invitrogen™
by life technologies™

eliminate the guesswork

visualize and analyze cells right at your bench

Tali™ Image-Based Cytometer

life technologies™

Versatile, convenient, and accurate

- Versatile—generate visual and analytical data on GFP/RFP expression, apoptosis, and cell viability
- Convenient—set up and analyze cells in minutes right at your bench, with minimal cleaning and maintenance
- Accurate—obtain statistically significant three-parameter population analysis

The Tali™ Image-Based Cytometer is a 3-channel benchtop imaging platform that performs quick, quantitative analysis of GFP/RFP expression, apoptosis, cell viability, and much more—right at your bench. Where researchers once relied on "eyeballing" the data, the Tali™ Image-Based Cytometer now gives precise and accurate statistical information about fluorescence expression within a population of suspension cells.

Using only 25 µL of sample volume, the Tali™ Image-Based Cytometer performs a typical cell population analysis in about 45 seconds. The Tali™ cytometer contains bright-field, red fluorescence, and green fluorescence channels, enabling researchers to simultaneously count green- and/or red-fluorescent stained cells, as well as cells expressing GFP and RFP. The Tali™ cytometer displays fluorescence data for the population in histograms, which can be adjusted (gated) to collect the fluorescence of interest. Both the raw cell-by-cell data and simple reports can then be exported for archiving and sample comparisons.

The Tali™ Image-Based Cytometer is ideal for:

- Rapid analysis of GFP/RFP vector transfection efficiency
- Identification of GFP- and/or RFP-positive cells (Figure 1)
- Simple two-color apoptosis assays using annexin V and PI (Figure 2)
- Accurate population analysis of cell viability
- Quick verification of samples before sorting or high-end flow cytometry analysis

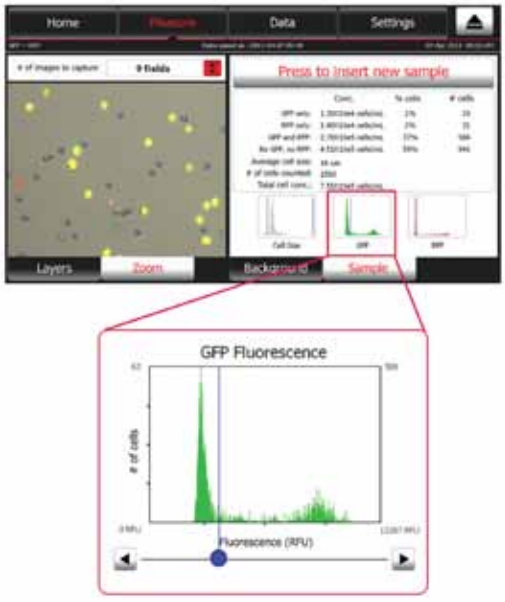


Figure 1. Simultaneous analysis of GFP- and RFP-expressing cells. The Tali™ Image-Based Cytometer displays green and red fluorescence channels, enabling simultaneous quantitation of green and red fluorescence from proteins and stains. The Tali™ cytometer also provides actual cell counts and automatically calculates cell concentration for each cell population.

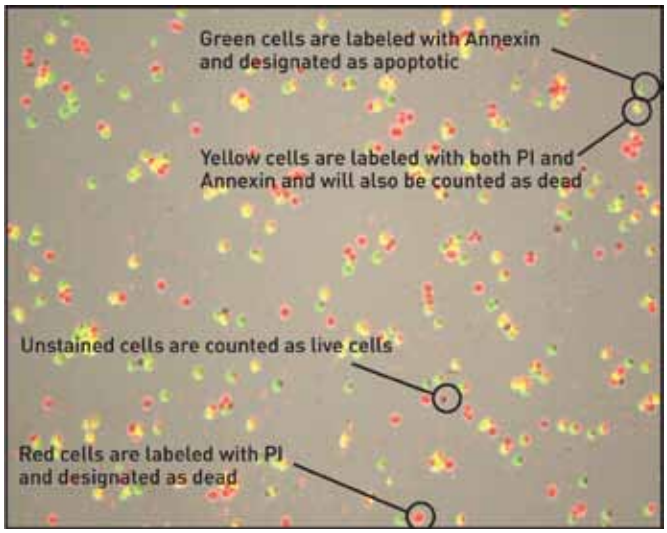


Figure 2. The Tali™ Apoptosis Assay. The Tali™ Apoptosis Assay uses an annexin V–Alexa Fluor® 488 conjugate and propidium iodide to assess cell viability and health. Results indicate whether each cell is live (unstained), dead (yellow and red), or apoptotic (green).

What type of research assays can be run on the Tali™ Image-Based Cytometer?

The Tali™ Image-Based Cytometer incorporates cell counting and fluorescence detection algorithms to perform the following research assays for cells in suspension:

GFP/RFP analysis

The Tali™ Image-Based Cytometer determines the relative GFP/RFP fluorescence in a sample of cells expressing green or red fluorescence, as well as any unstained or nonfluorescent cells. The GFP/RFP assay menu also includes combined GFP/RFP and viability assays. Use the Tali™ Viability Kit – Dead Cell Red (A10786) with cells expressing green-fluorescent proteins; use the Tali™ Viability Kit – Dead Cell Green (A10787) with cells expressing red-fluorescent proteins (Figure 3).

Apoptosis

The Tali™ Image-Based Cytometer distinguishes between apoptotic, dead, and live cell populations using the Tali™ Apoptosis Kit – Annexin V–Alexa Fluor® 488 and propidium iodide (PI) (A10788), counts the cells in each population, and calculates the relative amount of each population in the sample (Figure 4).

Viability

The Tali™ Image-Based Cytometer determines the number and proportion of viable and dead cells using the Tali™ Viability Kit – Dead Cell Red (A10786), which stains dead cells red.

Quick count

The Tali™ Image-Based Cytometer provides quick and accurate cell counts, without the need for staining your cells. The cytometer also determines the cell concentration of your sample and the average cell size.

While we have developed—and support—these particular assays for use on the Tali™ Image-Based Cytometer, any fluorescent dye or protein that can be detected with the green (FITC, Alexa Fluor® 488, GFP, etc.) or red (RFP, PI, etc.) fluorescence channels can also be analyzed on the Tali™ Image-Based Cytometer. Individual dyes can be checked for spectral overlap with adjacent channels, using our online SpectraViewer tool (www.invitrogen.com/spectraviewer).

Figure 3. Population analysis of GFP- and RFP-expressing cells. The Tali™ Image-Based Cytometer GFP+RFP display is shown after measuring U2OS cells transduced with CellLight® Nucleus-GFP and CellLight® Plasma Membrane-RFP. Representative images of cell fluorescence are shown on the left side of the screen, while quantitative population data (%GFP positive, %RFP positive, %GFP and RFP positive, and %GFP and RFP negative) are shown on the right of the screen.

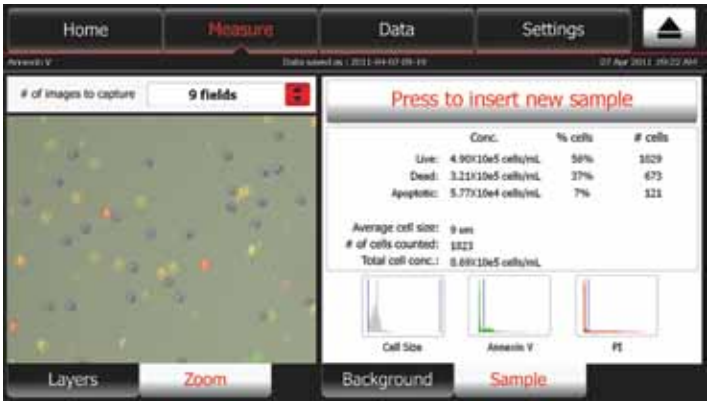


Figure 4. Apoptosis analysis using annexin–Alexa Fluor® 488 and propidium iodide. The Tali™ Image-Based Cytometer apoptosis display is shown after measuring Jurkat cells stained with the Tali™ Apoptosis Assay Kit. Representative images of cell fluorescence are shown on the left side of the screen, while quantitative population data (% live, dead, and apoptotic) are shown on the right of the screen.

How does the Tali™ Image-Based Cytometer work?

The Tali™ Image-Based Cytometer scans the Tali™ Cellular Analysis Slide, collecting bright-field and fluorescence images from up to 20 different fields of view (each containing approximately 5,000 cells for a 1 x 10^6 cells/mL sample). Using a highly sensitive camera and a sophisticated image-processing and analysis algorithm, the Tali™ cytometer is able to capture the faintest signals in a quantitative manner and displays the relevant data (e.g., cell count vs. cell size, cell count vs. fluorescence) in tables and histograms.

While sharing the same basic workflow and user interface, all Tali™ assays differ in the fluorescence channels being collected and analyzed by the internal algorithm. The number of fields to be collected (4, 9, 13, 18, or 20) can be selected by the user prior to each run on the touch screen interface. In each field of view, the Tali™ cytometer captures a combination of bright-field and fluorescence images, designed specifically for the assay selected. After capturing all fields of view, the instrument uses sophisticated digital image analysis algorithms to calculate the total cell population and determine the fluorescence characteristics of those cells on a cell-by-cell basis. The algorithm in the Tali™ cytometer is expressly designed to distinguish single cells from clumps and to determine the number of cells within a clump based on the area of the clump (up to 60 µm in diameter) and the average cell size in the population being measured. The ability of the Tali™ cytometer to accurately determine the number of cells within a clump is unique to this image-based system.

Relevant data (e.g.,cell count vs. cell size, cell count vs. fluorescence) are displayed in both table and histogram formats, allowing users to: select specific fields of view for review; zoom in on selected fields of view; display channel-specific layers (i.e., images captured in bright-field, green fluorescence, and red fluorescence channels or a combination of the three channels); and gate on cell counts by cell size and/or fluorescence intensity (where applicable). Analysis data, including the image files, can be downloaded to a USB flash drive any time after an assay has been run, and transferred to a computer for sample comparisons or additional analysis.

Is the Tali™ Image-Based Cytometer easy to use?

The intuitive user interface of the Tali™ Image-Based Cytometer makes it extremely easy to collect data and analyze results in as few as six easy steps:

1. Select an assay.

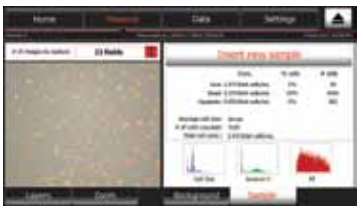
2. Add cells to the slide.

3. Insert the slide into the Tali™ cytometer.

4. Focus the image of the cells.

5. Press "Run Sample".

6. Collect and analyze data.



Typical processing times for the Tali™ Image-Based Cytometer are between 10 and 120 seconds, depending on the number of fields that are being captured and the complexity of the assay chosen. Following analysis, both qualitative (.bmp) and quantitative (.csv) data can be transferred to your computer using a USB drive.

How accurate are the data collected using the Tali™ cytometer?

The accuracy of results generated by the Tali™ Image-Based Cytometer was compared with those of a high-end flow cytometer. For each assay (apoptosis, cell viability, RFP/GFP expression) and cell type (JKT, HEKn, 293MSR, U2OS, CHO-S) tested, results from the Tali™ Image-Based Cytometer were comparable to those from the flow cytometer (Figures 5–8).

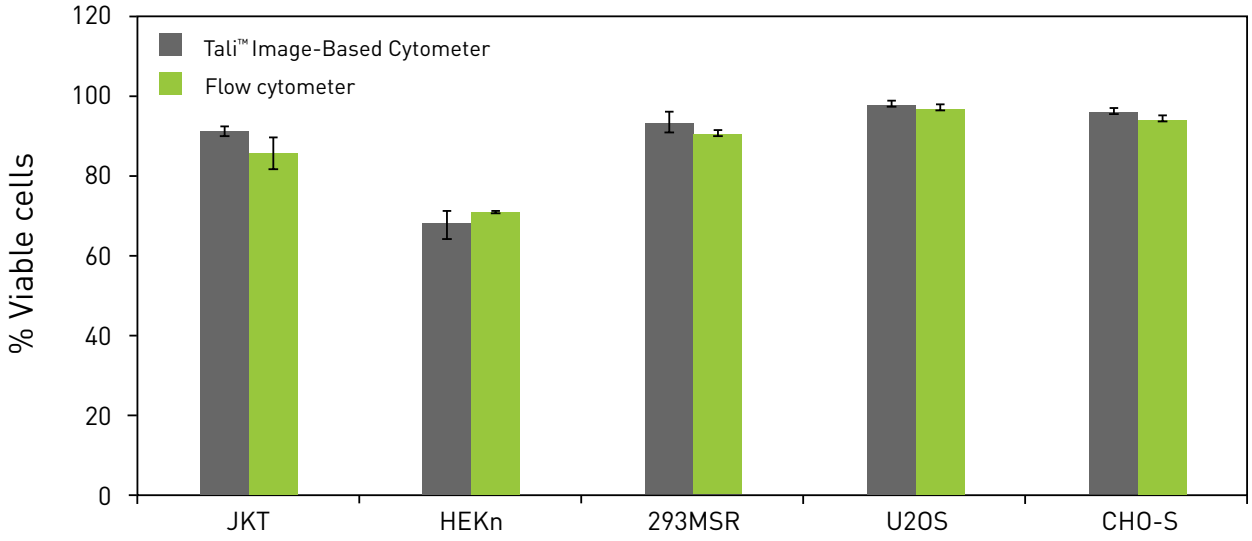


Figure 5. Comparison of cell viability as analyzed on the Tali™ Image-Based Cytometer and a flow cytometer. For end-point assays, cell viability was measured for five different cell types (Jurkat, U2OS, 293MSR, HEKn, and CHO-S). Cells were stained using the Tali™ Viability Kit and then measured using either the Tali™ Image-Based Cytometer or a flow cytometer. For all cell types tested, viable cell population data from the Tali™ Image-Based Cytometer were comparable to those obtained by flow cytometry.

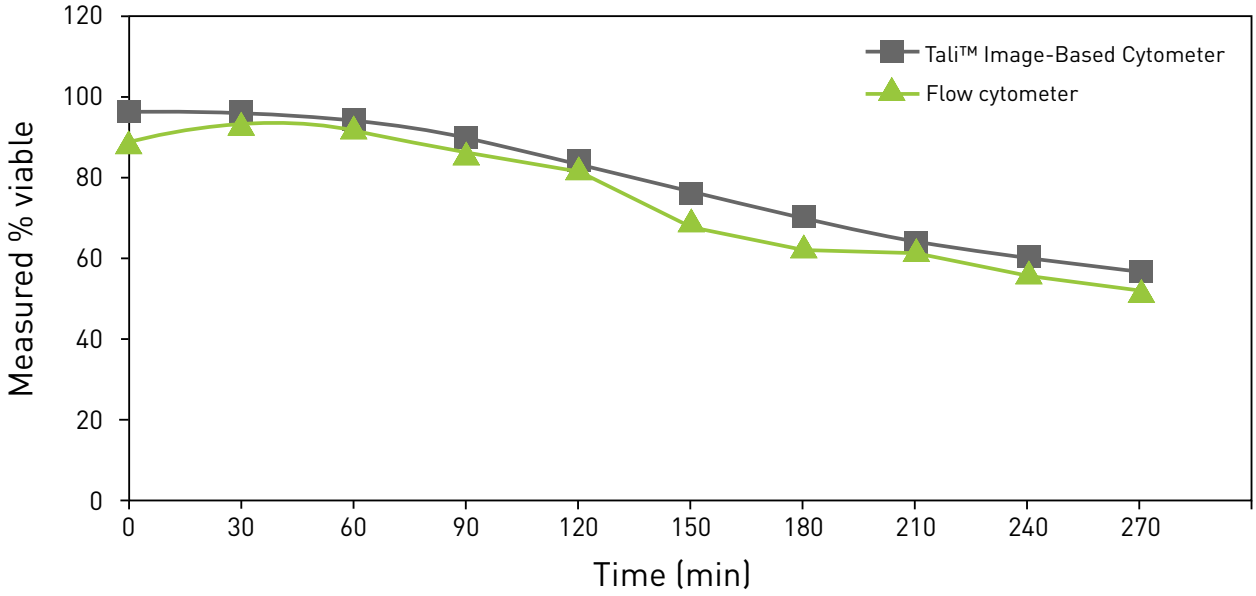


Figure 6. Time-course comparison of cell viability as analyzed on the Tali™ Image-Based Cytometer and a flow cytometer. Population data obtained with the Tali™ Image-Based Cytometer are comparable to those obtained using a flow cytometer. For the time-course assay, 10% (v/v) ethanol was added to 293MSR cells to induce cell death. Starting at time 0 and every 30 min up to 270 min, a 500 µL aliquot of the sample was removed. To this aliquot, 3 µL of Tali™ Dead Cell Red Reagent was added and then incubated for 1–2 min at room temperature. Three 100 µL aliquots of the stained sample were run on a flow cytometer, and a total of 10 measurements on the Tali™ Image-Based Cytometer were made using the remaining sample. Over time, the cells progressed from 95% viable at time 0 to less than 60% viable by 270 min. At every time point, the percentage of the population recorded as viable was comparable on both the Tali™ cytometer and the flow cytometer.

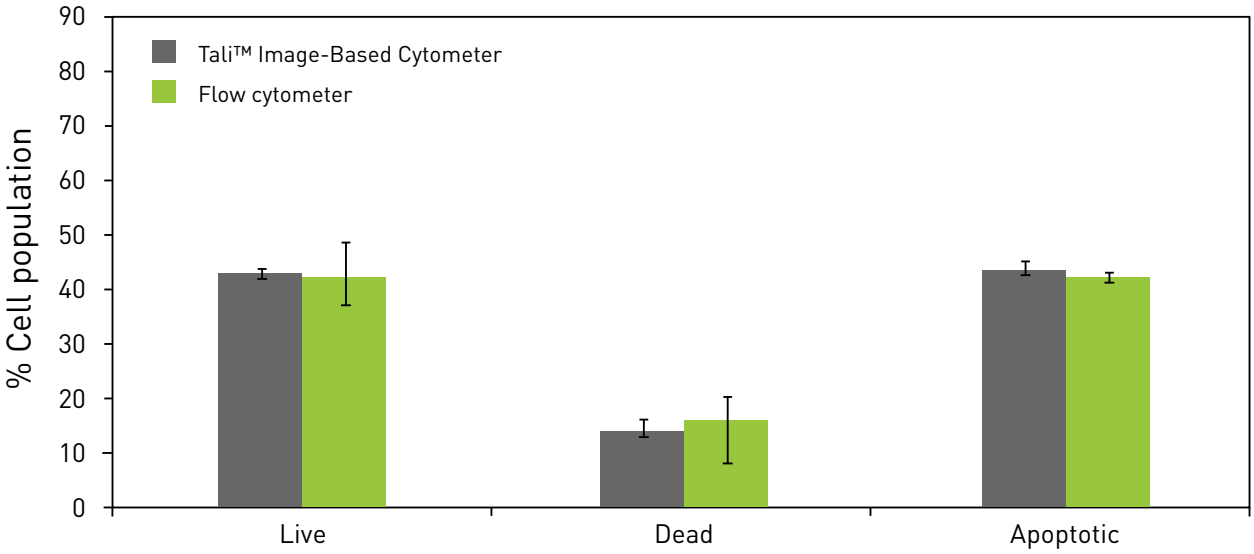


Figure 7. Comparison of apoptosis assays as analyzed on the Tali™ Image-Based Cytometer and a flow cytometer. Following a 4-hour induction with camptothecin, Jurkat cells were stained with the Tali™ Apoptosis Kit and assessed for apoptosis using the Tali™ cytometer and a flow cytometer. The Tali™ Apoptosis Kit contains an annexin V–Alexa Fluor® 488 conjugate and PI to differentiate live (annexin V–negative/PI-negative), dead (PI-positive), and apoptotic (annexin V–positive/PI-negative) cells. Using both platforms, 44% of the cell population were measured as live, 44% apoptotic, and 12% dead, confirming that the Tali™ cytometer provides quantitative data comparable to data collected by flow cytometry.

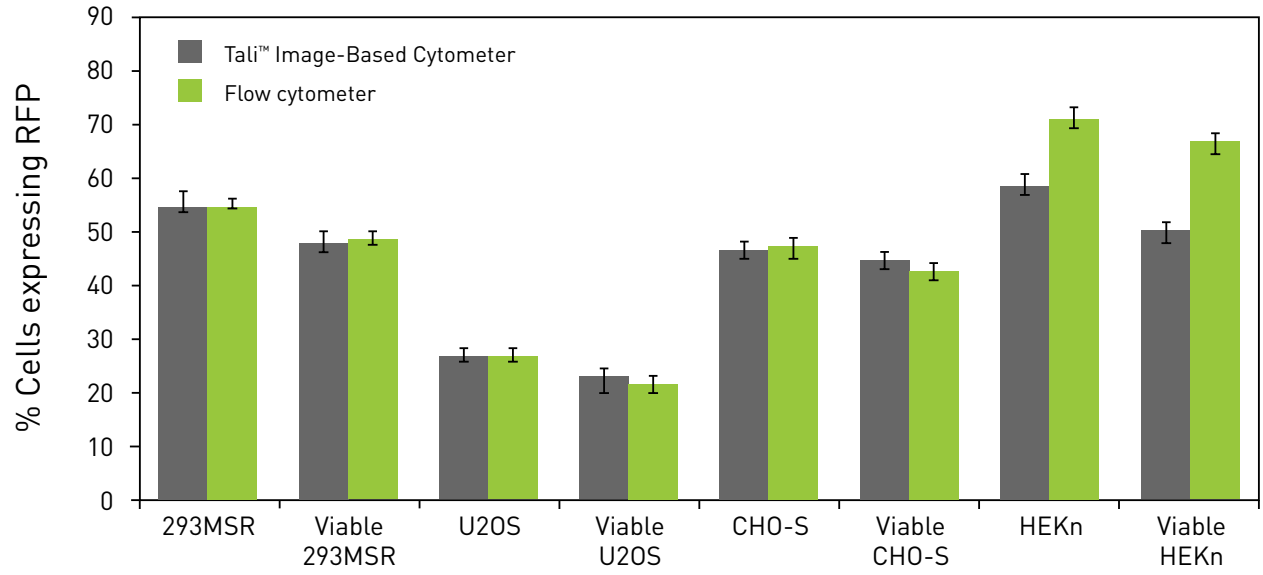


Figure 8. Comparison of RFP expression as analyzed on the Tali™ Image-Based Cytometer and a flow cytometer. Four cell types (U2OS, 293MSR, HEKn, and CHO-S) were transduced with a plasma membrane–targeted RFP BacMam construct (CellLight® Plasma Membrane-RFP (C10608)) and then analyzed on the Tali™ cytometer to determine transduction efficiency and RFP expression. The number of RFP-expressing cells in each experiment was determined using the Tali™ Viability Kit – Dead Cell Green on the Tali™ cytometer, and these data were compared to data collected from the same samples on a flow cytometer. For each cell type, the percentage of the total population expressing plasma membrane RFP is shown compared with flow cytometry. For most cell types tested, the percentages of RFP-expressing cells detected with the Tali™ Image-Based Cytometer were comparable to those obtained using flow cytometry. With the HEKn cell line there was lower correlation between the Tali™ cytometer and the flow cytometer, which is caused by the difference in how the Tali™ cytometer and a flow cytometer measure clumping cells. However, with both instruments, there was an equivalent drop in the percentage of cells that are considered expressing, when dead cells were removed by gating. [Note: Measuring only the viable cells expressing RFP (by excluding cells that stain with a dead cell marker) provides a more accurate measure of the usable cells in a population.]

What cell types have been tested on the Tali™ Image-Based Cytometer?

Currently, over 13 cell types have been tested on the Tali™ Image-Based Cytometer: 293 MSR, A431, A549, BPAEC, CHO-M1, HASMC, HDFN, HeLa, HEKn, JKT, MMM, NIH/3T3, and U2OS.

What are the specifications of the Tali™ Image-Based Cytometer?

Physical specifications	
Instrument type	Benchtop cell analyzer and suspension cell–based assay platform
Instrument dimensions	11 ½" (W) x 11 ½" (H) x 17 ½" (D)
Weight	19.4 lb (8.8 kg)
Operating power	100–240 VAC, 2.5 A, 120 V
Frequency	50/60 Hz
Electrical input	12 VDC, 13 A
Installation site	Class A environments (i.e., nonresidential or light industrial), pollution degree 2
Operating temperature	15–29°C
Operating humidity	<80% (noncondensing)
Technical specifications	
Processing time	10 seconds to 2 minutes, depending on number of fields captured and complexity of assay selected
Sample concentration range	1 x 10^5 to 1 x 10^7 cells/mL
Recommended sample diameter range	5–60 µm
Required sample volume	25 µL
Firmware (visit www.invitrogen.com/tali for updates)	Tali™ Image-Based Cytometer Firmware
USB drive	4 Gb
Optics	
Optics	3 channels (bright-field, green fluorescence, red fluorescence)
Excitation: Green channel LED	458 ± 20 nm
Red channel LED	530 ± 20 nm
Filters: Green channel	466/40 Ex, 495 LP Di, 525/50 Em
Red channel	543/22 Ex, 580 LP Di, 585 LP Em
Camera	1.3 Megapixels, 4x objective, 4x or 16x digital zoom
Tali™ Cellular Analysis Slides	
Material	Polylactic acid (PLA)
Dimensions	110 mm (W) x 24 mm (D) x 1.9 mm (H)
Chamber volume	25 µL

For more information on the Tali™ Image-Based Cytometer, including product manuals, quick reference cards, and demonstration videos, please visit www.invitrogen.com/tali.

Ordering information

Product	Quantity	Cat. No.
Instrument		
Tali™ Image-Based Cytometer	1 each	T10796
Products and accessories		
Tali™ Cellular Analysis Slides	50 slides 500 slides	T10794 T10795
Tali™ Image-Based Cytometer power cords, pack of 4 (for US/EU/UK/Australia)	1 each	T10793
Tali™ Image-Based Cytometer USB Drive	1 each	T10792
Tali™ Calibration Beads (includes 1 tube each of Tali™ Green Calibration Beads, Tali™ Red Calibration Beads, and Tali™ Alignment Beads)	1 kit	T10790
Assays*		
Tali™ Viability Kit – Dead Cell Red	100 assays	A10786
Tali™ Viability Kit – Dead Cell Green	100 assays	A10787
Tali™ Apoptosis Kit – Annexin V Alexa Fluor® 488 and Propidium Iodide	100 assays	A10788

* These assay kits have been designed and optimized for use with the Tali™ Image-Based Cytometer. For more information, refer to www.invitrogen.com/tali.

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