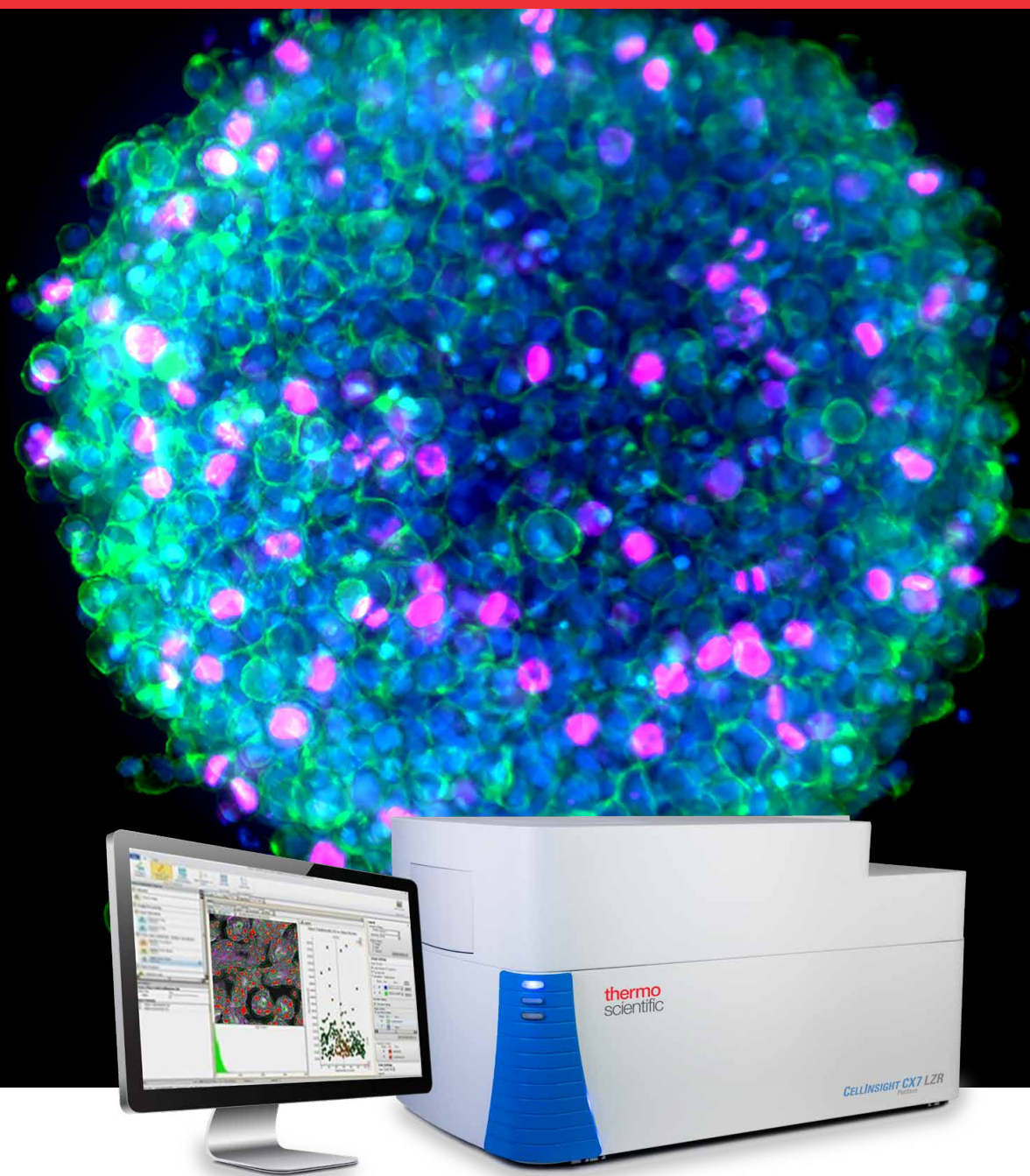# Lightning-fast discoveries powered by high-content screening

CellInsight CX5, CX7 LED, and CX7 LZR
High-Content Screening Platforms

Thermo Fisher
S C I E N T I F I C

Quantifiably brilliant data

High-content screening (analysis) was invented by and registered as a trademark of Cellomics, which is now part of Thermo Fisher Scientific. Since the introduction of Thermo Scientific™ ArrayScan™ high-content screening (HCS) readers in 1998, over 2,000 peer-reviewed Cellomics publications attest to a legacy of innovation and scientific excellence of the Thermo Scientific™ CellInsight™ CX5, CX7 LED, and CX7 LZR HCS platforms and Thermo Scientific™ HCS Studio™ software.

Our HCS instruments combine fluorescence imaging, image processing, automated cellular measurements using our cutting-edge algorithms, and informatics tools to extract quantitative data from cell populations. This powerful technology has enabled fundamental discoveries in basic research and advancements in drug-compound discovery.
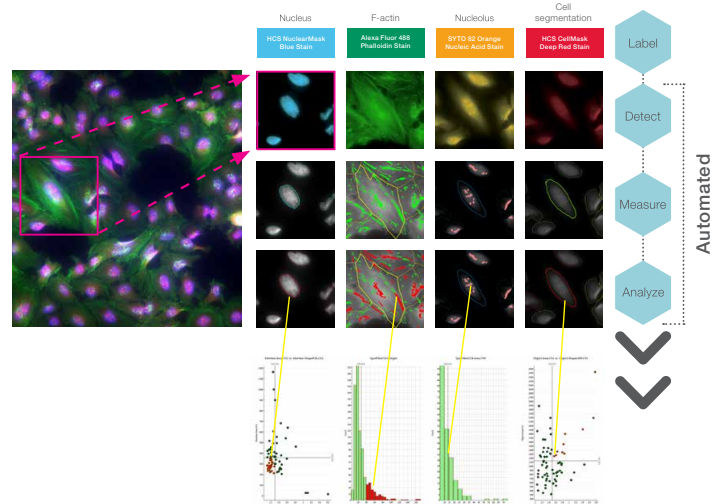
Automated imaging and quantification of multiple targets.

- On-the-fly phenotyping—parallel image capture and analysis for on-the-fly population calculation of specific cell phenotypes in real time.

- The CellInsight CX7 LZR platform comes with 7–laser based excitation (multiplexable-expandable with near-IR (785 nm) laser excitation) that can provide deep-tissue penetration for thicker samples like spheroids, tumors, and 3D cell culture samples to give better-quality images than LED illumination–based instruments.

- Cell-level cutouts for quality control measures— HCS Studio software provides cell-level cutouts that can be used to perform quality control by backtracking the data to each individual cell/event, thus excluding the artifacts in data and performing single-cell analyses.

- HCS Studio software comes with the Z-prime assay performer, allowing users to identify their top-performing assays in terms of signal/noise or background.

- For high-end customers who require excellent images along with good data, images/videos obtained from HCS Studio software can be run through Thermo Scientific™ Amira™ 3D Analysis Software for cutting-edge biologies, including 3D neuroscience morphology and immuno-oncology colocalization analysis.

- Numerous affordable biological assays are available, and new assays can be developed using HCS Studio software.

- Live-cell imaging—the Thermo Scientific™ Onstage Incubator allows precise control of temperature, humidity, and CO_2 levels so that you can observe and measure biological activity and changes over time. Also, N_2 gas regulation can generate physiological as well as nonphysiological incubation conditions, allowing hypoxia-based experiments to be performed on live cells.

Find out more at **thermofisher.com/hcs**

CellInsight CX7 LZR HCS Platform

Enhanced speed and analytical sensitivity for superior performance

The CellInsight CX7 LZR HCS Platform delivers superior performance for the diverse combinations of experiments and cell types that are emerging in cell-based assays.

- Perform confocal or 3D imaging with extremely bright illumination to penetrate thick samples.

- Dual Mode Autofocusing Software and Laser Autofocus modes allow for the broadest sample types.

- Speed up acquisition of images with short exposure times and laser autofocus capabilities.

- The best image quality—ore light that illuminates the field evenly makes image quality appropriate for quantitation.

- Laser-based illumination—seven lasers aligned with common dyes for the best performance in speed and image quality.

- Expand your multiplexing with near-IR (785 nm) laser excitation.

- Reduce photobleaching and phototoxicity by controlling the amount of light reaching the sample for live-cell imaging and analysis.

- Objective range from 2x to 60x with numerical apertures of up to 0.9.

- Expand your capabilities with optional onstage incubation and robotic plate-handling devices.

- Use the world-class HCS Studio software to build and screen your cell-based assays.

- Broad fluorophore choice for easy multiplexing.

- Compatible with glass slides and multiwell plates (6–1,536 wells), including emerging plates for 3D spheroid biology such as U-bottom, hanging droplet, and microfluidic plates.

- With multiple pinhole-size patterns, confocal imaging is optimized for both thin and thick samples.

- Decrease your confocal scan times by >50% by pairing high–numerical aperture (NA) objectives and laser illumination.

- Calorimetric absorbance, widefield capabilities, and 7-color laser excitation are perfect for high-throughput cell-level phenotyping for capturing more information from each cell as you label additional targets.
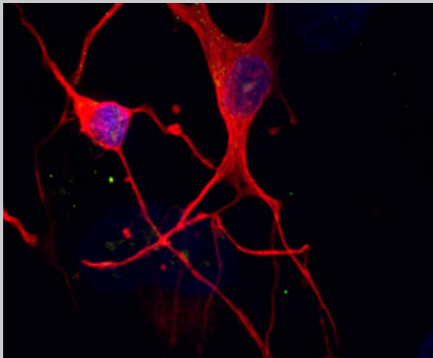
Confocal immunofluorescent imaging of human neuronal samples using the CellInsight CX7 LZR instrument. Neurons were fluorescently stained with both DAPI and MAP2 (560 nm) to counterstain the nucleus and cell body/neurites, respectively. The samples were then imaged using the CellInsight CX7 LZR instrument with 60x magnification and 40 μm confocal pinhole diameter.
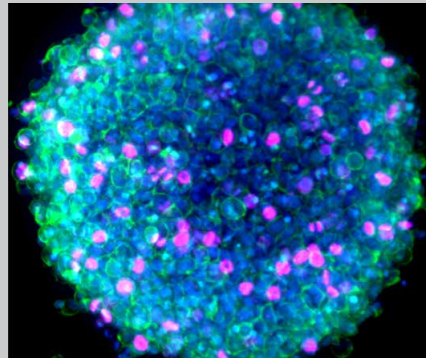
HeLa spheroids labeled with Ki67 antibody followed by Invitrogen™ Alexa Fluor™ 647 and Alexa Fluor™ 488 phalloidin and Hoechst 34580 stains for nuclei. Imaging was done on the CellInsight CX7 LZR instrument using a 10x objective. The image is a maximum-intensity projection of 200 Z sections at 1 μm each.
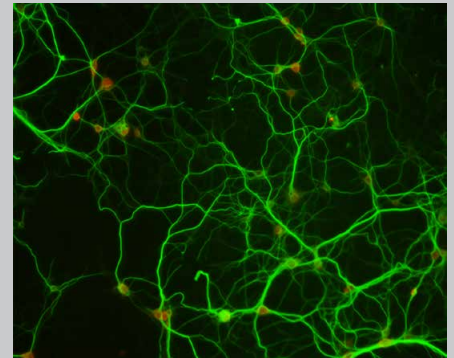
Rat primary cortical neurons labeled with neuronal dendritic marker MAP2 antibody, neuronal cell body marker, Hu C/D followed by Alexa Fluor 488 and Alexa Fluor 647 antibodies respectively and Hoechst 33420 dye. Imaging was done on the CellInsight CX7 LZR instrument using a 20x objective.

Find out more at **thermofisher.com/cx7lzr**

CellInsight CX7 LED HCS platform

The CellInsight CX7 LED HCS Platform provides a choice of imaging modes to extract the information you need from your samples. Both well by well and channel by channel, you can select the right modes to read your sample—with the resolution and dynamic range that results from the high performance of the optical train and sensitive camera.
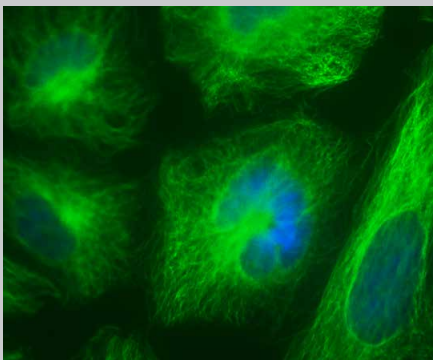
Confocal
- High-speed (10,000 RPM) CrEST™ spinning-disk confocal technology with 40 µm or 70 µm multiple pinhole sizes is built into the optical path to provide high-resolution, multicolor confocal imaging with thick samples.

- To enable sensitive confocal imaging and make more detailed measurements using the near-IR channel, the LED light engine is upgraded by laser diode illumination at 747 nm.

- With multiple pinhole-size patterns, confocal imaging is optimized for both thin and thick samples.

Widefield
- When confocal imaging mode is not required, the widefield imaging mode occupies the same light path as the confocal imaging mode because they share the same 7-color LED light.

- The 7-color light engine reduces switching times and intensity fluctuations to reduce scan times and boost quantitative performance.

- The CX7 LED light has been optimized for live-cell experiments.

Brightfield
- Using an LED array for RGB and amber illumination, you can make colorimetric absorbance measurements of your histology samples with classic stains like H&E.

- Multiplex your colorimetric absorbance data with fluorescence measurements, offering more possibilities for verification and correlation.

HeLa cells labeled with tubulin antibody followed by Invitrogen™ Alexa Fluor™ Plus 488 antibody and Hoechst 34580 staining. Imaging was performed on the CellInsight CX7 LED instrument using a 60x objective and confocal mode.
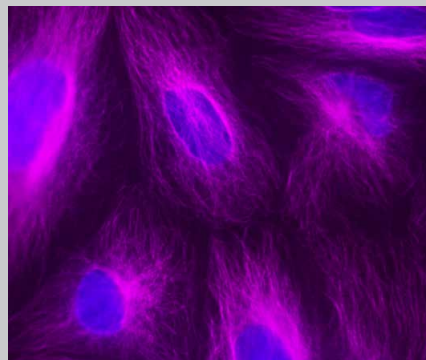
HeLa cells labeled with tubulin antibody followed by Invitrogen™ Alexa Fluor™ Plus 647 antibody and Hoechst 34580 staining. Imaging was performed on the CellInsight CX7 LED instrument using a 60x objective and confocal mode.
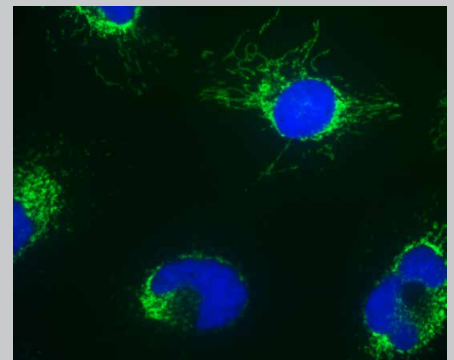
HeLa cells labeled with ATP synthase V antibody followed by Alexa Fluor Plus 488 antibody and Hoechst 34580 staining. Imaging was performed on the CellInsight CX7 LED instrument using a 60x objective and confocal mode.

Find out more at **thermofisher.com/cx7led**

CellInsight CX5 HCS Platform

The CellInsight CX5 High-Content Screening (HCS) Platform is small in size but massive in its power, offering automated quantitative cell analysis for every cell biology or screening lab. Transform your cell-based research by analyzing single cells in up to 5 fluorescent colors. With proprietary autofocus and integrated plate-scanning intelligence methods, the CellInsight CX5 HCS Platform brings speed and accuracy to investigate cell populations and phenotypes without sacrificing sensitivity and resolution.

Brightfield capabilities

- Designed to work with or without fluorescent labeling, the CellInsight CX5 instrument utilizes transmitted light, allowing you to explore more cell biology without the restriction of fluorescent dyes.

Scalable cell biology

- The CellInsight CX5 instrument addresses the problem of scale with a continuum of solutions depending on your lab's needs. It's compatible with slides all the way through 1,536-well microplates.

- The platform connects directly to the Thermo Scientific™ Orbitor™ RS Microplate Mover to increase processing capacity up to 80 plates. With included application programming interfaces (APIs), the CellInsight CX5 system can be integrated into any third-party automation platform.

The CellInsight CX5 HCS Platform can be equipped for automated high-throughput screening using the Orbitor RS plate handler. HCS Studio software can directly operate the Orbitor instrument, eliminating the need for third-party software.

Automation with Cytomat incubators offer easy integration and ease of use

Thermo Scientific™ Cytomat™ incubators have internal database-driven inventory management and device grouping. Discover the most advanced, intelligent incubators with market-leading flexibility. Cytomat Incubators, along with Orbitor RS plate, provide a complete solution to the automated, high-throughput analysis. Also, on-stage incubators (OSIs) provide solution to the live-cell imaging.

- Faster response through reduced data transfer.

- Plug-and-play functionality for super fast integration.

- Device-grouping for easy capacity ramp up.

- Simple, cost-effective upgrade for existing incubators.

Mixed brightfield-widefield imaging of *Caenorhabditis elegans in vivo* samples using the CellInsight CX5 instrument. Samples were imaged using the CellInsight CX5 instrument with 4x magnification and both brightfield and 488 fluorescent imaging modes while incubated at 37°C and 5% CO_2 within the optional CX5 Onstage Incubator.
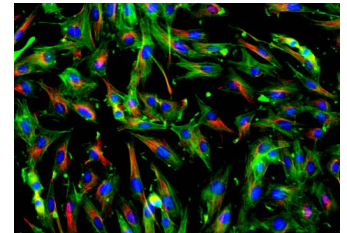
Widefield immunofluorescent imaging of HEK293 cells using the CellInsight CX5 instrument. Cells were fluorescently stained with Hoechst 33342, Actin 488, and Invitrogen™ MitoTracker™ Red dyes. The multiplexed samples were then imaged using the CellInsight CX5 instrument with 20x magnification.

The Thermo Scientific™ Cytomat™ automated incubators are an ideal solution for automation and high-throughput needs. Cytomat incubators are complimentary to the Orbitor RS plate handler and can be used with CX5, CX7 LED, and CX7 LZR instruments.

Find out more at **thermofisher.com/cx5**

HCS Studio cell analysis software

Intuitive interface and intelligent design

Scientists can study their HCS data at the individual cell-, field-, or well-level to determine the most sensitive cell phenotypes.

- On-the-fly real-time analysis, enabling fast results, simultaneous image acquisition, and data analyses.

- Icon-based guidance assists users in selecting specific assays easily and quickly.

- Fully customizable for experienced users, where experienced users can create their own assays.

- Features all of the validated Cellomics bioapplications, including Neuronal Profiling, Morphology Explorer, Spot Detector, Compartmental Analysis, and Colocalization, for assay development and screening.

High-content screening

- Go from image collection to tabulated results and population statistics—and backtrack each event/cell to perform analysis at the single-cell level.

- All the cellular features being reported in charts or tables are available for viewing at the touch of a button, so your data are grounded in an understanding of the biology and context.
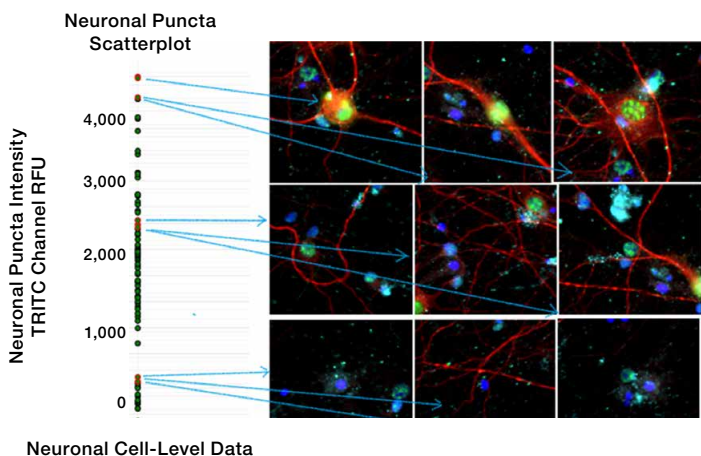
Cell-level data are seamlessly linked to the corresponding images within HCS Studio software, providing scientists with the ultimate quality control that biological measurements are indeed occurring in their samples.

Assay performance

- HCS Studio software helps you be confident of robust assay performance. Rank your assay parameters based on Z-prime before starting a screen, and then adjust your stop criteria to collect only the data you need for statistical significance.

- Allows you to ensure that you are capturing the top-performing assays with your HCS platform.

Rapid Z-prime tool to measure assay performance.

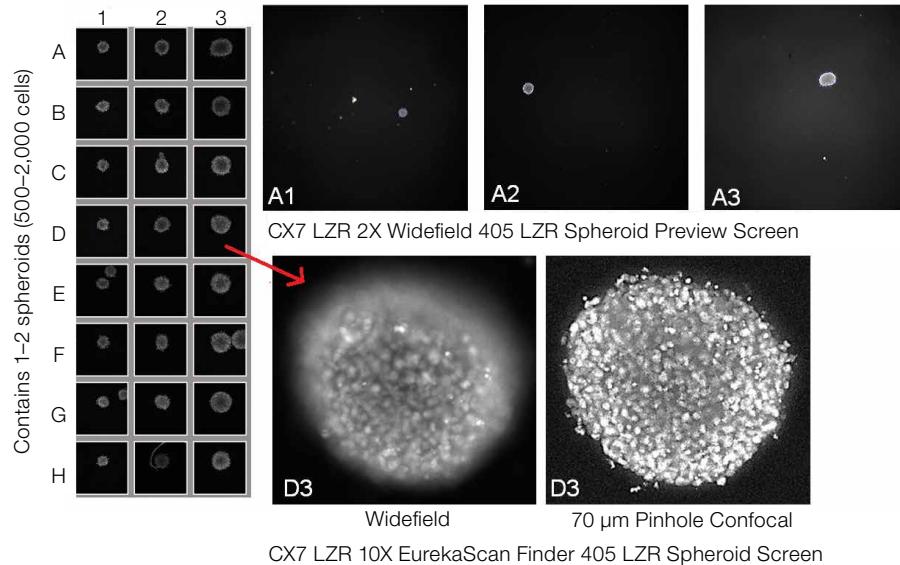Find out more at **thermofisher.com/hcsstudio**

3D (2D–5D) visualization and analyses with Amira software

- Perform 2D–5D visualization and analysis using Amira-FEI software. Amira software can be used for supporting researchers in the most frequently used image-analysis techniques, such as filament tracing and editing, DTI analysis, brain perfusion analysis, and object tracking.

- With incredible speed and flexibility, Amira software supports advanced 2D–5D bioimaging workflows in research areas ranging from structural and cellular biology to tissue imaging, neuroscience, preclinical imaging, and bioengineering.

Find out more at **thermofisher.com/amira-avizo**

HCS Studio software: EurekaScan Finder

Introducing Thermo Scientific™ EurekaScan™ Finder "seek-and-find" functionality in HCS Studio software

CX7 LZR 2X Widefield 405 LZR Spheroid Preview Screen

CX7 LZR 10X EurekaScan Finder 405 LZR Spheroid Screen

Example of low to high magnification of spheroids using HCS Studio software with the EurekaScan Finder. EurekaScan Finder example of human IPS spheroids depicts time and memory efficiencies when using the low-magnification to high-magnification seek-and-find functionality. IPS spheroids were fluorescently labeled with DAPI nuclear counterstain and then screened on the CellInsight CX7 LZR platform with either a 2X to 10X EurekaScan Finder screen or 10X screen alone. During the 10X screen, both widefield and 70 µm pinhole confocal images were acquired using the 405 LZR excitation. EurekaScan Finder utilization produced a 9.3-fold improvement in screening time compared to 10X screen alone. Additional efficiencies were captured when evaluating the file size of the two screens, with EurekaScan Finder using 25-fold improvement in memory usage to complete the screen. Data provided from Dr. Chi Yun at New York University.

Features and benefits of EurekaScan Finder:

- EurekaScan Finder is a new seek-and-find feature for the CellInsight CX7 LED and LZR HCS platforms aimed at automating the identification and subsequent capture of irregularly seeded biological samples at progressively higher magnifications.

- With EurekaScan Finder applied, specimens including spheroids and tissues may be identified during "seek" operations at low magnification and once "found," efficiently scanned at higher magnifications for optimal resolution.

- EurekaScan Finder was designed to enable multiple pass scans, such as identifying samples at low magnification across large surface areas, capturing samples at intermediate magnification, and evaluating for rare events or improved resolution at higher magnifications.

- By applying EurekaScan Finder, efficiencies in total scan times and corresponding file memory consumption are accomplished compared to non–EurekaScan Finder, high-magnification scans.

- Moreover, object identification and validation parameters are applied in real time during EurekaScan Finder operation, so scientists have confidence that the samples being adaptively examined are relevant to their research.

- EurekaScan Finder can also handle more than two passes for those scenarios that could benefit from three or more passes, such as identifying non-sparse fields at low magnification, or finding rare events at higher magnification and then evaluating them at the same or higher magnification.
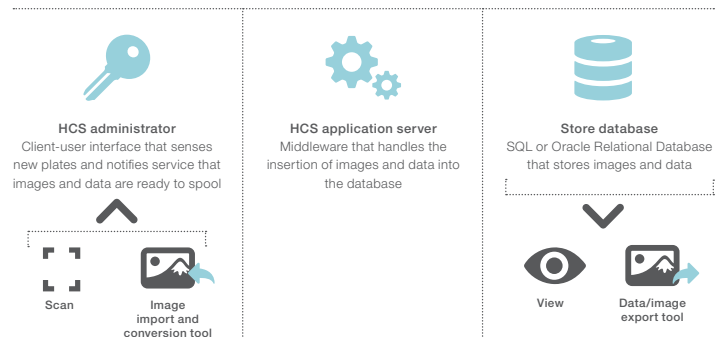
Find out more at **thermofisher.com/hcsstudio**

HCS data storage and accessories

Image storage and database management software

Every Thermo Scientific HCS platform is configured with a base version of Store Image and Database Management Software. With 10 GB of storage, Store software helps ensure the security of your data, allowing you to be productive from your first day of use. Although it is not a scalable solution, you always have the option to upgrade to the full version of this software as your requirements change.

With this software, you can import, convert, and spool images from any platform or client running HCS Studio software. Share data and images across your organization for a fully collaborative work environment.

HCS administrator
Client-user interface that senses new plates and notifies service that images and data are ready to spool

HCS application server
Middleware that handles the insertion of images and data into the database

Store database
SQL or Oracle Relational Database that stores images and data

Scan

Image import and conversion tool

View

Data/image export tool
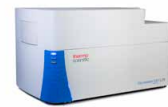
Which HCS system is right for you?

Compact screening system to scale up your throughput

Designed for everyone, with maximum versatility from confocal to live-cell research
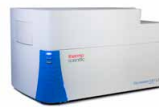
Designed to address emerging HCS assays, requiring laser-based confocal screening

	CellInsight CX5 platform	CellInsight CX7 LED platform	CellInsight CX7 LZR platform
Illumination	5 channels	7 channels	7 channels
Camera	Photometrics High-Resolution Fluorescent Camera		
Widefield	5 channels	7-color high-output LED	7-color laser excitation
Brightfield	White	4 specific LED plus white light for higher-contrast imaging	
Confocal	NA	Spinning disk 40 µm/70 µm	
Objectives	Single position, 2x–60x	3-position turret, 2x–60x	3-position turret, 2x–60x; additional options available
Focus	Software	Laser and software	Laser and software
Live-cell imaging	Optional HCS Onstage Incubator with kinetic scheduling of acquisition		
Software	HCS Studio Cell Analysis Software; optional client software available		
Database	Store Image and Database Management Software included; scalable SQL or Oracle database options available		

Ordering information

Product	Cat. No.
CellInsight CX5 + Store + 2-Year Protection + SmartStart Orientation	A46121
CellInsight CX7 LED + 2-Year Protection + SmartStart Orientation	A46144
CellInsight CX7 LED + Store + 2-Year Protection + SmartStart Orientation	A46145
CellInsight CX7 LZR + 2-Year Protection + SmartStart Orientation	A46119
CellInsight CX7 LZR + Store + 2-Year Protection + SmartStart Orientation	A46120

Find out more at **thermofisher.com/hcs**

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