaneous acquisition of two compatible fluorescent channels. By capturing compatible channels in parallel rather than sequentially, the ImageXpress HCS.ai Advanced Duo system helps reduce acquisition time across demanding multiwell experiments.

TL Plus transmitted light imaging adds high-contrast visualization of unstained cells, complementing fluorescence imaging with an additional view of cellular biology. Fast autofocus, widefield and spinning disk confocal imaging, and high-sensitivity detection further support the speed and flexibility required for complex screening workflows.



Performance you can put to work

Up to 50% higher imaging throughput

Achieve 13–50% higher imaging throughput across tested workflows, including complex 3D confocal assays.

Over 50% reduction in brightfield acquisition time

Reduce brightfield acquisition time by more than 50% with TL Plus illumination.

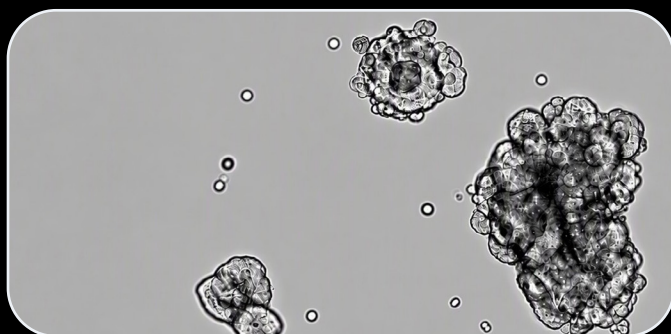
Image a 96-well multiparameter plate in under 3 minutes

Acquire six parameters across a 96-well plate in under three minutes for applications such as Cell Painting.

Performance results are based on specified imaging configurations and acquisition conditions. Actual performance may vary depending on assay and imaging parameters.

Capture the biology your screen demands.

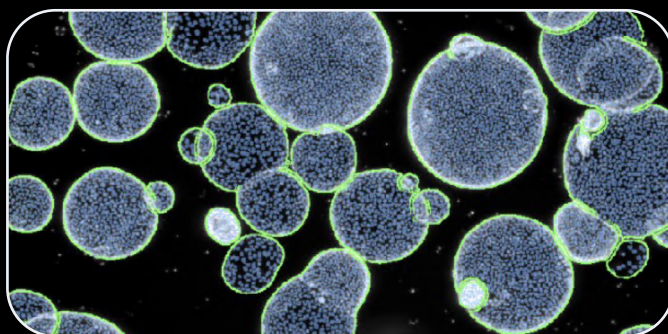
The ImageXpress HCS.ai Advanced Duo system combines flexible widefield and spinning disk confocal imaging with high-sensitivity detection to support demanding cell-based assays across both 2D and 3D models. From rapid screening of large sample populations to imaging deeper into complex biological structures, researchers can select the imaging approach appropriate for the assay without losing sight of throughput.



Enhanced brightfield imaging

Capture detailed images of unstained cells and cellular structures with TL Plus high-intensity transmitted light imaging. Visualize cellular morphology and 3D biological models with enhanced contrast and shorter exposure times, supporting efficient acquisition and downstream image analysis.

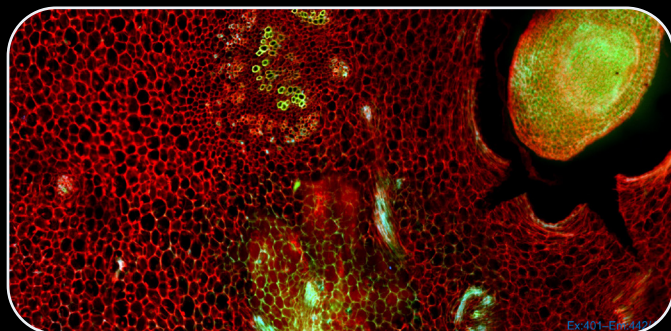
Image: Colorectal cancer organoids imaged at 10x magnification using a 60 μ m spinning disk confocal



Spinning disk confocal

Reveal fine detail with precise optical sectioning. Reduce out-of-focus fluorescence for crisp, high-contrast images and detailed Z-stacks of complex biological samples.

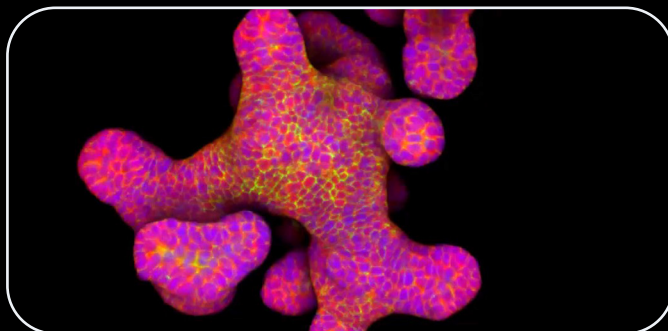
Image: Nuclei in Organoid Segmentation in IN Carta Image Analysis software



Deep-tissue imaging

Extend imaging deeper into thick biological samples. Capture fluorescence at greater depths within spheroids, organoids, and other thick samples to investigate biology beyond the surface.

Image: Lilium (lily) ovary, cross-section



High-sensitivity sCMOS detection

Capture subtle fluorescence with confidence. Efficiently detect low-intensity signals and preserve biological differences for robust quantitative imaging and downstream analysis.

Image: Mouse intestinal organoids

Turn every image into a path forward.

A seamless software workflow extends high-content imaging from acquisition through analysis and screen-level evaluation, helping screening teams turn complex imaging data into meaningful biological results and determine what moves forward.

1

ACQUIRE

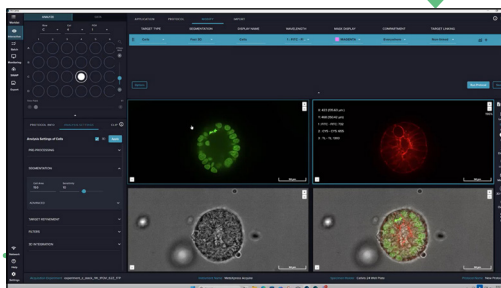
Capture high-content data efficiently



MetaXpress® Acquire High-Content Image Acquisition Software

provides a flexible, intuitive environment for designing and executing imaging experiments of any complexity with the ImageXpress HCS.ai Advanced Duo system.

IN Carta Image Analysis software applies advanced image analysis, machine learning, and AI-enabled tools to segment, characterize, and quantify complex cellular phenotypes.



ANALYZE

Transform images into biological measurements

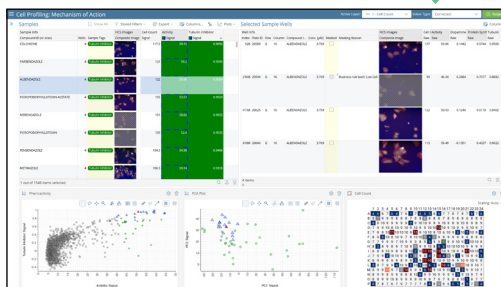
2

EVALUATE
Understand results across the screen



IN Screen software extends analysis from individual cellular measurements to screen-level insights, helping teams explore, compare, and interpret results across large screening datasets.

Bring imaging and analytical results together to identify meaningful biological responses and inform further investigation.



PRIORITIZE

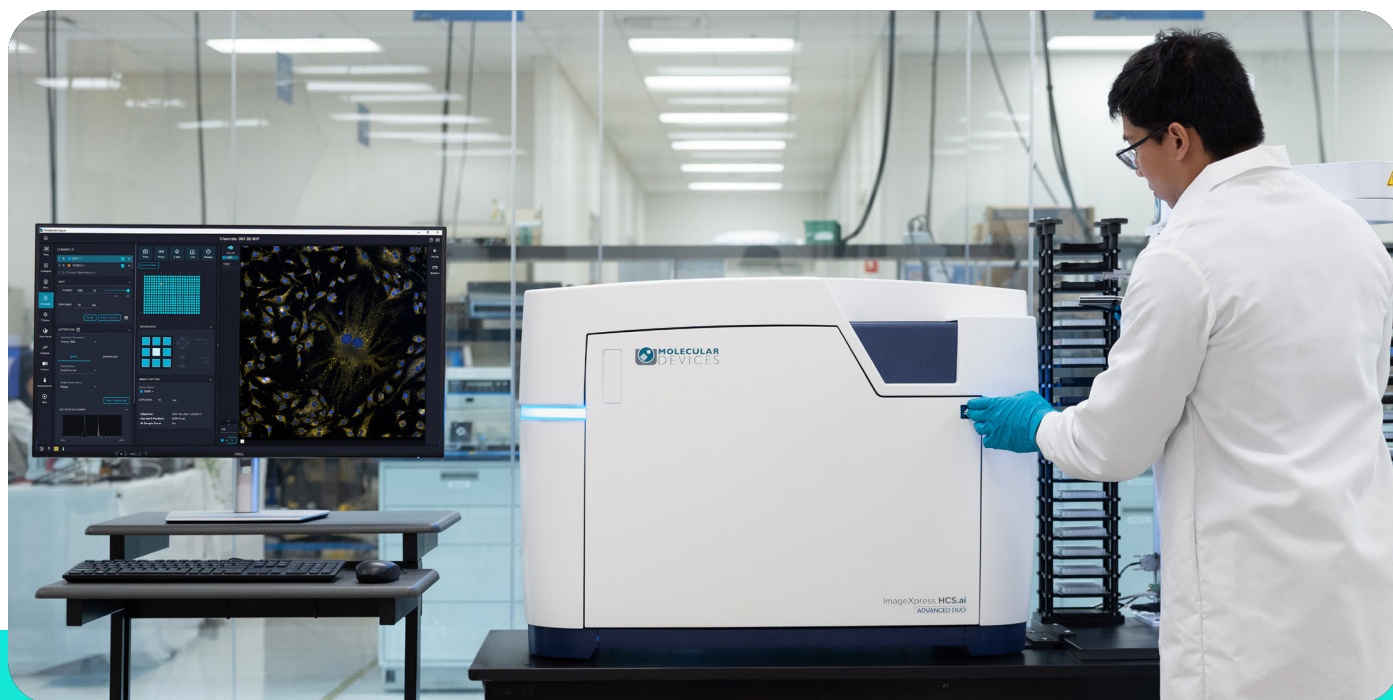
Focus on what warrants attention next

4



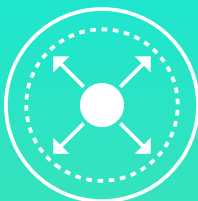
Extend high-content imaging into automated screening workflows designed to increase throughput and reduce manual intervention.

The ImageXpress HCS.ai Advanced Duo system can integrate with automated plate handling and broader laboratory automation to keep samples moving efficiently through fluorescence and transmitted light imaging workflows.



Walk away from routine plate handling

Automate plate loading and imaging to keep screening moving with less operator intervention.



Scale around your workflow

Expand from automated plate handling to integrated workcells as screening requirements evolve.

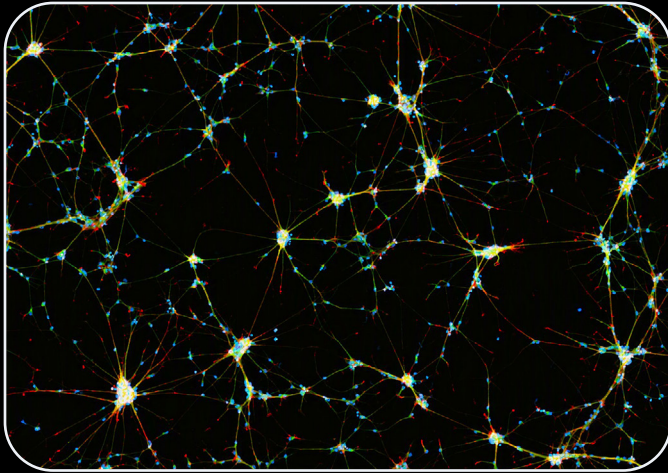


Drive greater consistency

Standardize repetitive workflow steps to support reliable operation across large screening runs.

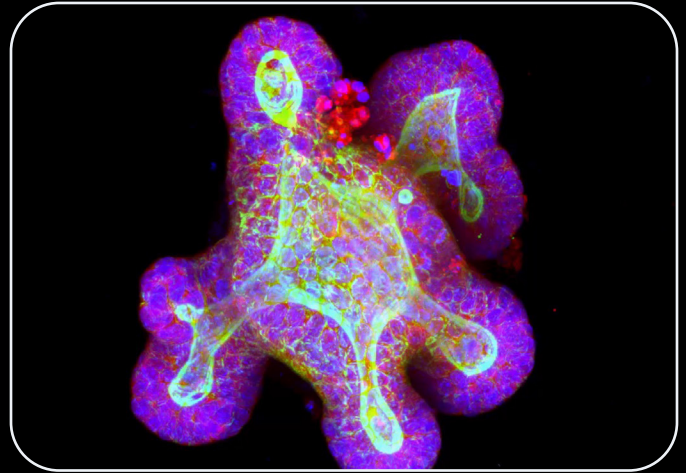
One platform.

Many ways to interrogate biology.



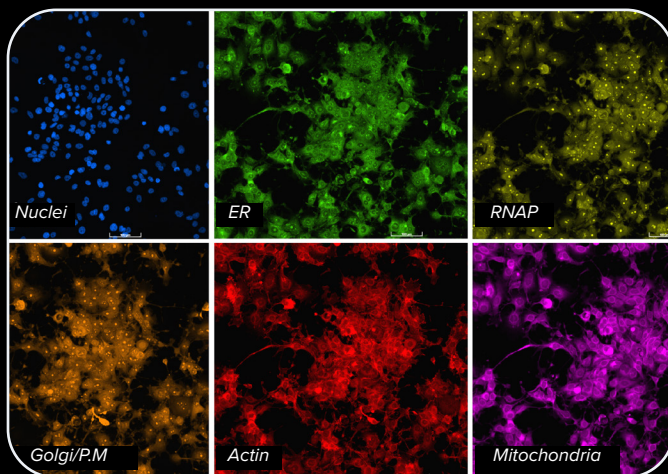
Phenotypic screening

Capture multidimensional cellular responses using fluorescence and high-contrast transmitted light imaging. Combine morphological, intensity, localization, and other cellular measurements to characterize biological responses across experimental conditions.



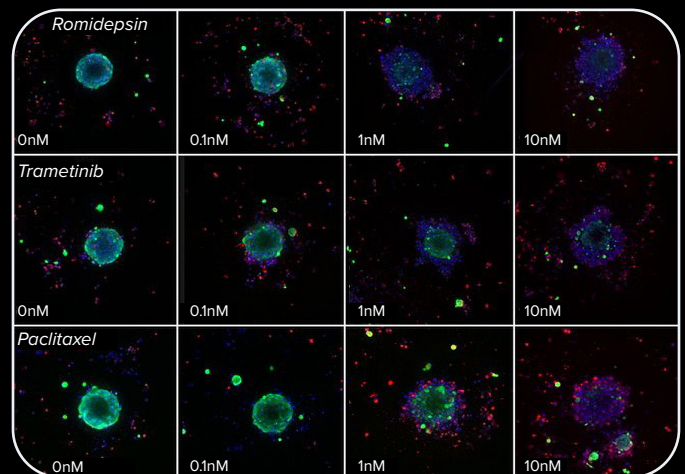
3D biology

Investigate spheroids, organoids, and other three-dimensional systems. Capture cellular and structural information across depth to characterize biologically relevant responses.



Cell painting

Acquire multiparametric cellular information across multiple fluorescent channels for high-dimensional phenotypic profiling and rich morphological characterization.



Compound screening

Generate quantitative cellular measurements across compounds, concentrations, and conditions to characterize biological response and help identify candidates for further investigation.

Specifications

ImageXpress HCS.ai Advanced Duo system

Focus	- High-speed hardware autofocus with multi-surface detection - Integrated image autofocus option
Cameras (2)	- Two camera configuration >5 mega pixel sCMOS sensor with large sensor size (224mm²) >3 log dynamic range with 16-bit detector, 95% peak quantum efficiency
Stage	Linear encoded voice coil driven X, Y, and Z stages with better than 25 nm resolution
Filters	4-position software selectable excitation and dichroic filter wheel 10-position software selectable emission filter wheel
Transmitted light (TL Plus)	High-contrast transmitted light imaging for enhanced visualization of unstained cells and improved distinction between cells and background
Objectives	6-position automated objective changer - High NA air objectives: 2X–60X (up to 0.9 NA) - Extra long working distance objectives 20X–60X (up to 0.7 NA)
Sample compatibility	Standard microplates (1–1536 wells), round or flat bottom, low to high profile, slide holder

Options

Magnification changer (optional)	1X (standard) and 1.5X modifies objective capability: to provide 2X–90X magnification - Automated switching with software control
Water immersion (optional)	20X, 40X, 60X objectives available (up to 1.2 NA) - Increase signal up to four times for brighter intensity at lower exposure times - Increase in penetration depths dependent on sample - Improve z-resolution and decrease optical aberrations - Auto water replenishment enables screening or imaging across a plate
Environmental control (optional)	- Multi-day, live cell time-lapse imaging - Controls for appropriate atmospheric conditions - Temperature: heating up to 40°C - Integrated gas mixer: CO₂ (0–15%), O₂ (1–21%) - Controls humidity and minimizes evaporation (0.5 µL/well/hour for 96- or 384-well formats) - Robot-friendly loading design

Acquisition

Digital Confocal	2D real-time deconvolution technology
Quick ID Targeted Acquisition	Use 2–step acquisitions to identify and selectively image objects of interest
MetaXpress Developer	Utilize journal macro capability for advanced customization
Output data format	16-bit TIFF image files format with folder-based storage management

MetaXpress Acquire software

Image analysis

SINAP	- Deep-learning segmentation analysis tool - Train custom AI models to segment biological structures of interest, with nine pretrained models available - Link segmentation in 3D to perform volumetric analyses
Phenoglyphs™	- Machine learning object classification - Leverage hundreds of measurements to classify identified objects for phenotypic analysis
Custom Module Editor	Analysis toolbox with wide variety of functions to build analyses for 2D and 3D assays
3D Viewer	Visualize 3D datasets and analysis masks with an immersive viewing tool
Image transformation application	Run image processing from MetaXpress Acquire Software, including shading, correction, Z-projection, and montage

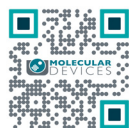
IN Carta software

Data analytics

Dose-response analysis	Curve fitting; IC ₅₀ /EC ₅₀ calculations; potency and efficacy analysis
Quality control	Z' factor calculations; plate heatmaps; outlier detection
Hit selection	Multi-parameter filtering; automated hit calling; candidate prioritization
Interactive data exploration	Linked visualizations; image review; dynamic data filtering
Data integration	Unified analysis of imaging, screening, and annotation data
Visualization & reporting	Publication-ready plots; dashboards; automated report generation

IN Screen software

Note: all options, filters, and objectives are available at point of sale or as after market upgrades. Configurations shown herein do not encompass all configurations available. Contact your sales and support team today to identify the system configuration most suitable for your applications.



Learn more about the ImageXpress HCS.ai Advanced Duo system.
moleculardevices.com/imageexpress-hcs-ai

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