NEW

# FDSS®-µCELL v2

Kinetic Plate Imager
C13299-02


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# Compact-design Kinetic Plate Imager for reliable and stable drug screening

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

Now Hamamatsu Photonics has released the FDSS-µCELL v2, the compact laboratory screening system that integrates the technologies and experience gained from the field of drug discovery.

**FDSS-µCELL v2**

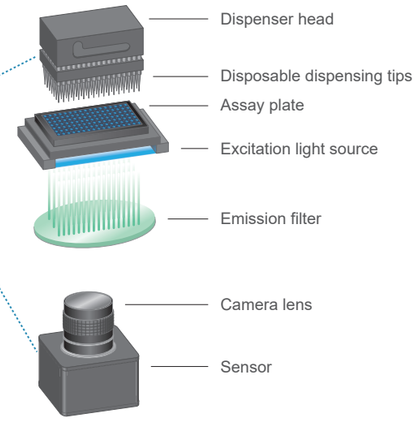

POINT

## Optical system with qCMOS® sensor

01 96 / 384 ch manifold pipettor head with independent metal piston cylinders

02 High sensitivity qCMOS sensor for fluorescence and luminescence

03 Semi-automation workflow




**Enabling whole microplate imaging and simultaneous injections to all wells** >> **Well-optimized fluorescence and luminescence systems for screening**

# Achieving high-sensitivity imaging across a wide range of applications

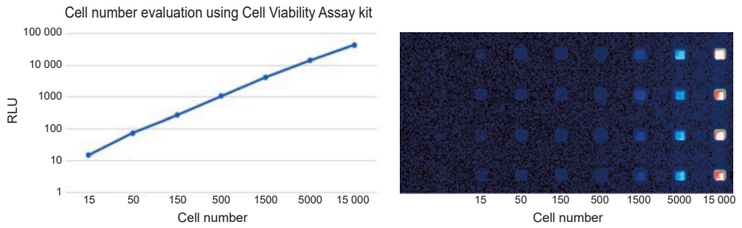
FDSS-µCELL v2

## High-sensitivity luminescence / high-speed fluorescence measurement

The high sensitivity qCMOS sensor comes as a standard in the FDSS-µCELL v2 optical system.
In fluorescence and luminescence measurements, high quantitative performance has been achieved for low-light imaging and high-speed fluorescence changes. Even with fluorescent proteins that have low fluorescence intensity, high-precision real-time measurements can be achieved, enabling more detailed analysis of cellular responses.

### Cell number evaluation using Cell Viability Assay kit

The qCMOS sensor offers measurement with wide linearity range and high sensitivity, enabling luminescence detection even with small numbers of cells.





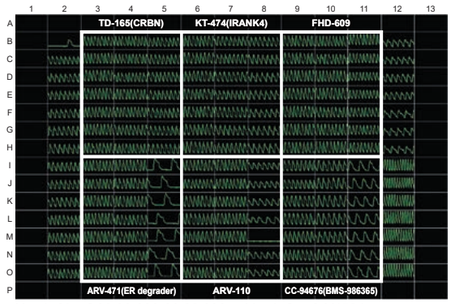


Cell : CHO-K (15 000, 5000, 1500, 500, 150, 50, 15 cells/well)
Kit : Cell Titer (Promega Corporation)

### Measurement of calcium concentration changes associated with beating in iPS-derived cardiomyocytes

qCMOS sensors enable high-speed measurement of minute changes in fluorescence.

Cell : iCell Cardiomyocytes² (CDI)
Dye : EarlyTox kit
Condition : PROTAC Evaluation high speed, modeconc=0.1, 1, 10 µM, 48 h exposure




X-axis [time] 00:00.000-00:20.000 Y-axis [raw] 0/4584

## EFS pacing system

Electric field stimulation using electrodes is an effective technique for pacing of cardiomyocyte and skeletal muscle cells and for neuronal oscillation. FDSS-µCELL v2 simultaneously stimulates all wells of a 96 multi-EFS electrodes. It can be used in contraction timing control of muscle cells such as cardiomyocytes and skeletal muscle, or in $Ca^{2+}$ oscillation control of nerve cells.

### Example of measuring automatically beating iPS-derived cardiomyocytes

EFS pacing can be applied during calcium measurement (Cal-520AM) in automatically beating iPS-derived cardiomyocytes.

Cell : MyoridgeCarmyA
Dye : 2 µM Cal-520AM
Condition : 1st frequency 0.5 Hz, 2nd frequency 1 Hz




X-axis [time] 00:00.000-03:53.051 Y-axis [raw] 4397/7351

## Applications

### GPCR

FDSS-µCELL v2 is capable of detecting messengers, such as $Ca^{2+}$ and cAMP, which are major contributors to the GPCR signaling system by using fluorescence and luminescence probes. FDSS-µCELL v2 allows simultaneous dispensing and kinetic measurement of compounds in whole microplate wells, thus realizing high throughput screening.

- $Ca^{2+}$ measurement: Fluo-4, Fluo-8, Cal-520, Aequorin
- cAMP measurement: Glo-Sensor

### Ion channel

FDSS-µCELL v2 performs high throughput drug screening using voltage-sensitive fluorescent dyes or fluorescent indicators for different ions.

- $Na^+$ measurement: ANG-2, Corona-Green, Corona-Red, Sodium-Green
- $K^+$ measurement: FluxOR
- $Cl^-$ measurement: MEQ, MQAE, YFP
- Membrane potential measurement: FluoVolt, Di-8-ANEPPS, $DiBAC_4(3)$

### Luminescence

With its high-sensitivity qCMOS sensor, the FDSS-µCELL v2 performs different assays simultaneously using luminescence probes on a single microplate. This allows high-throughput screening without bothersome time lags after substrate addition.

### BRET/FRET

FDSS-µCELL v2 simultaneously performs BRET (bioluminescence resonance energy transfer) measurements, a luminescence-based approach, and FRET (fluorescence resonance energy transfer) measurements, a fluorescence-based approach, on a single microplate using the high sensitivity qCMOS sensor and an automatic filter changer.

- BRET: BRET1, BRET2, NanoBRET®
- FRET: C/Y FRET, VSP, Cameleon

### iPS-cell

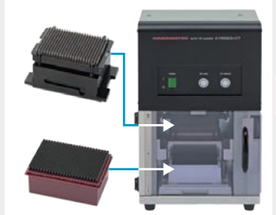
Various differentiated cells have recently been created from iPSC (induced pluripotent stem cell), and this increasingly allows for the conduct of cell-based assays using human-derived native cells. In particular, iPS Cardiotoxicity, iPS Neurotoxicity, and iPS Hematotoxicity assessments have been increasingly performed as safety evaluation of compounds. FDSS-µCELL v2 performs high-throughput toxicity screening.

# Measurement flow for semi-automation

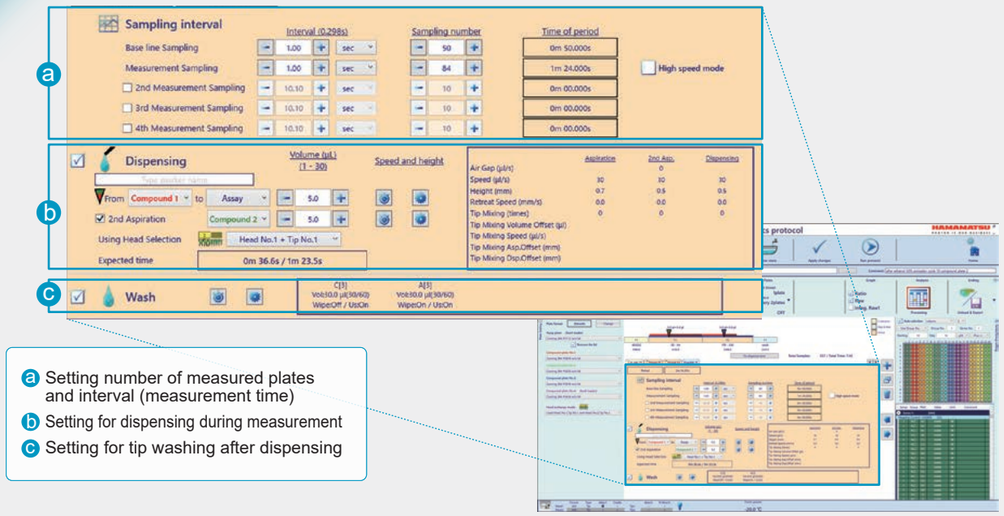


Load the FDSS dedicated dispensing tips to the dispensing unit by using the automatic tip loader. Set the tip-loaded dispensing unit into the FDSS-µCELL v2 unit.

**Tip loading**



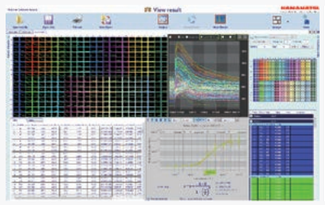
**Head/Plate setting**

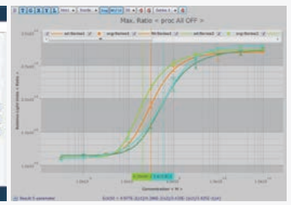


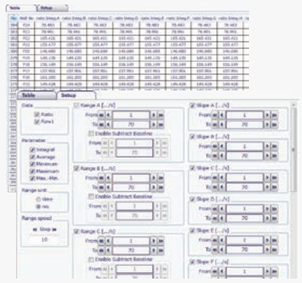

a Setting number of measured plates and interval (measurement time)
b Setting for dispensing during measurement
c Setting for tip washing after dispensing

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

## Various data processing and analysis of measurement results are possible



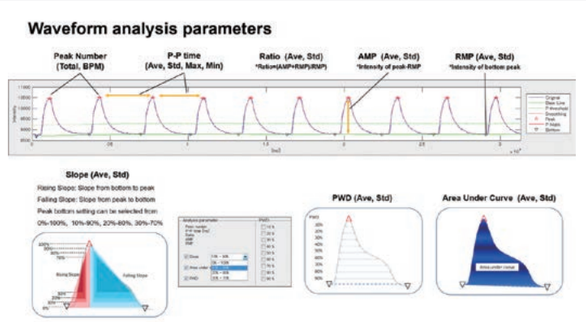




- Spatial correction between wells (spatial uniformity)
- Negative control correction
- Positive control correction
- Baseline subtraction correction (subtract bias)
- IC/EC graph calculation from multiple series (4 or 5 parameters may be selected)
- IC/EC graph calculation using Max, Min, Average and 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





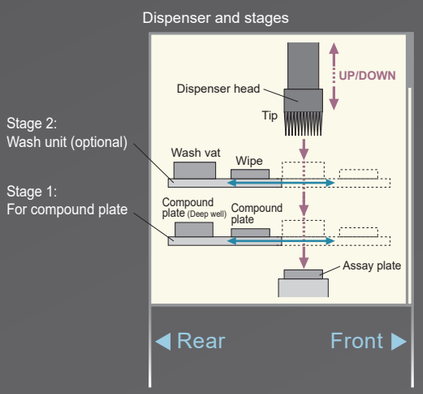

## A wide variety of assay designs are available.

### Compound plate stage

- 2 compound stages available

### Washing stage

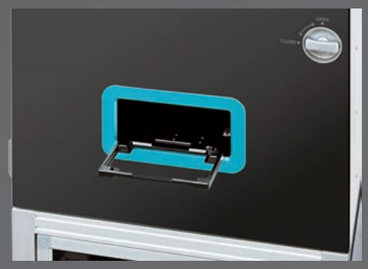
- Overflow washing with chimney plates
- Tip wipe stage is equipped as a standard to blot out water droplets on tips after washing




## Highly flexible plate transfer

### Robot connection

- Semi-automation can be achieved by automatic transfer of assay plate and compound plate
- Automation option enables connection to robots from various venders



# FDSS-µCELL v2 standard configuration

### FDSS-µCELL v2 Kinetic Plate Imager C13299-02

FDSS-µCELL v2 system main unit. Automation upgrade available. Main unit, compound plate stage, washing stage, light source array unit (Fluo-4, FMP), and FDSS software are included.

### Luminescence/fluorescence sensor unit (high sensitivity) C17606-01

High sensitivity qCMOS sensor. Capture whole plate image simultaneously.

### Data analysis unit C7903-13

Control PC for FDSS-µCELL v2. (Computer table is not included.)

### FDSS software Additional offline software license U8524-03A

Used to display, analyze, and output data on devices other than FDSS-µCELL v2 control PC. Windows® 64-bit OS compatible.

# Dispensing units

### Dispensing unit (384 tip type) A10118-26

Dispensing 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

Dispensing 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)

### 384 black tip (10 racks) for FDSS7000/µCELL/-GX A8687-62C

### 96 black tip (10 racks) for FDSS7000/µCELL/-GX A8687-32A


# 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 Light stimulus option U8514-15

Add function of light stimulus measurement to FDSS software.

### FDSS software option High speed acquisition option U8524-11

Software module and protection key enabling high speed capture.

### FDSS software option Export TIFF image option U8524-14

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



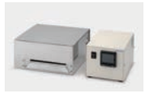
# Options

### Washing unit C17041-01

Unit for washing tips attached to the dispenser head. Includes bath/tube/control pump/washing liquid tank/waste liquid tank/chimney plate (96 tip type, 384 tip type).

### Heater unit A11529-15

Heater is compatible with robot automation. Install inside the main unit to keep the temperature at +35 ˚C to +37 ˚C.



### Fluorescence filter changer unit A8472-07

Unit for change the emission wavelength automatically.

### Automatic tip loader A15623-07

Automatically loading/unloading tips on to dispensing unit.

### C17043-01 EFS pacing unit

Option to give 96 multichannel electrical stimulation to cells. Pace cellular activity and evaluate the effect of drugs added to the cells.

### $CO_2$ incubator with gas mixer A11529-16

Add $CO_2$ incubation function around the assay plate installed in FDSS-µCELL. Includes chamber unit, tubes and gas mixer.

### Barcode reader for assay plate A11529-10

Options for reading the barcode attached to the assay plate. Reads the barcode on the right side of the assay plate on the stage.

### Barcode reader for compound plate A11529-11

Options for reading the barcode attached to the compound plate. Reads the barcode on the right side of the compound plate on the stage.

### Fluorescence sensor unit C17040-01

Sensor for fluorescence measurement.
Capture whole plate image simultaneously.

### Automation unit C17042-01

Options for robot connection. Includes automatic front door/automatic assay plate stage, FDSS external control software.

### Light source array unit (Fluo-4) L11601-01A

LED light source and emission filter for Fluo-4 measurement.
Excitation LED: 470 nm
Emission filter: 540 nm

### Light source array unit (FMP) L11601-02A

LED light source and emission filter for FMP measurement.
Excitation LED: 530 nm
Emission filter: 593 nm

### Light source array unit (VSP-FRET) L11601-03

LED light source and emission filter for membrane potential measurement.
Excitation LED: 385 nm
Emission filter: 465 nm and 565 nm

### Light source array unit (CFP/YFP-FRET) L11601-04

LED light source and emission filter for C/Y FRET measurement.
Excitation LED: 450 nm
Emission filter: 483 nm and 542 nm

### Light source array unit (Fura-2) L11601-07

LED light source for Fura-2 measurement.
Excitation LED: 340 nm and 385 nm
*Use the emission filter for Fluo-4 included in C13299-02

# Recommended configuration for semi-automation

## Standard configuration

- FDSS-µCELL v2 Kinetic Plate Imager C13299-02
  - FDSS-µCELL v2 main unit
  - Compound plate stage
  - Washing stage
  - Light source array unit (Fluo-4, FMP)
  - FDSS software
- Luminescence/fluorescence sensor unit (high sensitivity) C17606-01
- Data analysis unit C7903-13
- Automatic tip loader A15623-07
- FDSS software Additional offline software license U8524-03A

## Dispensing units

- Dispensing unit (96 tip type) A10118-24

- Dispensing unit (384 tip type) A10118-26

## Recommended options

- Washing unit C17041-01
- Heater unit A11529-15
- Fluorescence filter changer unit A8472-07

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.

### Option

EFS pacing unit C17043-01
Light source array unit (VSP-FRET) L11601-03
Light source array unit (CFP/YFP-FRET) L11601-04
Light source array unit (Fura-2) L11601-07

### Software

FDSS software option High speed acquisition option U8524-11
FDSS software option Waveform analysis software for cardiomyocyte U8524-12

## 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

Standard type

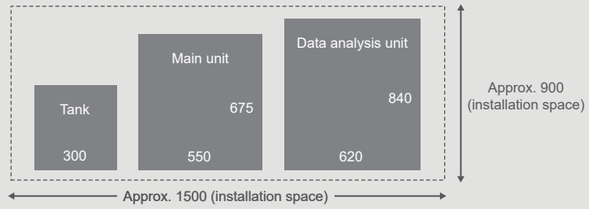
Robot connection type

*To support the robotic integration, Automation unit C17042-01 is required.
Retrofitting is not supported. Please contact your Hamamatsu representative for further information.

*Computer table is not included.

# System footprint

Unit: mm



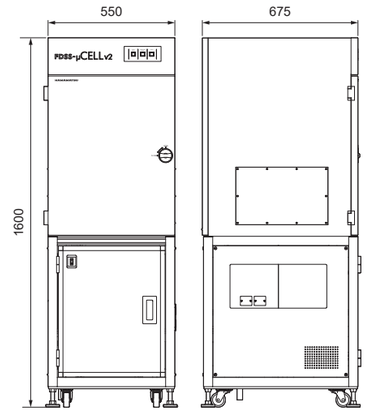

# Specifications

| | | |
|---|---|---|
| Dispense | (96 tip type) A10118-24 | 10 µL to 200 µL |
| | (384 tip type) A10118-26 | 1 µL to 30 µL |
| Sensor | | Hamamatsu qCMOS sensor dedicated to FDSS |
| Sampling rate | | 10 Hz (10 data point per second) |
| | | Maximum with U8524-11 option 120 Hz (120 data point per second) |
| Sampling interval | | 0.1 s minimum |
| | | With U8524-11 option 0.0083 s minimum |
| Light source | | 470 nm excitation and 540 nm emission |
| | | 530 nm excitation and 593 nm emission |
| Plate positions | | One stage for assay plate, two stages for compound plate |
| Adaptable microplate | | Clear bottom black 96/384 plates (SBS format height 8 mm to 15 mm) |
| Tip/Plate loading | | Manual loading |
| Number of sampling data point | | 1 to 50 000 sampling |
| Power supply specification | | Input power supply: AC 100 V to AC 240 V, Frequency: 50 Hz/60 Hz |
| Power consumption when AC 100 V to AC 120 V (Data Analysis unit and FDSS-µCELL main unit with heater) | | Approx. 1300 VA (Data analysis unit: approx. 500 VA, dispenser main unit: approx. 300 VA, heater unit, approx. 500 VA) |
| Ambient operating temperature | | +15 ºC to +30 ºC |
| Dimension/weight | Main unit (Data analysis unit is not included) | 550 mm (W) × 675 mm (D) × 1600 mm (H) / approx. 200 kg |

# Dimensional outlines

Unit: mm

●Main unit Weight: Approx. 200 kg



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