NEW

FDSS®-GX

Kinetic Plate Imager
C15711-02

HAMAMATSU
PHOTON IS OUR BUSINESS

Kinetic Plate Imager
for reliable and stable high throughput screening (HTS)

››› New Release

Since the 1990s, Hamamatsu Photonics has designed 9 models of kinetic plate imagers and has been providing solutions for kinetic, cell-based assays mainly for GPCR/ion channel research and screening in the drug discovery market.

Now in 2022, Hamamatsu Photonics has released the FDSS®-GX, the highest-performance kinetic plate imager in the FDSS® series, maximizing the technology and experience gained from the field of drug discovery.

FDSS®-GX

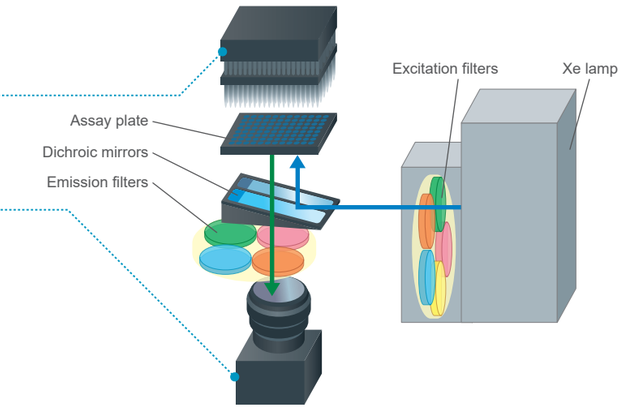
POINT

High-precision epifluorescence optical system

01 1536 ch manifold pipettor head with independent metal piston cylinders

02 High sensitivity qCMOS® sensor for fluorescence and luminescence

03 Semi-automation with stackers



Enabling whole microplate imaging and simultaneous injections to all wells ››› **Well-optimized fluorescence and luminescence system for HTS**

1990s 2000s 2010s 2020s

▶ FDSS® SERIES

FDSS® series released


FDSS®7000


FDSS®/µCELL


FDSS®7000EX


FDSS®-GX

▶ SENSOR

sCMOS sensor

qCMOS® sensor

EM-CCD sensor

Cooled CCD sensor

ICCD sensor

High sensitivity imaging with qCMOS® sensor

FDSS-GX

Quantitative and wide assay window

The high sensitivity qCMOS® sensor comes as a standard in the FDSS®-GX optical system.
In fluorescence and luminescence measurements, high quantitative performance has been achieved for low-light imaging, and the assay window has been expanded due to the sensor's wide dynamic range, enabling measurement with a wide linearity range.

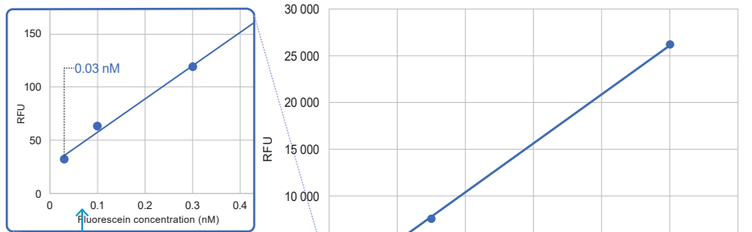
Detection sensitivity in fluorescence

In fluorescence measurements, the FDSS®-GX was able to detect 0.03 nM Fluorescein* (exposure time: 50 ms).
The graph below shows the fluorescence count and S/N ratio for titrated concentrations of Fluorescein, and the image on the right shows the 384 microplate.

* This is the actual measurement value.

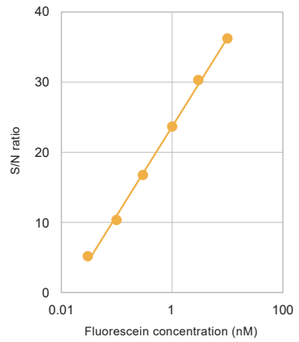
Microplate image (384 microplate)

Fluorescein concentration vs. RFU



Quantitative and linear measurement in the low-light range!

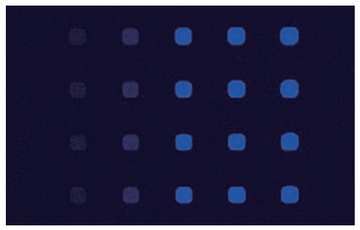
S/N ratio



Detections sensitivity in luminescence

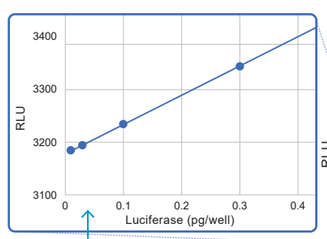
In luminescence measurements, the FDSS®-GX was able to detect 3.9 fg Luciferase* (exposure time: 5 seconds) according to the calculations.
The graph below shows the luminescence count for titrated concentrations of Luciferase, and the image on the right shows the 384 microplate.

* This is the theoretical value calculated from the measurement data below.

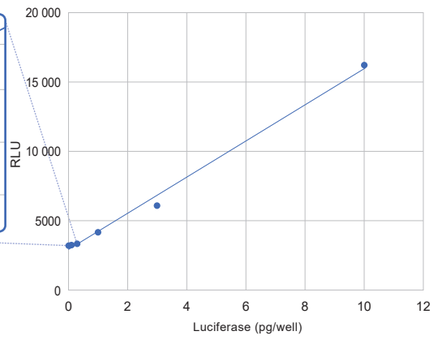


Microplate image (384 microplate)

Luciferase (pg/well) vs. RLU



Quantitative and linear measurement in the low-light range!



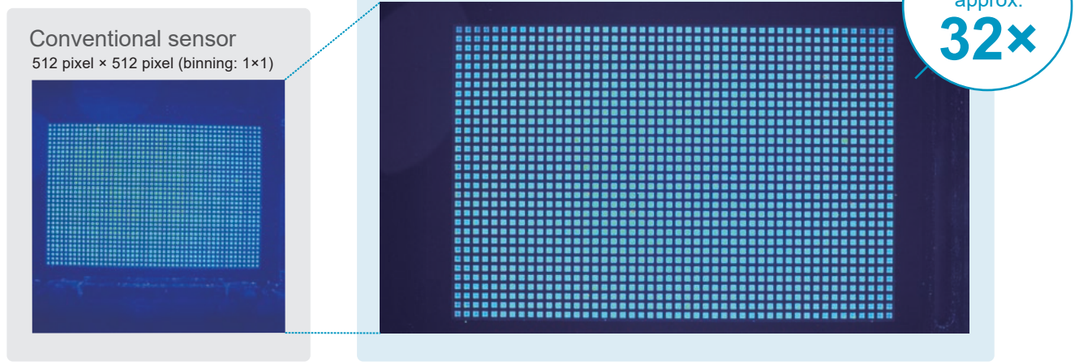
High-resolution whole plate imaging

Kinetic plate imagers that use the qCMOS® sensor have many advantages due to the large sensor size and low noise.
The qCMOS® sensor enables measurement with high sensitivity and high resolution.

Comparison of whole plate imaging

(1536 plate, Sample: B-Beads)

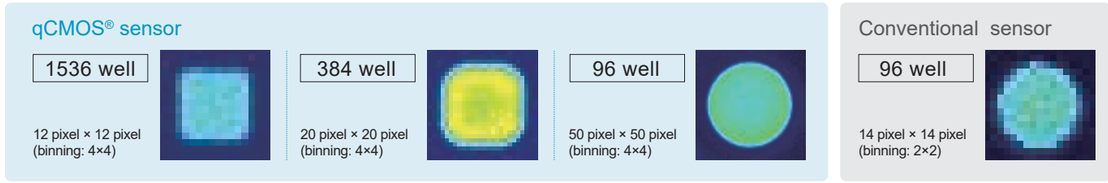
The qCMOS® sensor makes it possible to image the whole plate due to the large sensor size, and enables high-resolution measurement.



Comparison of well image

(Sample: B-Beads)

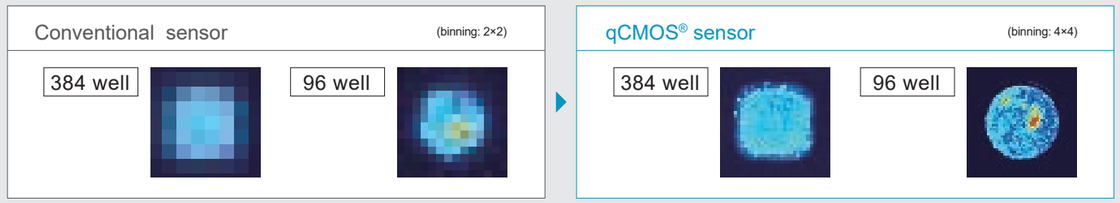
For kinetic plate imagers that measure average intensity in wells, it is essential to set the ROI (Region of Interest) precisely for quantitative measurement.
Compared to the conventional sensor, the number of pixels per well has increased and the ROI is set more accurately, enabling quantitative measurement.



Observation in wells

(384 well / sample: primary rat cortex neuron cells / Fluo-4, 96 well / sample: CHO cell)

The high resolution and low noise measurements allow observation inside the wells.



1536 ch manifold pipettor head with independent metal piston cylinders

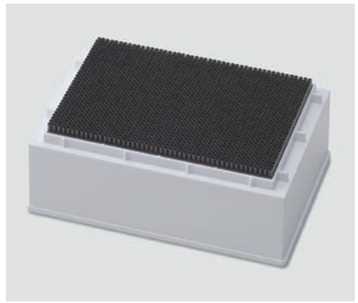
FDSS®-GX

Simultaneous injection to all wells in 1536 plates

Dispensing accuracy and repeatability are important factors in performing assays.
The FDSS®-GX achieves highly accurate and repeatable micro-dispensing by adopting a 1536 ch dispensing unit capable of dispensing variable volumes. This dispensing unit has independent metal piston cylinders and dispensing tips dedicated to the FDSS®-GX.

* Dispensing units in 96 ch and 384 ch are also available.

Dispensing unit (1536 tip type) A15623-28



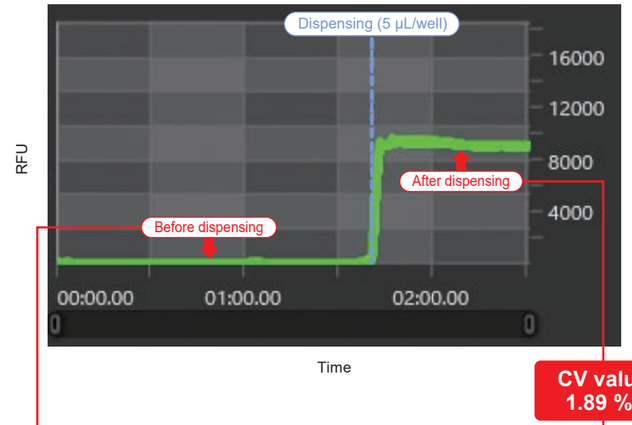
1536 black tip (10 racks) for FDSS®-GX A8687-82

Dispensing performance

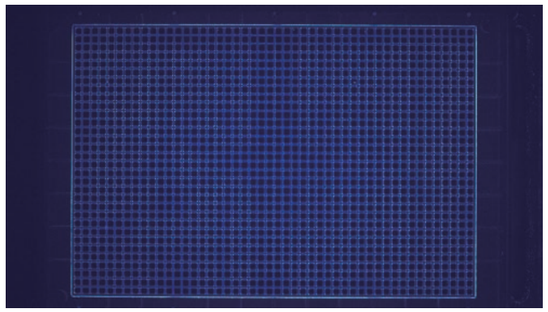
The figure below shows the fluorescence intensity change in time and plate image when B-beads were dispensed into a 1536 microplate (5 µL/well), showing a CV of 1.89 % after dispensing.
The 1536 ch dispensing unit with independent metal piston cylinders and dispensing tips dedicated to FDSS® provide the best dispensing performance.

* This is the actual measurement value when dispensing B-beads (5 µL/well) with overhauled or calibrated 1536 ch dispensing unit and dispensing tips dedicated to FDSS®-GX. Please refer to page 12 for detailed specifications.

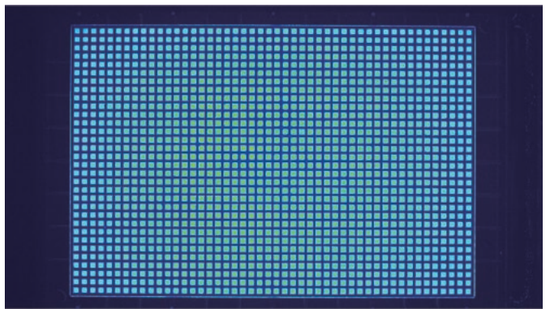
Fluorescence intensity change in time



Before dispensing (1536 microplate)



After dispensing (1536 microplate)



Advanced washing stage

In constructing an assay system for HTS, washing dispensed tips enables the reuse of the tips, thereby reducing costs and improving efficiency of an assay.
The FDSS®-GX is compatible with automatic washing up to 3 solvents and achieves washing with no carry over.

* The dispensing accuracy is not guaranteed for reuse after the tips are unloaded.

Tip washer

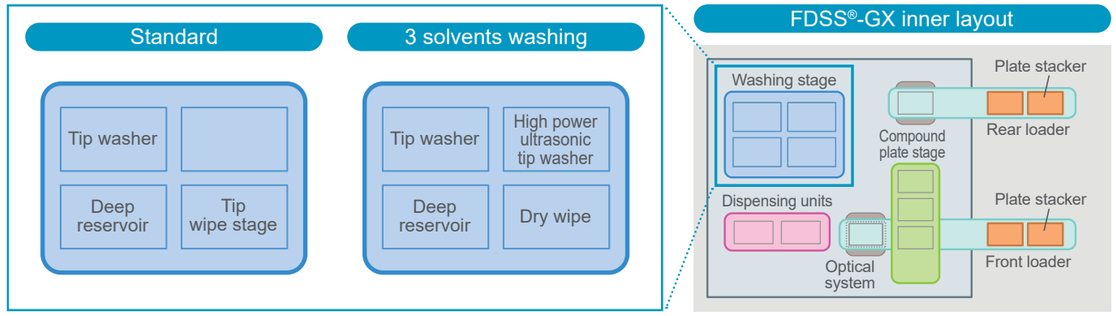
- Up to 3 tip washers available
- Overflow washing with chimney plates
- High power ultrasonic tip washer* available

Tip wipe stage

- Tip wipe stage is equipped as standard to blot out water droplets on tips after washing
- Dry wipe* to always keep blotting capability by suction pump is available

* Optional component

Example of washing unit configuration

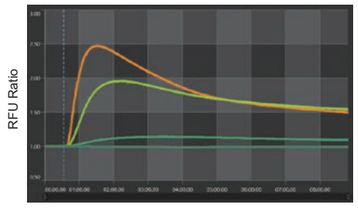


Washing effect of high power ultrasonic tip washer

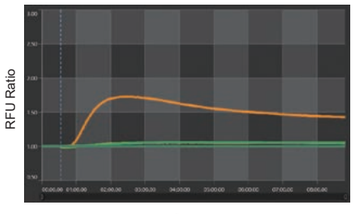
Tip washing with the high power ultrasonic tip washer prevents carryover of compounds that could not be washed out by overflow washing, reducing tip costs and improving assay efficiency.

The figure below shows data regarding the washing effect of overflow washing and ultrasonic washing using Milli-Q water. After attaching each concentration of Ionomycin to dispensing tips, tips were washed under the following conditions and the presence of carryover was checked.

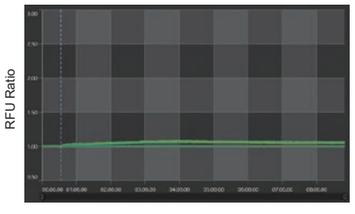
1. Overflow washing (Milli-Q water)



2. Ultrasonic washing (Milli-Q water)



3. Ethanol washing + ultrasonic washing (Milli-Q water)



1 µM Ionomycin　100 nM Ionomycin　10 nM Ionomycin　PBS (Negative Control)

* Each washing involves 10 cycles of aspiration and dispensing operation.
* Use 50 % ethanol solution

Normal overflow washing does not fully wash concentrations of 1 µM and 100 nM Ionomycin.
When ultrasonic washing is performed, 100 nM Ionomycin is completely washed out and no carryover is observed. Furthermore, it can be seen that even very high concentrations of 1 µM Ionomycin are completely washed when washed with an ethanol solution prior to ultrasonic washing.

Measurement flow for semi-automation

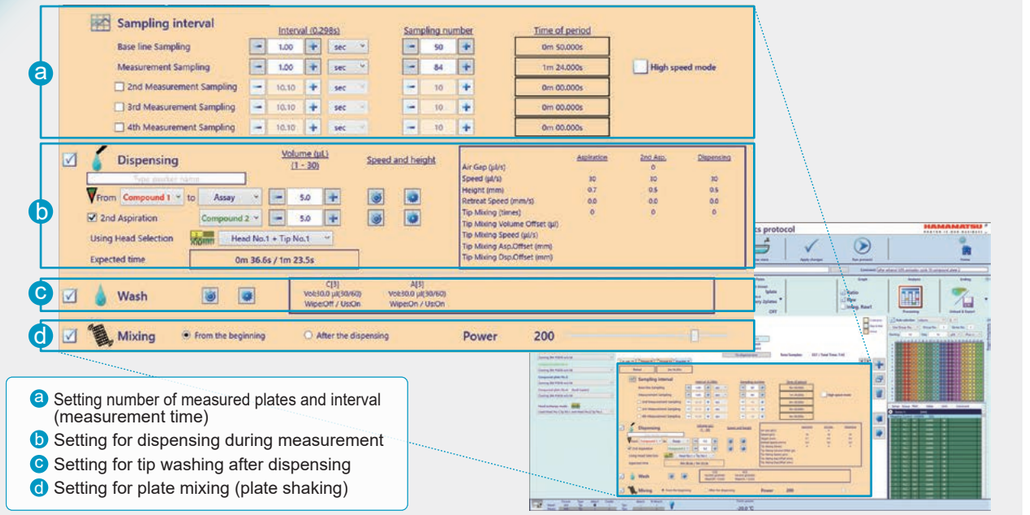
FDSS®-GX

Load the FDSS® dedicated dispensing tips to dispensing unit by using automatic tip loader and set the tip-loaded dispensing unit into the FDSS®-GX main unit

Tip loading

Head setting

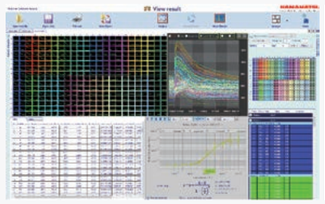
Plate setting

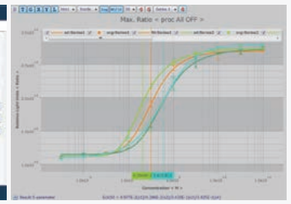


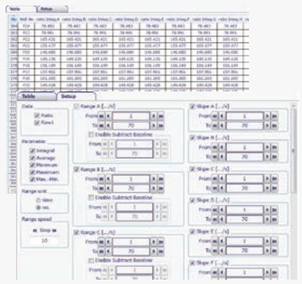
a Setting number of measured plates and interval (measurement time)
b Setting for dispensing during measurement
c Setting for tip washing after dispensing
d Setting for plate mixing (plate shaking)

Tip loading | Head setting | Plate setting | Protocol setting | Data acquisition | Data analysis

Various data processing and analysis of measurement results are possible



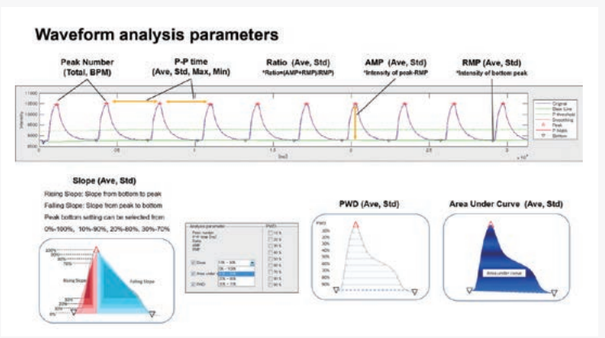




- Spatial correction between wells (spatial uniformity)
- Negative control correction
- Positive control correction
- Baseline subtraction correction (subtract bias)
- IC/EC graph calculation from multiple series (4 or 5 parameters may be selected)
- IC/EC graph calculation using Max, Min, Average and Max-Min in up to 3 time ranges in the same series
- Slope calculation to maximum range of 8
- Max, Min, Max-Min and Ratio calculation to maximum range of 8

- Waveform peak number (Peak number: Total, BPM)
- Peak-to-peak time (p-p time: Ave, Std, Max, Min)
- Peak luminescence value/bottom luminance value ratio (Ratio: Ave, Std)
- Peak amplitude {Peak luminance value} (Amplitude: Ave, Std)
- Bottom luminance value (RMP: Ave, Std)
- Rise and fall slope (Rising/Falling slope: Ave, Std)
- Peak pulse width 10 % to 90 % (PWD10, 20, 30, 40, 50, 60, 70, 80, 90)
- Peak total area (Area under curve: Ave, Std)

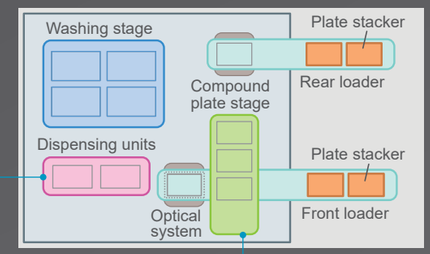
Analysis of calcium transient waveform of iPS cardiomyocyte



A wide variety of assay designs available

Two dispensing units capability

- Two dispensing units can be used according to the characteristics of compounds / reagents
- Compatible with 1536 / 384 / 96 tip type
- Dispensing units can be selected depending on assay design



Compound plate stage

- 3 fixed compound plate stages available
- Compound plate loading using rear loader
- Automatic reagent feeder* can be equipped on the fixed compound plate stage

*Optional component

Highly flexible plate transfer

Plate stacker unit*

- Semi-automation can be achieved by automatic transfer of assay plate and compound plate
- Large capacity of cassette for up to 20 microplates
- Barcode reader* for reading the barcode attached to the assay / reagent plate is selectable
- Lid opener function available

*Optional component

Robot connection

- Automation accessories enable connection to robots from various vendors

Applications

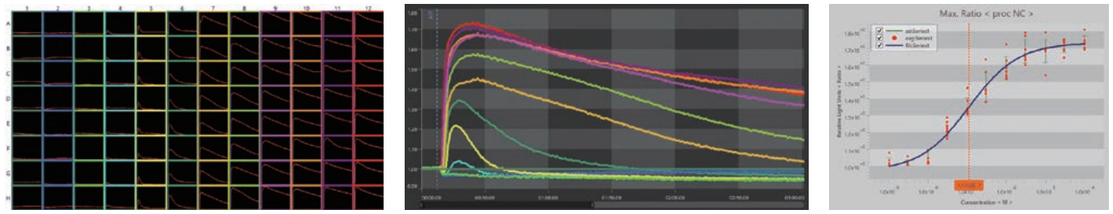
FDSS-GX

Fluorescence applications

Ca2+ assays

Fluo-8, Calbryte -520, -590, -630 AM, Fura-2

Evaluation of ATP dose response using Fluo-8 AM-stained CHO cells



- Cell: CHO cell
- Dye: Fluo-8 AM (AAT Bioquest)
- Compound: ATP final 100 µM –1 nM

Membrane potential assays

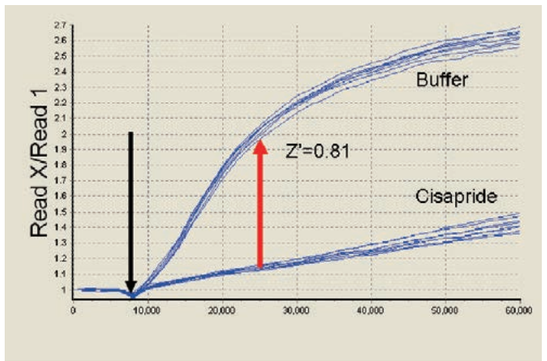
FluoVolt, SQMP, FMP

Other ion channel assays

K+: FluxOR*, Na+: ANG2, SodiumGreen, Cl−: YFP, diH-MEQ

*Potassium ion channel screening using Tl+ is available.

K+ assay in CHO cells using FluxOR

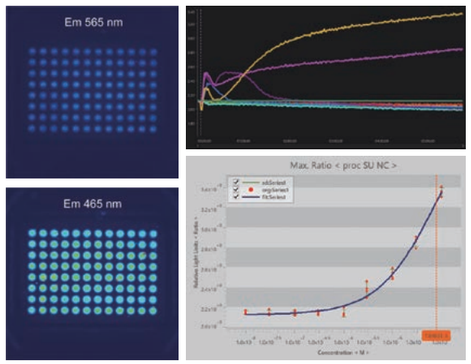


- Cell: CHO cell
- Dye: Flux-OR Potassium

FRET assays

CFP/YFP, voltage sensor probe, fluorecence probe, fluorecence protein

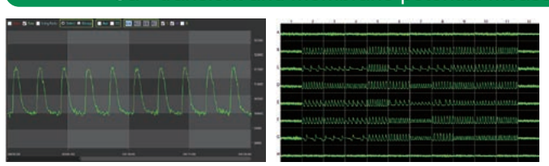
Evaluation of Nav 1.5-CHO cells using FRET-type voltage sensitive dye (VSP)



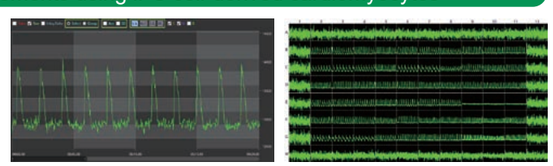
- Cell: Nav1.5-CHO cells (Ion Chat Research Corporation)
- Dye: Donor: CC2-DMPE (Invitrogen) final 5 µM
  Acceptor: DiSBAC4(3) (Invitrogen) final 10 µM
- Compound: Veratridine (Sigma) final 100 µM –10 nM

iPSC-derived cells

Ca2+ transient and membrane potential measurements using iPS cell-derived cardiomyocytes



- Cell: iCell Cardiomyocytes² (CDI)
- Dye: Cal-520AM
- Ca2+ transient after addition of various compounds



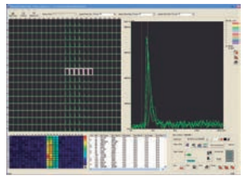
- Cell: iCell Cardiomyocytes² (CDI)
- Dye: FluoVolt
- Action potential after addition of various compounds

Luminescence applications

Ca2+ assays

Aequorin

Intracellular Ca2+ assay by luminescence using an aequorin-expressing cell line



- Cell: Aeg-CHO (8000 cells/well)
- Substrate: coelenterazine
- Ligand: ATP
  (500 nM, 100 nM, 20 nM)

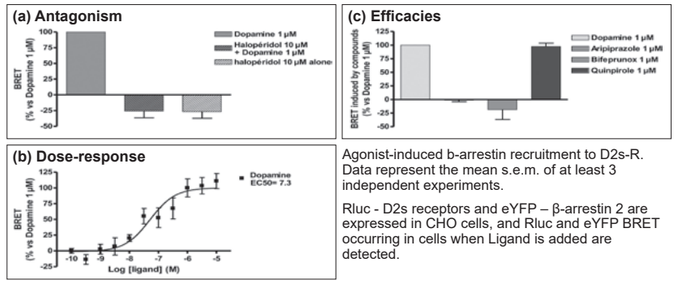
- Cell: CHO-K1 stably expressing apoaequorin with a mitochondrial targeting signal
- Substrate: *h*-coelenterazine (*h*-CTZ), *cf3*-coelenterazine (*cf3*-CTZ)
- Compound: acetylcholine final 30 nM–1 µM

S. Inouye, R. Iimori, Y. Sahara, S. Hisada, T. Hosoya, Application of new semisynthetic aequorins with long half-decay time of luminescence to G-protein-coupled receptor assay, *Analytical biochemistry.* **407. 2,** 247-252 (2010).

BRET assays

BRET1, BRET2, NanoBRET

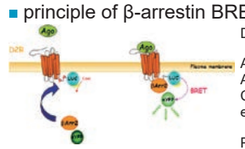
BRET assay using CHO cells



Agonist-induced b-arrestin recruitment to D2s-R. Data represent the mean s.e.m. of at least 3 independent experiments.

Rluc - D2s receptors and eYFP – β-arrestin 2 are expressed in CHO cells, and Rluc and eYFP BRET occurring in cells when Ligand is added are detected.

■ principle of β-arrestin BRET[1]- assay



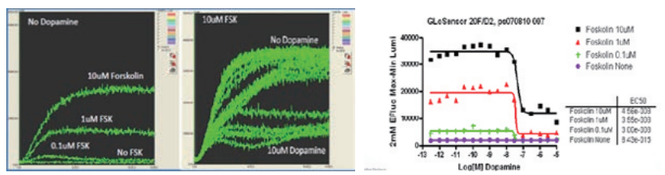
D2R: Dopaminergic Receptor D2
Ago: Agonist
Arr: Arrestin
Coel: Coelenterazine h
eYFP: enhanced Yellow Fluorescent Protein
P: phosphorylation Sites

Data courtesy : Frederic Finana
Biologie Cellulaire et Moléculaire, Centre de Recherche Pierre Fabre Finana F, De Vries L, Rauly-Lestienne I et al. 10th European Functional Drug Screening Symposium Poster No.8 (2014)

cAMP assays

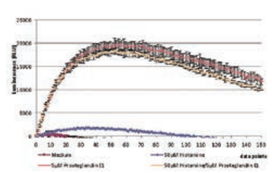
GloSensor

cAMP evaluation using GloSensor



- Cell: CHO cell
- Kit: GloSensor

Analysis of time course of cAMP using HUVEC expressing GloSensor (Promega)

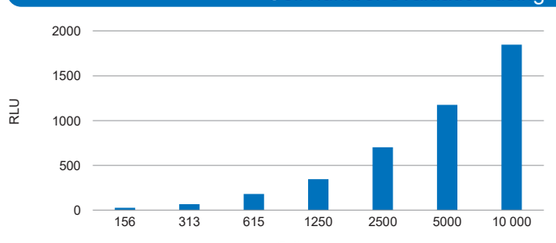


Measurement for 25 minutes at 10 second intervals after adding Histamine and Prostaglandin.

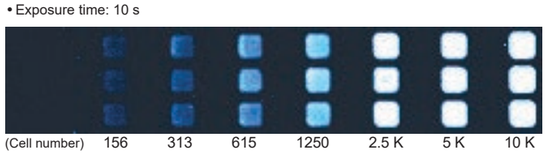
- Cell: HUVEC
- Kit: GloSensor

Cell number evaluation using CytoTox-Glo cytotoxicity assay

Cell number evaluation using CytoTox-Glo cytotoxicity Assay



- Cell: CHO (10 000, 5000, 2500, 1250, 615, 313, 156 cells/well)
- Kit: CytoTox-Glo cytotoxicity assay (Promega)
- Plate: 1536 format
- Exposure time: 10 s



FDSS®-GX standard configuration

FDSS®-GX Kinetic Plate Imager C15711-02

Fluorescence luminescence sensor unit (1 lamp)
- Xe lamp, Automatic EX filter changer (5 positions for filters)
- Automatic EM filter/DM slot changer (2 positions for DM, 4 positions for filters)
- Excitation filters: 472 nm (Fluo-4), 531 nm (FMP)
- Emission filters: 520 nm to 560 nm (Fluo-4), 593 nm (FMP)
- Dichroic mirrors: B (Fluo-4) / FMP
- Shortpass filters: SPF 495 (Fluo-4), SPF 550 (FMP)

Detector
- Hamamatsu qCMOS® sensor dedicated to FDSS®
- Circulating water cooler
- Fluorescence/luminescence detection and measurement functions
  Sampling rate: 10 Hz (10 data points per second) minimum
  Sampling interval: 0.1 s minimum

Plate loading line

Front loader and rear loader for loading of assay plate and compound plate
- Assay plate: Front loader ×1
- Compound plate: Compound plate stage (manual exchange) ×3 Rear loader ×1

Washing stage
- Tip washer (including bath, tubes, pump, tanks)
- Deep reservoir
- Tip wipe stage
- Chimney plates (96 / 384 tip type)

Plate shaking function (front loader)

Plate shaking level step: 256 (software control)
Revolutions per minute: 0 to 3000 rpm

Heater unit

Keeps the main unit chamber in 35 to 37 ºC range
Assay plate and compound plates are homogeneously at that temperature

FDSS® software

FDSS® control software operates in data analysis unit
Compatible with Windows® 64-bit OS

Data analysis unit C7903-13

64-bit computer, Windows® operating system for FDSS®-GX

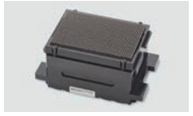
Automatic tip loader A15623-07

Automatically loading/unloading tips on to dispensing unit
(1536, 384, 96 tip type).

Dispensing units

Dispensing unit (1536 tip type) A15623-28

Dispenser head for dispensing reagents simultaneously into a 1536-well microplate.
Dispensing volume: 1 µL to 5 µL, Dispensing accuracy: within CV 10 % (when dispensing 5 µL)
* including chimney plate (1536 tip type)



Dispensing unit (384 tip type) A10118-26

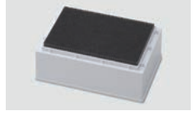
Dispenser head for dispensing reagents simultaneously into a 384-well microplate.
Dispensing volume: 1 µL to 30 µL, Dispensing accuracy: within CV 5 % (when dispensing 5 µL)

Dispensing unit (96 tip type) A10118-24

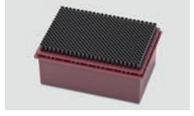
Dispenser head for dispensing reagents simultaneously into a 96-well microplate.
Dispensing volume: 10 µL to 200 µL, Dispensing accuracy: within CV 3 % (when dispensing 10 µL)

Consumables (Dispensing tips)

1536 black tip (10 racks) for FDSS®-GX A8687-82



384 black tip (10 racks) for FDSS®7000/ µCELL/-GX A8687-62C



96 black tip (10 racks) for FDSS®7000/ µCELL/-GX A8687-32A

Options

Plate stacker set with lid opener A15623-05

Set of plate stackers for front/rear loader with lid opener. Microplates in cassette are automatically loaded in the FDSS®-GX and unloaded after measurement. Storage capacity of 20 plates.

Additional tip washer A15623-48

Unit for washing tips attached to the dispensing unit.
Includes bath, tubes, pump, washing liquid tank, waste liquid tank.

High power ultrasonic tip washer A15623-49

Unit for washing tips attached to the dispensing unit with high power ultrasonic.
Includes bath, tubes, pump, washing liquid tank, waste liquid tank, ultrasonic controller.

Barcode reader set for front and rear loaders A15623-50

Option for reading the barcode attached to the assay/reagent plate.
Set for front/rear loader line.

Automatic reagent feeder A15623-55

Reagents are automatically supplied into the bath inside the FDSS®-GX.
Includes bath, pump, tubes, volume detection sensor, reagent tank rack.

* Reagent tank and stirrer are not included.

Dry wipe A15623-56

Wipe stage to always keep blotting capability by suction pump is available.

* Pump is not included.

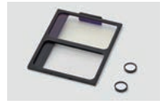
Deep reservoir A10118-61

Reservoir to be used with reagent or washing solution.

Filter set (Fura-2) A10343-61

Excitation filter: 340 nm, 387 nm
Dichroic mirror: Fura-2
ND filter 0.3

* Use the emission filter and the shortpass filter for Fluo-4 included in C15711-02.
  Emission filter: 520 nm to 560 nm
  Shortpass filter: SPF 495 (Fluo-4)



Filter set (CFP/YFP-FRET) A10343-21B

Excitation filter: 438 nm
Emission filter: 483 nm, 542 nm
Shortpass filter: SPF 450
Dichroic mirror: CFP/YFP-FRET

Filter set (CFP/YFP-FRET) A10343-01C

Excitation filter: 387 nm
Emission filter: 466 nm, 560 nm
Shortpass filter: SPF 400
Dichroic mirror: VSP

* Other filter sets or single filters are also available.
  Please contact your Hamamatsu representative for further information.

Software options

FDSS® software Additional offline software license U8524-03A

Used to display, analyze and output data on devices other than FDSS®-GX. Windows® 64-bit OS compatible.

FDSS® software option Waveform analysis software for cardiomyocyte U8524-12

Software protection key for multi-well analysis of waveform obtained from cardiomyocytes.

FDSS® software option Export TIFF image option U8524-14

Add function to save TIFF (16-bit) image from FDSS® software.

FDSS® software option High speed acquisition option U8524-11

Software module and protection key enabling high speed capture.

FDSS® software option Interface for external control U8524-13A

Enables FDSS® external control interface of FDSS® software.

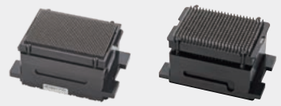
Recommended configuration for semi-automation

Standard configuration

- FDSS®-GX Kinetic Plate Imager C15711-02
  - Fluorescence luminescence sensor unit (1 lamp)
  - Detector
  - Plate loading line
  - Washing stage
  - Plate shaking function
  - Heater unit
  - FDSS® software
- Data analysis unit C7903-13
- Automatic tip loader A15623-07

Dispensing units

- Dispensing unit (1536 tip type) A15623-28
- Dispensing unit (384 tip type) A10118-26



Recommended options

- Plate stacker set with lid opener A15623-05
- Barcode reader set for front and rear loaders A15623-50
- Automatic reagent feeder A15623-55
- Deep reservoir A10118-61
- High power ultrasonic tip washer A15623-49
- Dry wipe A15623-56
- FDSS® software Additional offline software license U8524-03A
- FDSS® software option High speed acquisition option U8524-11

This is an example of a configuration for semi-automation.
Please contact your Hamamatsu representative for further information.

Other components

The following options can be selected depending on your application.

- Dispensing unit

Dispensing unit (96 tip type) A10118-24

- Options

Filter set (VSP) A10343-01C
Filter set (CFP/YFP-FRET) A10343-21B
Filter set (Fura-2) A10343-61
FDSS® software option Waveform analysis software for cardiomyocyte U8524-12
FDSS® software option Interface for external control U8524-13A
FDSS® software option Export TIFF image option U8524-14

Maintenance and validation service

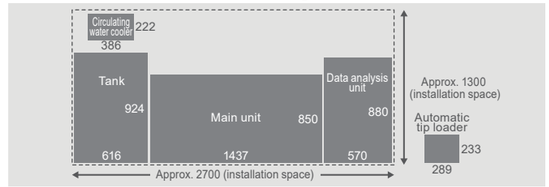
Maintenance for the hardware and quality check of the dispenser head should be performed periodically to validate your instrument.
The maintenance service and validation service should be done within the first year after installation, and we strongly recommend signing up for a full-service contract that covers the maintenance service and validation service, to certify the instrument's performance. The full-service contract is only offered during the first year after installation. Please contact your Hamamatsu representative for further information.

System appearance

* Stand for Automatic tip loader is not included in the FDSS®-GX configuration.

System footprint

(Unit: mm)



* Please secure a separate space to install the automatic tip loader.

Specifications

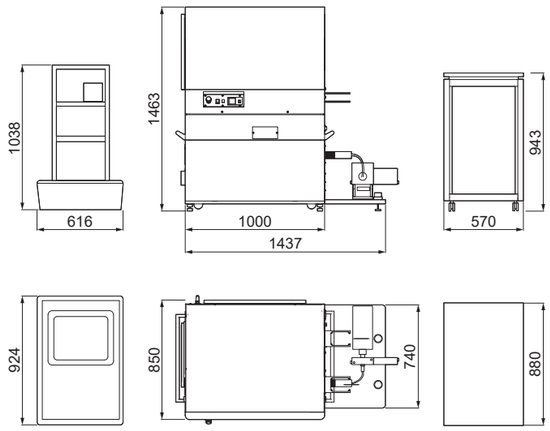
Dispensing units	1536 tip type A15623-28	1 µL to 5 µL
	384 tip type A10118-26	1 µL to 30 µL
	96 tip type A10118-24	10 µL to 200 µL
Fluorescence and luminescence detector		Hamamatsu qCMOS® sensor dedicated to FDSS®
Number of sampling data points		1 to 50 000 sampling
Sampling rate		10 Hz (10 data points per second) minimum
		120 Hz (120 data points per second) maximum*
Sampling interval		0.1 s minimum
		0.0083 s minimum*
Excitation light source		Xe lamp
		Optical filters can be selected
Plate shaking function		Adjustable in 256 steps
		Revolutions per minute: 0 to 3000 rpm
Heater unit	Temperature control part	FDSS®-GX Main unit chamber (whole upper half)
	Configurable temperature	+40 °C maximum
Tip loading		Use Automatic tip loader A15623-07
Number of plate loading lines		Front loader × 1 Rear loader × 1
Number of plate positions	Assay plate	Front loader × 1
	Compound plate	Rear loader × 1, Compound plate stage (manual exchange) × 3
Number of tip washer positions		3 units maximum (Total with/without high power ultrasonic function, deep reservoir)
Number of dispensing unit positions		2 units maximum (same tip type only)
Compatible dispensing tip		1536 / 384 / 96 black tips dedicated to FDSS®, A8687 series
		Disposable type
Compatible microplate		Clear bottom black 1536 / 384 / 96 plates
		SBS format height 10 mm minimum
Power supply specifications		Single phase AC 100 V to 240 V, 50 Hz / 60 Hz
Power consumption		C15711-02: approx. 3115 VA C7903-13: approx. 660 W Required supply line: 15 A × 3 lines
Ambient operating temperature		+15 °C to 30 °C
Dimensions/ Weight	Main unit	1437 (W) × 850 (D) × 1467 (H) mm / approx. 320 kg
	Data analysis unit	570 (W) × 880 (D) × 943 (H) mm / approx. 82 kg
	Plate stacker set	437 (W) × 580 (D) × 1340 (H) mm / approx. 36 kg
	Washing rack	616 (W) × 924 (D) × 1038 (H) mm / approx. 19 kg
	Circulating water cooler	222 (W) × 386 (D) × 649 (H) mm / approx. 26 kg
	Automatic tip loader	233 (W) × 289 (D) × 447 (H) mm / approx. 21 kg

* When using FDSS® software option High speed acquisition option U8524-11

Dimensional outlines

(Unit: mm)

Weight: approx. 380 kg



	User application					
	Excitation filter 1	Excitation filter 2	Shortpass filter	Dichroic mirror	Emission filter 1	Emission filter 2
Fura-2 (Ca^{2+})	340 nm	387 nm	SPF 495	UV	520 nm to 560 nm	-
SBFI (Na^+)	340 nm	387 nm	SPF 495	UV	520 nm to 560 nm	-
PBFI (K^+)	340 nm	387 nm	SPF 495	UV	520 nm to 560 nm	-
MQAE, diH-MEQ (Cl^-)	387 nm	-	SPF 495	UV	440 nm to 470 nm	-
DAPI (DNA)	387 nm	-	SPF 495	UV	440 nm to 470 nm	-
Hoechst33258	387 nm	-	SPF 495	UV	440 nm to 470 nm	-
VSP-1	387 nm	-	SPF 400	For VSP	466 nm	560 nm
CFP/YFP	438 nm	-	SPF 450	For C/Y	483 nm	542 nm
HYPER	425 nm	483 nm	SPF 495	For HYPER	520 nm to 560 nm	-
Fluo-8 (Ca^{2+})	472 nm	-	SPF 495	B	520 nm to 560 nm	-
Cal-520 (Ca^{2+})	472 nm	-	SPF 495	B	520 nm to 560 nm	-
Sodium Green (Na^+)	472 nm	-	SPF 495	B	520 nm to 560 nm	-
FluxOR (K^+)	472 nm	-	SPF 495	B	520 nm to 560 nm	-
BCECF (pH)	472 nm	-	SPF 495	B	520 nm to 560 nm	-
FluoVolt	472 nm	-	SPF 495	B	520 nm to 560 nm	
GFP	472 nm	-	SPF 495	B	520 nm to 560 nm	-
FITC	472 nm	-	SPF 495	B	520 nm to 560 nm	-
YFP	472 nm	-	SPF 495	For YFP	520 nm to 560 nm	-
JC-1	531 nm	-	SPF 550	For JC-1	593 nm	-
CoroNa Red (Na^+)	531 nm	-	SPF 550	For FMP	593 nm	-
FMP	531 nm	-	SPF 550	For FMP	593 nm	-
Cal-590 (Ca^{2+})	531 nm	-	SPF 550	For FMP	593 nm	-
Rhodamine	531 nm	-	SPF 550	For FMP	593 nm	-
Cal-630 (Ca^{2+})	605 nm	-	SPF 630	For RED	676 nm	-
Nano-BRET	-	-	-	-	461 nm	647 nm

Standard Options

* The wavelength value in the table above may not correspond to the typical excitation/emission wavelength for each application.
Depending on the application, we offer filter sets suitable for the FDSS®-GX optical system. Please contact your Hamamatsu representative for further information.

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