Images are courtesy of the following institutions:

"Brainbow" mouse brain stem
*Courtesy of the laboratories of Jeff W. Lichtman and Joshua R., Sanes Harvard University MCB Department and the Center for Brain Science (cover page)*

Glandular and non-glandular leaf hairs (trichomes) of Pelargonium
*Courtesy of Dr Ferhan Ayaydin, Cellular Imaging Laboratory, Biological Research Center, Szeged, Hungary (1, on page 1)*

Pilidium larva of Micrura alaskensis
*Courtesy of Dr Svetlana Maslakova of the University of Washington and Dr. Mikhail V Matz of the Whitney Laboratory for Marine Bioscience, University of Florida (2, on the page 1)*

CFP and YFP labelling of glycerol-cleared fruit fly brain taken with 30x silicone objective
*Courtesy of Dr.Hidehiko Inagaki, Anderson lab, California Institute of Technology (3, on page 1)*

Cultured nerve cells derived from the mouse hippocampus
*Courtesy of Dr Koji Ikegami, Dr. Mitsutoshi Setou, Molecular Geriatric Medicine, Mitsubishi Kagaku Institute of Life Sciences (5, on page 1, bottom of page 2)*

Drosophila, Stage 14
*Courtesy of Dr Tetsuya Kojima, Laboratory of Innovational Biology, Department of Integrated Biosciences Graduate School of Frontier Sciences, University of Tokyo (top of page 2)*




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OLYMPUS

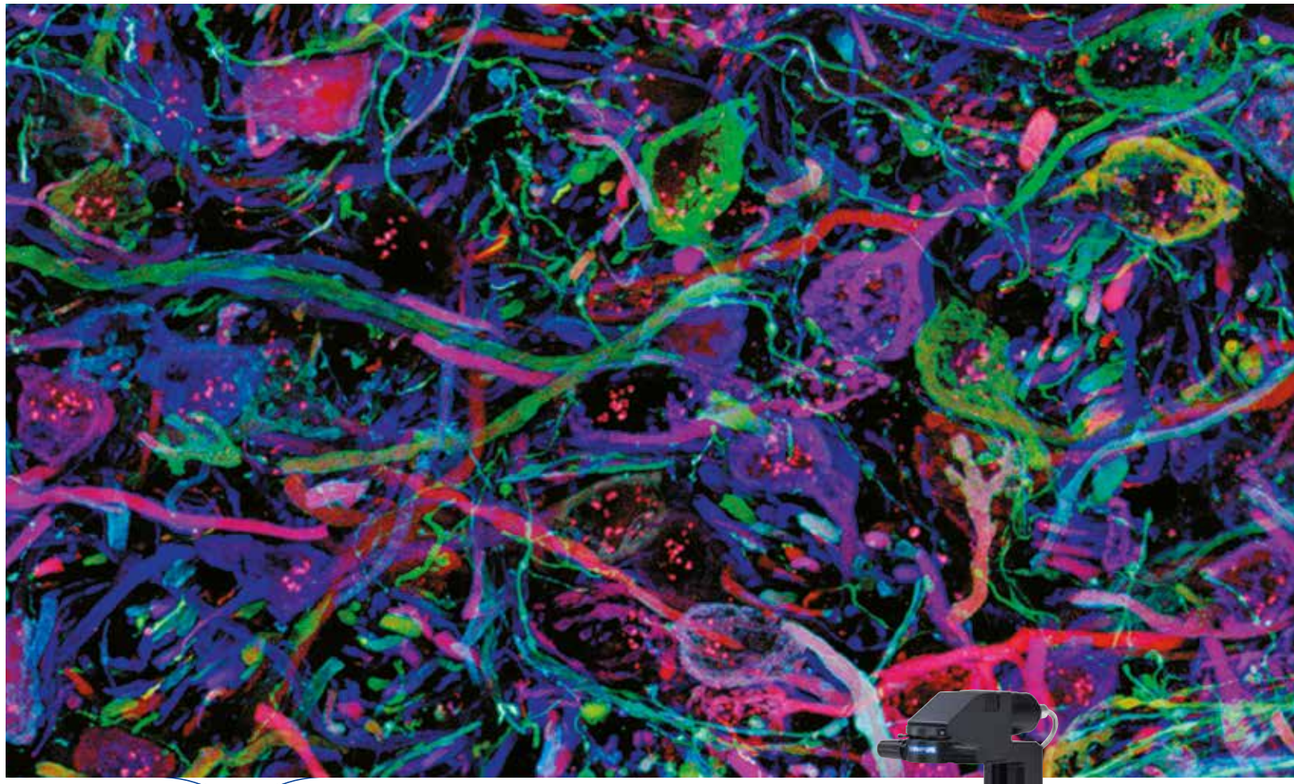
Your Vision, Our Future

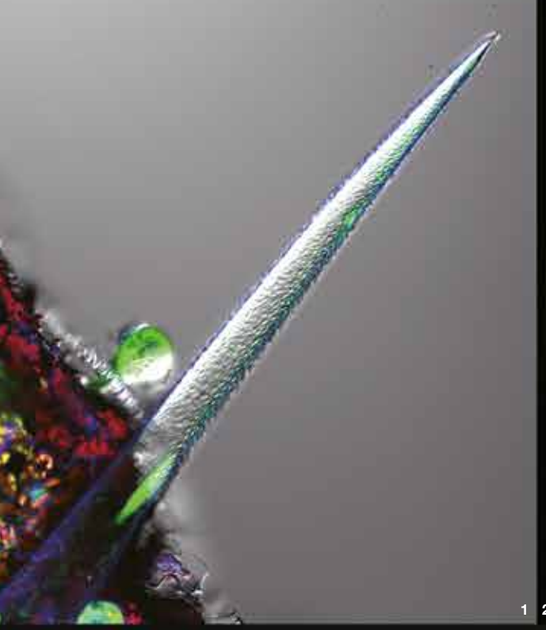
Biological confocal laser scanning microscope

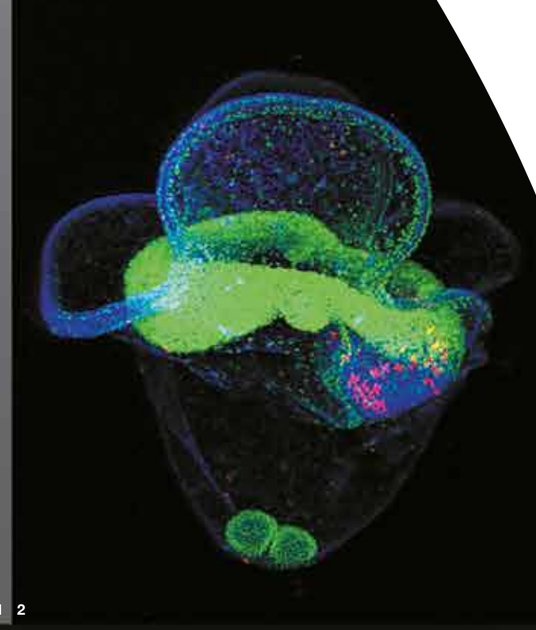
# FV1200

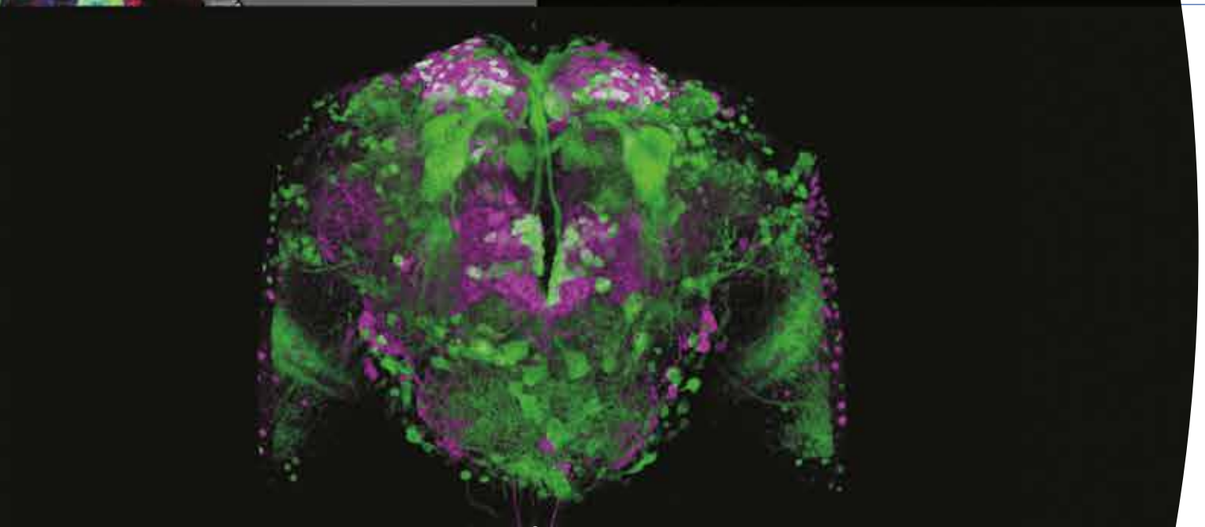
## FLUOVIEW

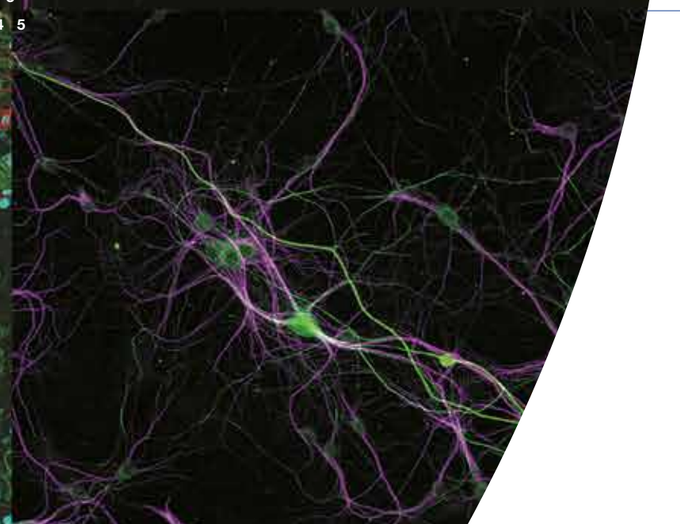
***High-performance laser scanning microscope for live cell imaging, combining accuracy, sensitivity and laser stimulation***











1 2 3 4 5

FV1200 (IX83 configuration)

# THE FLUOVIEW FV1200: HIGH-QUALITY LIVE CELL IMAGING WITH HIGH-LEVEL RELIABILITY

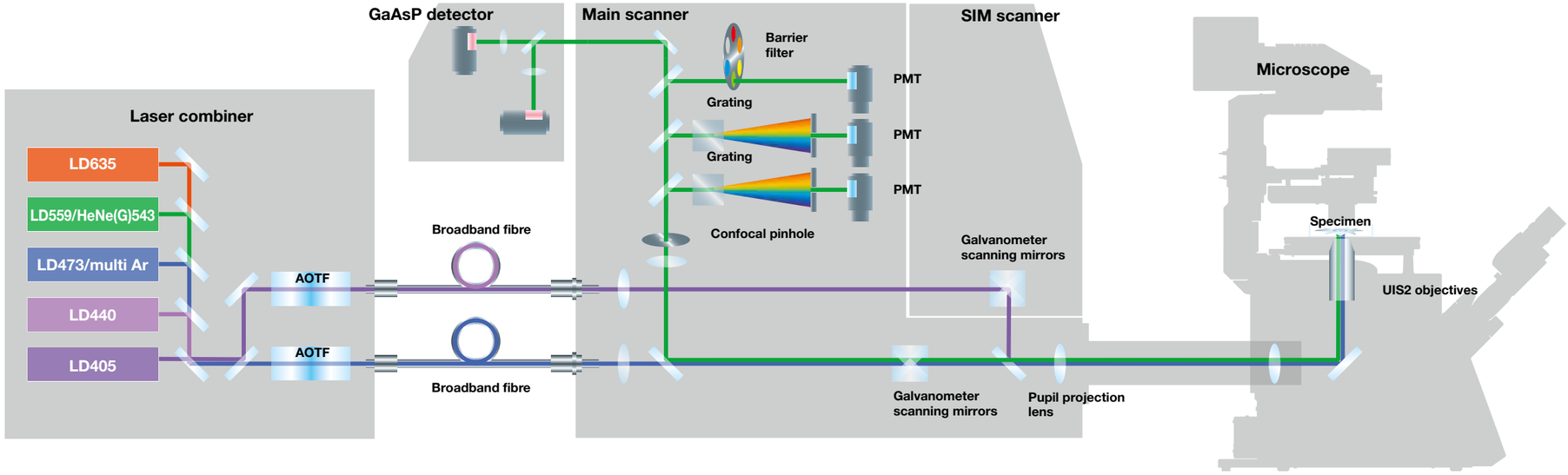
The FLUOVIEW FV1200 biological laser scanning microscope builds on renowned Olympus optics, enhancing sensitivity through a new galvanometer coating and GaAsP detector technology. With the new IX83 microscope, the FV1200 has been optimised for some of the most challenging live cell imaging experiments, implementing real-time Z-drift compensation and touch panel control.

From the high-resolution, confocal observation of fixed samples, with up to 5 simultaneous fluorescent detection channels, through to high-speed fluorescent measurements and the simultaneous stimulation of living cells, the FV1200 offers advances in confocal system performance while providing the speed and sensitivity required for live cell imaging, with minimal risk of damage to living specimens.

What's more, the FLUOVIEW FV1200 supports an array of optional functions – such as the ability to measure cellular molecular diffusion coefficients – extending the exceptional performance from visualisation and stimulation through to precision measurement.

FV1200 (BX61WI configuration)

# EXCELLENT PRECISION, SENSITIVITY AND STABILITY FLUOVIEW FV1200 ENABLES PRECISE, BRIGHT IMAGING WITH MINIMUM PHOTOTOXICITY




## Laser combiner/fibre

### Diode laser
Greater stability, longer service life and lower operating costs are achieved using diode lasers.

### Laser feedback control
Scanner unit is equipped with laser power monitor for feedback control, ensuring stable laser output.

### Laser compatibility
Diode laser: 405 nm, 440 nm, 473 nm, 559 nm, 635 nm
Gas laser; Multi Ar laser (458 nm, 488 nm, 515 nm)
HeNe (G) laser (543 nm)

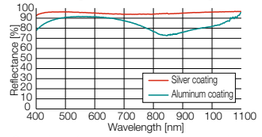
### Broadband fibre
Broadband fibre connection for 405–635 nm lasers, to achieve an ideal point light source with minimal colour shift and position shift between images.

### Laser combiner – two versions available
- Dual fibre-type combiner for observation and simultaneous photostimulation
- Single fibre-type combiner for observation and sequential photostimulation

## Scanners and detection system

### Choice of main scanner
Select the scanner to match the purpose at hand by choosing either the spectral scan unit that achieves 2 nm resolution for high-precision spectroscopy or the filter scan unit featuring high-quality filters.

### High-performance detection system
High performance and high S/N ratio optical performance are achieved through the smooth integration of a pupil projection lens, a high-performance photomultiplier tube, silver-coated galvanometer scanning mirrors with high reflectance across a broad range of wavelengths, and an analogue processing circuit that reduces noise to an absolute minimum. Furthermore, because the system enables image acquisition of this quality with minimal laser power, phototoxicity is also significantly reduced.




Comparison of galvano mirrors, silver vs. aluminium
* Reflectance of two galvanometer scanning mirrors

### High-sensitivity detector
A high-sensitivity detector employing gallium phosphide (GaAsP) is also available as an option.

## Optical system

### UIS2 objectives
Olympus UIS2 objectives offer world-leading, infinity-corrected optics that deliver unsurpassed optical performance over a wide range of wavelengths.

### High S/N ratio objectives with suppressed autofluorescence
Olympus offers a range of high numerical aperture objectives with improved fluorescence S/N ratio, including objectives with silicone immersion, exceptional correction for chromatic aberration, total internal reflection fluorescence (TIRF), and oil and water immersion objectives.

## Features of the NEW IX83

### Discover improved expandability and rigidity with the IX83
The Z-drive guide with high thermal rigidity is installed near the revolving nosepiece to further augment the stability of the IX83 in the face of heat and vibration, and improve the results of time-lapse imaging. Furthermore, when combined with the IX3-ZDC Z-drift compensator and the motorised stage, high-precision multipoint time-lapse imaging is made possible without the risk of focus drift or misalignment.


### Switch observation methods with a tap of the touch panel
A single tap is all it takes to manage changes in magnification, switch between optical elements, and make adjustments to illumination. Not only does the controller make it a cinch to carry out complex microscope operations, it can also save settings for observation modes.


### The U-MCZ controller executes procedures from a preferred position
The controller allows monitor observation to be executed in your preferred position and mode, while simple key arrangement allows confident control – even under darkroom conditions.

### The U-HGLGPS fluorescence illumination source minimises the impact of lamp heat to both microscope and specimen
Featuring a high-pressure mercury lamp with an average life of 2,000 hours, this user-friendly fluorescence illumination source incorporates a low chromatic aberration adapter that cleverly compensates when switching between excitation wavelengths.

# A STEP UP IN SENSITIVITY
# THE FV1200 CAPTURES SUBTLE CHANGES IN LIVE CELLS, WITH HIGHLY SENSITIVE DETECTION IMMEDIATELY FOLLOWING PHOTO STIMULATION

### High performance across a wide range of wavelengths

Galvanometer scanning mirrors on the main scanner feature an anti-oxidative silver coating that increases reflection efficiency for excitation and emission filters from 5% to 15% in the visible spectrum, and by a maximum of 22% in the near-infrared spectrum. The standard, onboard multi-alkali photomultiplier tubes with a high dynamic range can also be combined with the optional, ultra high-sensitivity GaAsP photomultiplier tubes to further increase the freedom for experimental set-ups across a broad range of wavelengths.

## Two versions of light detection system that set new quality standards

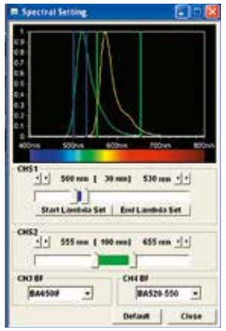
### Spectral-based detection

#### High performance

Spectral detection using gratings for 2 nm wavelength resolution and image acquisition matched to fluorescence wavelength peaks. User-adjustable bandwidth of emission spectrum for acquiring bright images with minimal crosstalk.

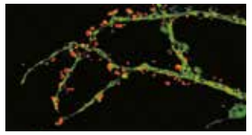
#### Precise spectral imaging

The spectral detection unit uses a grating method that offers linear dispersion compared with prism non-linear dispersion. The unit provides a uniform 2 nm wavelength resolution across the entire detection spectrum and high-performance photomultiplier tube detectors. Fluorescence separation can be achieved through unmixing, even when crosstalk is generated by multiple fluorescent dyes with similar peaks. A standard third filter channel is provided without a grating, allowing researchers greater flexibility and sensitivity.




EGFP–EYFP fluorescence separation



**EGFP (dendrite)—EYFP (synapse) XYλ.**
Wavelength detection range: 495 nm–561 nm in 2 nm steps
Excitation wavelength: 488 nm

*Courtesy of Dr Shigeo Okabe*
*Department of Anatomy and Cell Biology,*
*Tokyo Medical and Dental University*

### Filter-based detection

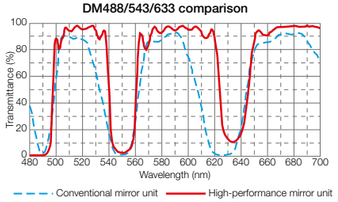
#### Enhanced sensitivity

Three-channel scan unit with detection system featuring hard coated filter base. High transmittance and high S/N ratio optical performance is achieved through the integration of a pupil projection lens within the optics, and the use of a high-performance photomultiplier and an analogue processing circuit with minimal noise.

#### High-performance filters deliver outstanding separation

Special coatings deliver exceptionally sharp transitions to a degree never achieved before, for acquisition of brighter fluorescence images.

DM488/543/633 comparison



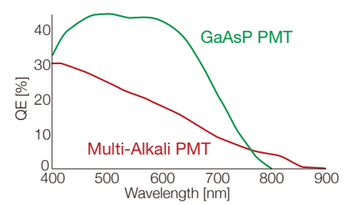

## The high-sensitivity GaAsP detector module

### Cooled GaAsP Photodetector

#### Ultra-high sensitivity detector with GaAsP photomultiplier tubes further enhances quantum efficiency

The ultra high-sensitivity detector makes it possible to view samples that were simply too dim to view with conventional equipment. The GaAsP PMT incorporates 2 channels and combines the images with a further 3 built-in channels, as well as the channel transmitted from the detector. Maximum quantum efficiency is 45%, Peltier cooling holds noise down by 20%, and high S/N ratio images can be obtained under exceptionally low excitation light.

Standard quantum efficiencies of detector technologies




## SIM scanner allows simultaneous photostimulation during time-lapse imaging

### SIM scanner unit

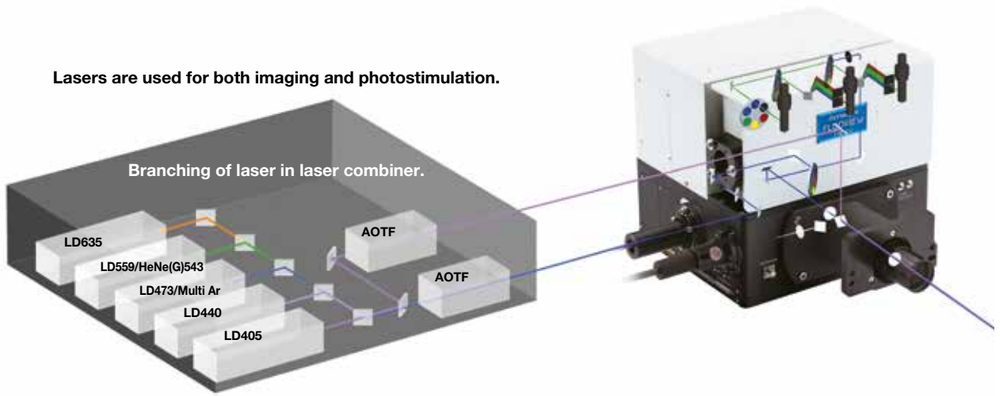
#### Dedicated scanner for photostimulation

The combination of the main and photostimulation scanner provides essential flexibility for tracking the diffusion or the transport of fluorescence-labelled molecules or for marking specific live cells.The dual-fibre laser combiner makes it possible to use imaging lasers for photostimulation.

#### Simultaneous photostimulation and imaging

Performs simultaneous photostimulation and imaging to acquire images of immediate cell responses to stimulation in photobleaching experiments.

**Lasers are used for both imaging and photostimulation.**



# ENHANCED RELIABILITY FOR LIVE CELL IMAGING MEETS DEMANDS FOR DEEPER 3D STRUCTURING, TIME-LAPSE IMAGING AND PRECISION MEASUREMENT

## Silicone immersion objectives for live cell imaging deliver high-resolution observation at depth

### Silicone immersion objective

#### High-resolution silicone immersion objective

Silicone immersion objectives can be designed with a larger numerical aperture (NA) than water immersion objectives, increasing image resolution and brightness.

#### Complete the range with the UPLSAPO40XS

This new objective with intermediate magnification and high NA performance supports continuous focus with the IX3-ZDC. Continuous high-resolution observation during extended time-lapse imaging.

Magnification: 40x
NA: 1.25 (silicone oil immersion)
W.D.: 0.3 mm
Cover glass thickness: 0.15–0.19 mm
Operation temperature: 23 ºC–37 ºC

#### UPLSAPO30XS: for a broader view and greater depth

Magnification: 30x
NA: 1.05 (silicone oil immersion)
W.D.: 0.8 mm
Cover glass thickness: 0.13–0.19 mm
Operation temperature: 23 ºC–37 ºC

#### UPLSAPO60XS: for 3D with superior resolution

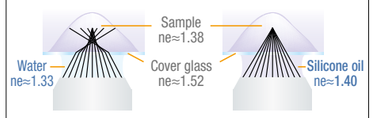
Magnification: 60x
NA: 1.30 (silicone oil immersion)
W.D.: 0.3 mm
Cover glass thickness: 0.15–0.19 mm
Operation temperature: 23 ºC–37 ºC

#### SIL300CS-30CC: for extended time-lapse imaging

Refractive index: ne=1.406, 23 ºC
Net 30 ml
Low autofluorescence

**Refractive index is important with deep tissue observation**

In deep tissue observation, image quality depends on keeping the refractive index of the sample and the immersion medium as close to each other as possible.

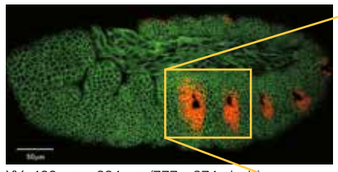



**Water immersion objective**

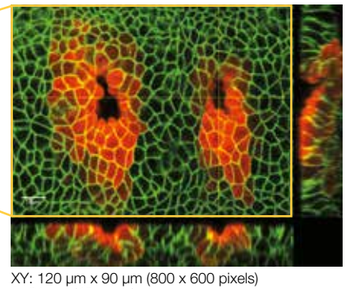
When working with a water immersion objective, the difference between the refractive index of the samples and the water results in spherical aberration in deep tissue, causing resolution to deteriorate and fluorescence to become dim.

**Silicone immersion objective**

When working with a silicone immersion objective, the difference between the refractive index of the samples and silicone oil is minimal. So it achieves brighter fluorescence images with higher resolution for deep tissue.



XY: 466 µm x 224 µm (777 x 374 pixels)



XY: 120 µm x 90 µm (800 x 600 pixels)
Z: 21 µm (42 slices)

Confocal image of a Drosophila embryo at stage 11 expressing the tracheal marker trh-LacZ (Cy3, red) and the cell membrane marker Dlg (Alexa488, green). Enlarged view shows invaginating tracheal placode.

*Courtesy of Dr Takefumi Kondo, Dr Shigeo Hayashi, Laboratory for Morphogenetic Signaling, RIKEN Center for Developmental Biology*

## Enhance the reliability of colocalisation analysis with the low chromatic aberration objective

### Low chromatic aberration objective

#### Acquire and analyse colocalisation imaging with the PLAPON60XOSC

This oil immersion objective minimises lateral and axial chromatic aberration in the 405–650 nm spectrum, while supporting the reliable acquisition and measurement of colocalisation images with superior positional accuracy. The objective also compensates for chromatic aberration through near infrared of up to 850 nm, making it an optimal choice for near infrared fluorescence observation.

**Low chromatic aberration objective**

Magnification: 60x
NA: 1.4 (oil immersion)
W.D.: 0.12 mm
Chromatic aberration compensation range: 405–650 nm
Optical data provided for each objective.

**Performance comparison of PLAPON 60×OSC and UPLSAPO 60×O**

| | PLAPON 60×OSC | UPLSAPO 60×O |
|---|---|---|
| Axial chromatic aberration (Z-direction)<br>Compared for PSF fluorescent beads<br>(405 nm, 633 nm) | Approx. 0 µm | Approx. 0.5 µm |
| Lateral chromatic aberration (X-Y direction)<br>Compared for PSF fluorescent beads<br>(405 nm, 488 nm, 633 nm) | Approx. 0.1 µm | Approx. 0.2 µm |
| 3D image<br>Tubulin in Ptk2 cells labelled with two colours<br>(405 nm, 635 nm) and compared | | |

## Maintain high-precision focus through extended time-lapse imaging

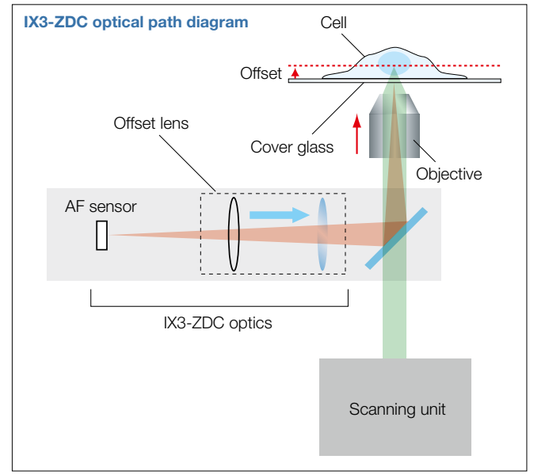
### Z-drift compensation system

#### The IX3-ZDC Z-drift compensator offers a range of functions for autofocusing

The IX3-ZDC uses low phototoxicity IR light to detect the correct focus position, as set by the user. One-shot AF mode allows several focus positions to be set as desired for deeper samples, enabling efficient Z-stack acquisition in multi-position experiments. Continuous AF mode keeps the desired plane of observation precisely in focus, avoiding focus drift caused by temperature changes due to perfusion or reagent addition, and making it ideal for measurements such as TIRF that requires more stringent focusing.

#### ZDC one-shot function detects focus fast, even in high-magnification observation

IX3-ZDC focus detection and tracking can be performed via the innovative touch panel independent of software. There's also a focus search function supported by a cell-safe, near-infrared laser enabling instant focusing on samples.



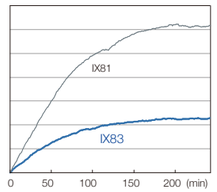

### Rigidity

#### Tackle the conflicting requirements of expandability and rigidity with the IX3

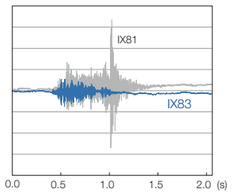
A Z-drive guide installed near the revolving nosepiece combines high thermal rigidity with the stability of a wrap-around structure to significantly reduce the impact of heat and vibration and improve the quality of time-lapse imaging. Integration with the IX3-ZDC Z-drift compensator permits imaging without focus drift or misalignment, even through temperature changes due to the addition of reagents or a perfusion device. Furthermore, combination with a motorised stage that enables multipoint registration makes high-precision multipoint time-lapse imaging possible.

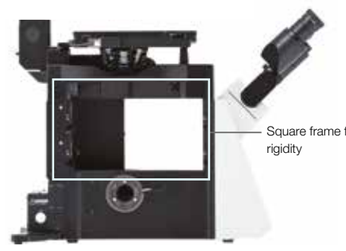
IX83 : two-deck system + IX3-ZDC

Thermal drift displacement



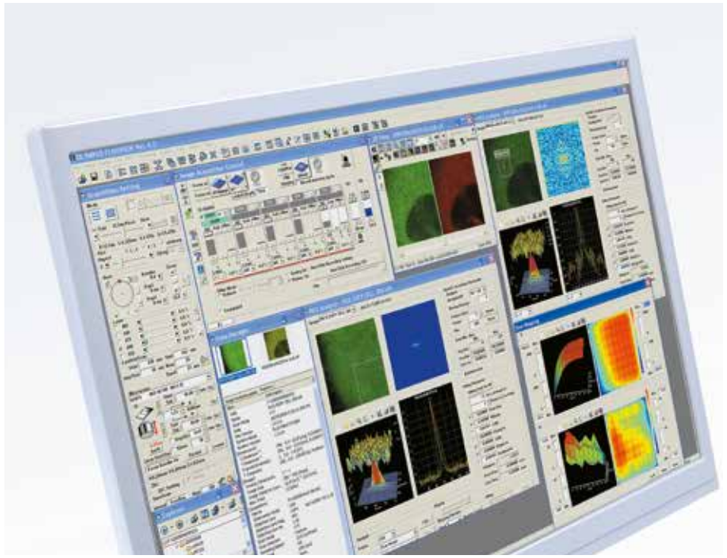

Periodic damping



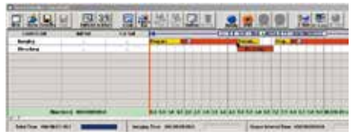

* UPLSAPO40XS: scheduled to be available 2013.

# USER-FRIENDLY SOFTWARE TO SUPPORT YOUR RESEARCH

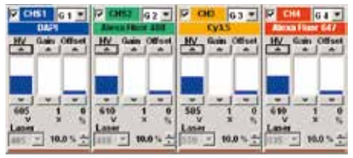


### Image acquisition by application
User-friendly icons offer quick access to functions, for image acquisition according to the application (XYZ, XYT, XYZT, XYλ, XYλT).


### Time controller
Precisely synchronises different experimental protocols including FRAP, FLIP and FRET through acceptor photobleaching and time lapse. Save and reopen settings for later use.

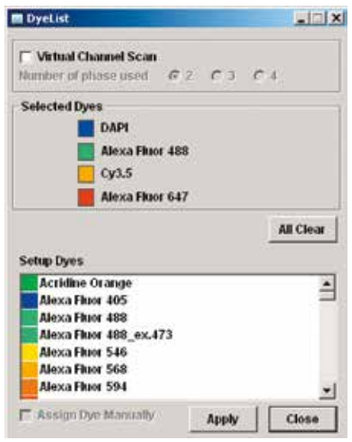


### Reuse function
Open previously configured scanning conditions and apply them to new or subsequent experiments.

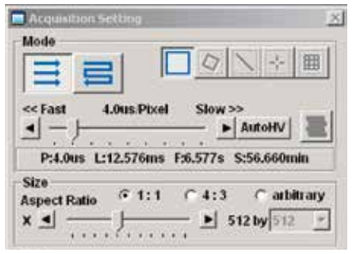



### Dark application skin
The use of the dark application skin mode minimises the influence of the screen brightness for the imaging process.

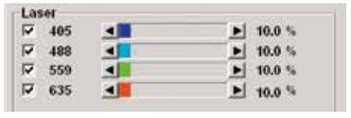
### Configurable emission wavelength
Select the dye name to set the optimal filters and laser lines.




### Wide choice of scanning modes
Several scanning modes available, including ROI, point and high-speed bi-directional scanning.



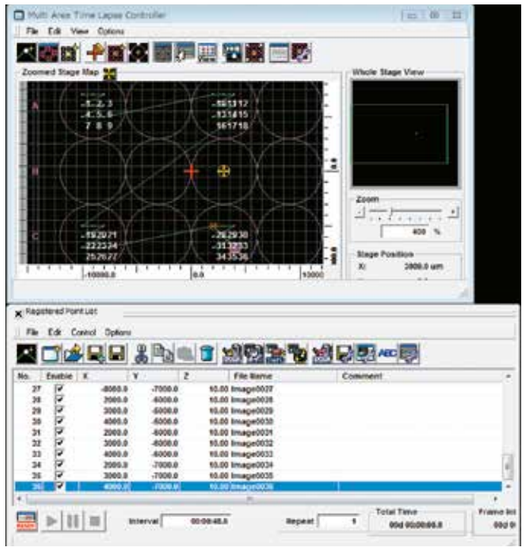

### Configurable excitation laser power
Easily adjust the optimum laser power for each specimen (live cells and fixed specimens).

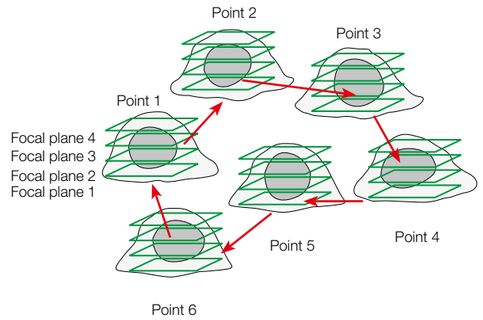



# MULTI-DIMENSIONAL TIME LAPSE

### Multi-dimensional time lapse imaging with outstanding positional accuracy
The FLUOVIEW FV1200 can be used for ideal multi-dimensional time-lapse imaging during confocal observation, using multi-area time-lapse software to control the Motorised XY stage and IX3-ZDC Z-drift compensator.

### Significantly improved multi-point time-lapse throughput
Equipped with motorised XY stage for repeated image acquisition from multiple points scattered across a wide area. The system efficiently analyses changes over time of cells in several different areas, capturing large amounts of data during a single experiment for increased efficiency. Microplates can be used to run parallel experiments, which significantly improves throughput for experiments that require long-term observation.

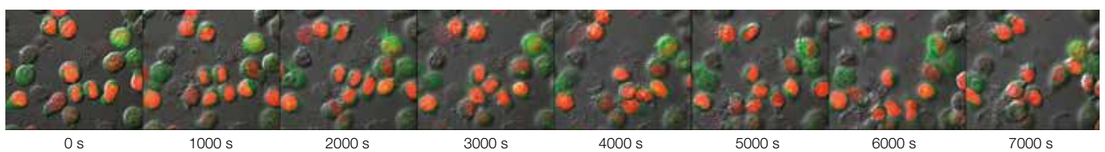



Supports repeated image acquisition from multiple areas in a single microplate well.

Multi-point time-lapse software

### Maintain cell activity over a long period
$CO_2$ incubator control keeps the environment inside the tissue culture dish completely stable. The environment is maintained precisely at 37 °C,with 90% humidity and 5% $CO_2$ concentration.




Human lymphoblast cells TK6

*Courtesy of Masamitsu Honma, Dir.*
*Biological Safety Research Center Div. of Genetics and Mutagenesis I, National Institute of Health Sciences*

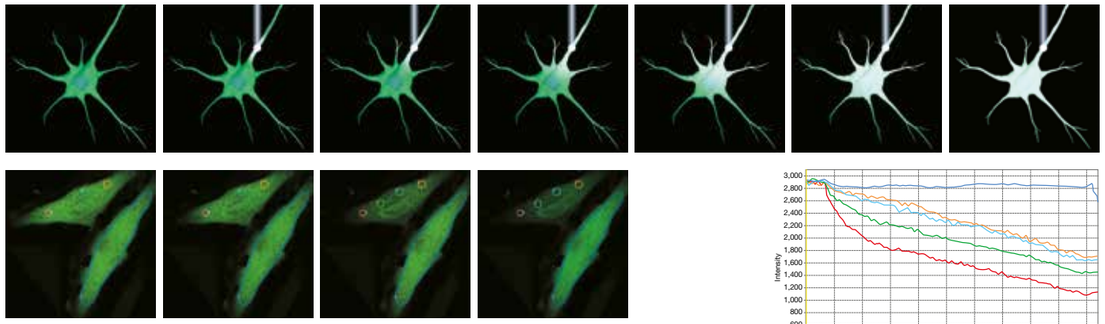
# SIMULTANEOUS PHOTOSTIMULATION

## Combined photostimulation and imaging with microsecond precision control

The SIM scanner system combines the main scanner with a photostimulation scanner. Control of the two independent beams enables simultaneous stimulation and imaging in order to capture reactions during stimulation. Multi-stimulation software is used to continuously stimulate multiple points with laser light for the simultaneous imaging of the effects of stimulation on the cell.

## FLIP – fluorescence loss in photobleaching

Fluorescence loss in photobleaching (FLIP) combines imaging with the continuous bleaching of a specific region to observe the diffusion of a target protein within a cell. The changes in the image over time make it possible to observe the location of structural bodies that inhibit the diffusion of the molecule.

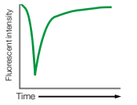





Specimen: HeLa cell, GFP (free), 488 nm excitation (multi-argon laser)
Image acquisition time: 100 ms bleach time: 100 s continuously, 405 nm bleaching

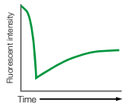
## FRAP—Fluorescence Recovery after Photobleaching

Exposure of fluorescently labelled target proteins to strong laser light causes their fluorescence to fade locally. Fluorescence recovery after photobleaching (FRAP) is used to observe the gradual recovery of fluorescence intensity caused by protein diffusion from the area surrounding the bleached region. By examining the resulting images, it is possible to characterise the diffusion speed of the molecule, and the speed of binding and release between the molecule and cell structures.



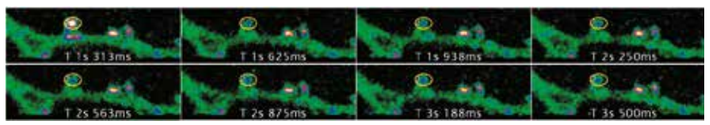

### Example: fluorescence recovery without interactions

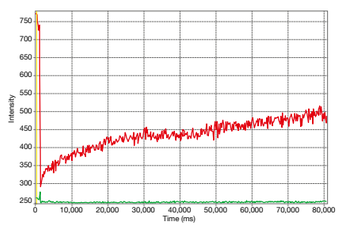
If the protein can freely diffuse, the bleached region recovers its fluorescence at a high speed due to Brownian motion.




### Example: fluorescence recovery with interactions

If the protein is strongly bound to a structure, or forms part of a large protein complex, the bleached region recovers its fluorescence at a slower rate relative to the unbound state.

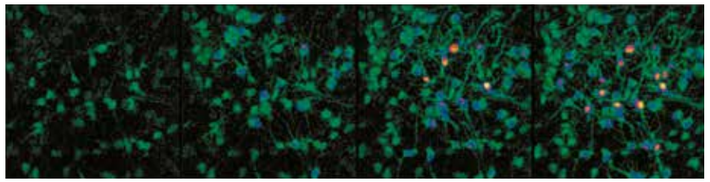


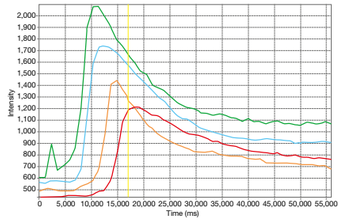




Specimen: Hippocampal neurons, Shank-GFP stain, 488 nm excitation (multi-argon laser)
Image acquisition time: 100 ms Bleach time: 80 ms, 488 nm excitation (Sapphire 488 laser)
*Data courtesy of Dr Shigeo Okabe,*
*Department of Anatomy and Cell Biology, Tokyo Medical and Dental University*

## Uncaging

A 405 nm laser is optional for uncaging with the SIM scanner system. Caged compounds can be uncaged point by point, or within a region of interest, while the main scanner of the FV1200 captures images of the response with no time delay.



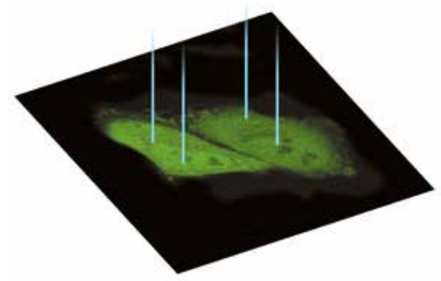


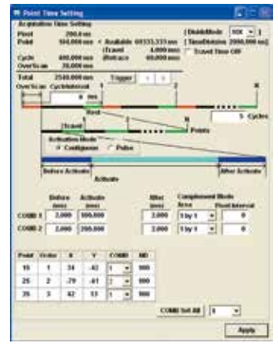

Caged glutamate
Fluorescent calcium indicator Fluo-3 in HeLa cells. Image acquisition at 1-second intervals.
Using the caged compound Bhcmoc-Glutamate, an increase in the calcium ion concentration inside the cell can be observed in response to glutamate stimulation, released via 405 nm laser illumination.
*Data courtesy of Dr Hiroshi Hama, Dr Atsushi Miyawaki*
*RIKEN Brain Science Institute Laboratory for Cell Function Dynamics*
*Caged compound Bhcmoc-Glutamate presented by Dr Toshiaki Furuta,*
*Department of Science, Toho University*

## Multi-stimulation software

### High-speed multipoint scans

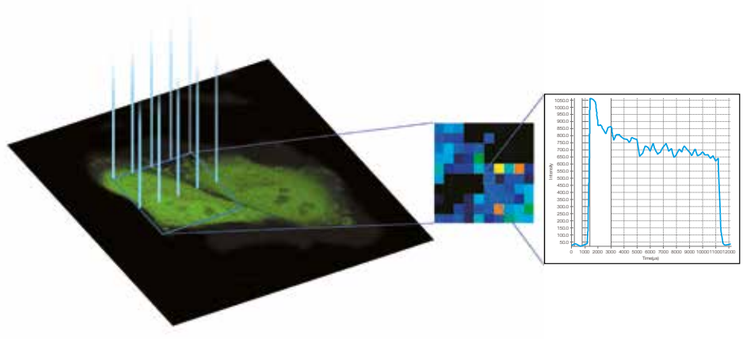
Users can designate the number of points on an image for light stimulation. Stimulation timing, duration and intervals can be defined in the magnitude of µs and the user can programme the experiment with continuous or pulse stimulation. The same software also provides features that allows extended multiple points surrounding one single point to cover a small area.





### Mapping scans

Light stimulation can be applied to a rectangular region of interest. Software control of the stimulation of each point assures that neighbouring points will not be excited. This allows the user to observe the reaction of a sample more accurately. Changes in intensity from those points can be processed as a mapped image or graph.



# DIFFUSION MEASUREMENT PACKAGE

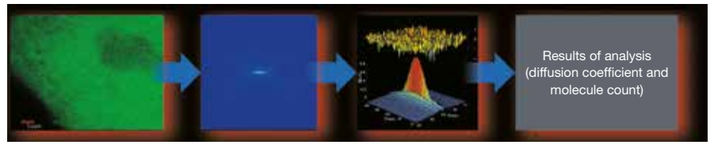
## Diffusion measurement package extends analytical capabilities

This optional software module enables data acquisition and analysis to investigate molecular interactions and concentrations by calculating the diffusion coefficients of molecules within the cell. Diverse analytical methods (RICS/ccRICS, point FCS/point FCCS and FRAP) cover a wide range of molecular sizes and speeds.

## RICS – raster image correlation spectroscopy

Raster image correlation spectroscopy (RICS) is a new method for analysing the diffusion and binding dynamics of molecules in one complete image. RICS uses a spatial correlation algorithm to calculate diffusion coefficients and the number of molecules in specified regions. Cross correlation RICS (ccRICS) characterises molecular interactions using fluorescense labelled molecules in two colours.

**RICS analytical method**

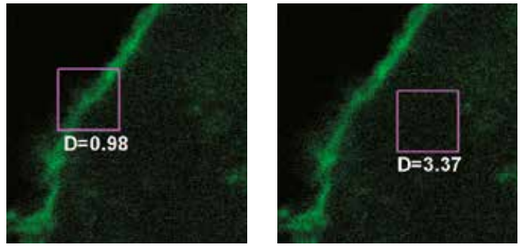



## Comparison of diffusion coefficients for EGFP fusion proteins near to cell membranes and in cytoplasm

RICS can be used to designate and analyze regions of interest based on acquired images.
EGFP is fused with protein kinase C (PKC) for visualisation, using live cells to analyse the translocation with RICS. The diffusion coefficient close to cell membranes was confirmed to be lower than in cytoplasm, after stimulation with phorbol myristate acetate (PMA). This is thought to arise from the mutual interaction between PKC and cell membrane molecules in cell membranes.
In addition to the localisation of molecules, RICS analysis can simultaneously determine changes in the diffusion coefficient, for a detailed analysis of various intracellular signalling proteins.

**At cytoplasmic membrane**
**Diffusion coefficient: D=0.98 μm²/s**

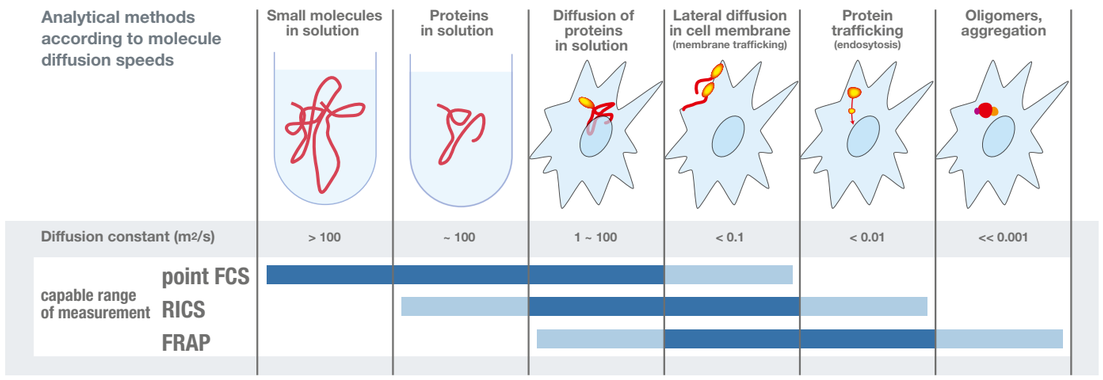
**In cytoplasm**
**Diffusion coefficient: D=3.37 μm²/s**




Sample image:
HeLa cells expressing EGFP fusion PKC (after PMA stimulation)

## FRAP analysis

The Axelrod analytical algorithm is used as a FRAP analysis method. The algorithm is used to calculate diffusion coefficients and the proportions of diffusing molecules.





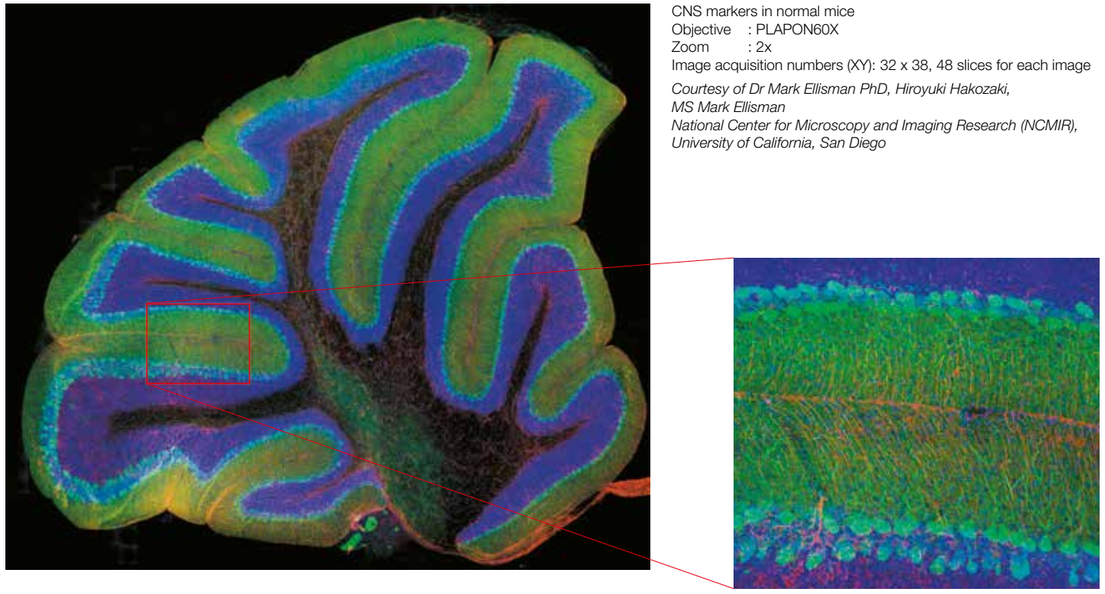

# 3D MOSAIC IMAGING

## High-level magnification with high resolution for the broad-scope imaging of large-scale specimens

Mosaic imaging is performed using a high-magnification objective to acquire continuous 3D (XYZ) images of adjacent fields of view using the motorised stage and utilising proprietary software to assemble the images. The entire process, from image acquisition to tiling, can be fully automated.

## Mosaic imaging for 3D XYZ construction

Composite images are quickly and easily prepared using the stitching function, to form an image over a wide area. 3D construction can also be performed by acquiring images in the X, Y and Z directions. Tiled images can be enlarged in sections without losing resolution. Particularly useful for “connectome” or “brain mapping” or similar projects requiring large-area scanning at high resolution. Tiling functions include true stitching and smoothing options for improved seamless images.

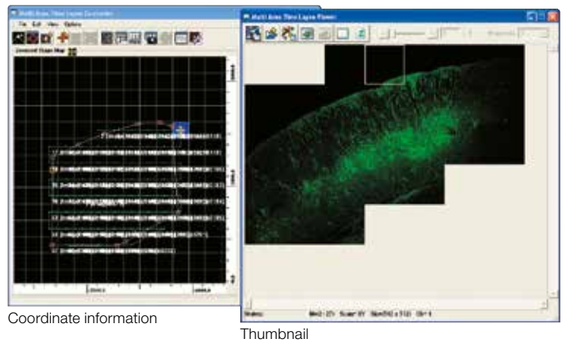


CNS markers in normal mice
Objective : PLAPON60X
Zoom : 2x
Image acquisition numbers (XY): 32 x 38, 48 slices for each image

*Courtesy of Dr Mark Ellisman PhD, Hiroyuki Hakozaki, MS Mark Ellisman*
*National Center for Microscopy and Imaging Research (NCMIR), University of California, San Diego*

## Automated from 3D image acquisition to mosaic imaging

Multi-area time-lapse software automates the process from 3D image acquisition (using the Motorised XY stage) to stitching. The software can be used to easily register wide areas, and the thumbnail display provides a view of the entire image acquired during the mosaic imaging process.



Coordinate information
Thumbnail

# ACCESSORY UNITS THAT SUPPORT AN ARRAY OF APPLICATIONS

## Laser systems

The multi-combiner enables combinations with all of the following diode lasers: 405 nm, 440 nm, 473 nm, 559 nm and 635 nm. The system can also be equipped with the conventional multiline Ar laser and HeNe(G) laser.

**Dual type**

The multi-combiner outputs laser light with two fibres. Light can be used for both observation and photostimulation.

**Single type**

Single-channel laser output. AOTF is standard equipment.

## Illumination units

Conventional illumination modules are designed for long-duration time-lapse experiments. Since light is introduced through fibre delivery systems, no heat is transferred to the microscope.

**Fluorescence illumination source/U-HGLGPS**

The pre centred fluorescence illumination source requires no adjustment and has an average lifespan of 2,000 hours.

**Transmitted light detection unit**

External transmitted light photomultiplier detector and 100 W halogen conventional illumination, integrated for both laser scanning and conventional transmitted light Nomarski DIC observation. Motorised exchange between transmitted light illumination and laser detection. Simultaneous multichannel confocal fluorescence image and transmitted DIC acquisition enabled.

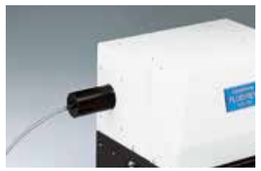
## Optional upgrade equipment for FV1200

**Ultra high-sensitivity detector/GaAsP photomultiplier tubes**

Achieve ultra-high sensitivity with low noise thanks to the gallium arsenide phoshide (GaAsP) detector and the on-board Peltier cooling system.

**4th channel detector unit**

Attaches to the optional port of either the filter or spectral-type scanning unit and is used as a 4th confocal fluorescence detection channel. This is a filter-based fluorescence detection unit.



**Fibre port for fluorescence output**

Confocal fluorescence emission can be introduced into an external device via a fibre delivery system. Fibre port equipped with FC connector (fibre delivery system not included).

**SIM Scanner**

Second dedicated scanner for photostimulation, synchronised to the FV1200 main scanner for simultaneous photostimulation and confocal image acquisition. Independent fibre-optic laser introduction port. Dichromatic mirror within motorised optical port of the scan unit required for introduction of laser into main scanner.

**TIRFM unit**

Enables control of the necessary volume of excitation light using FV1200 software. This unit enables TIRF imaging using the laser light source used with the confocal system.

**IX3-ZDC/Z-drift compensator**

Focal drift compensation for long time-lapse imaging.

* Requires IX83 microscope. For information about ZDC-compatible objectives, contact your Olympus dealer.

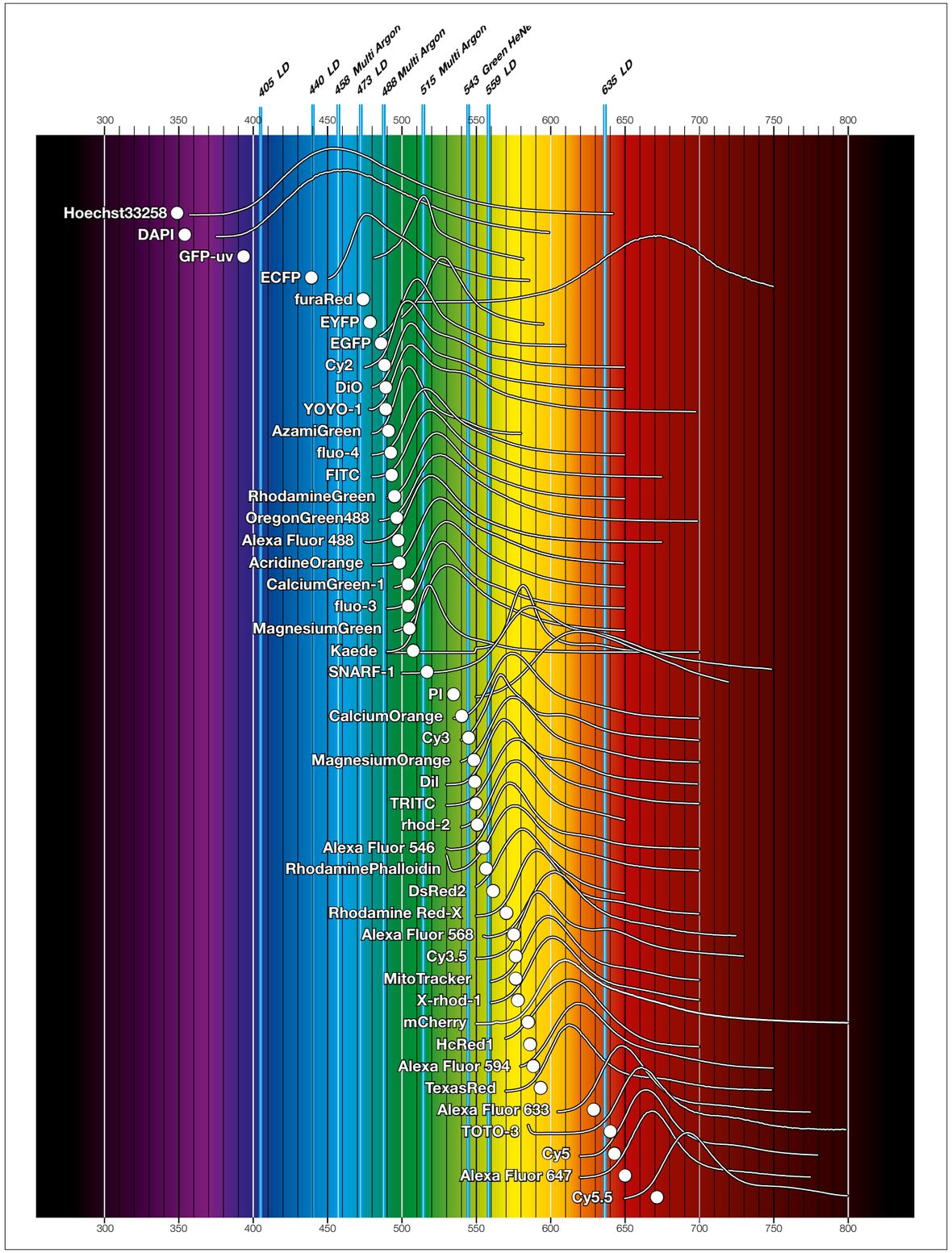
**$CO_2$ stage top incubator*1**

Precise controls maintain a constant environment within the dish or well plate, controlling temperature, humidity and $CO_2$ concentration. (Manufactured by Tokai Hit CO., Ltd).

**Motorised XY stage*1**

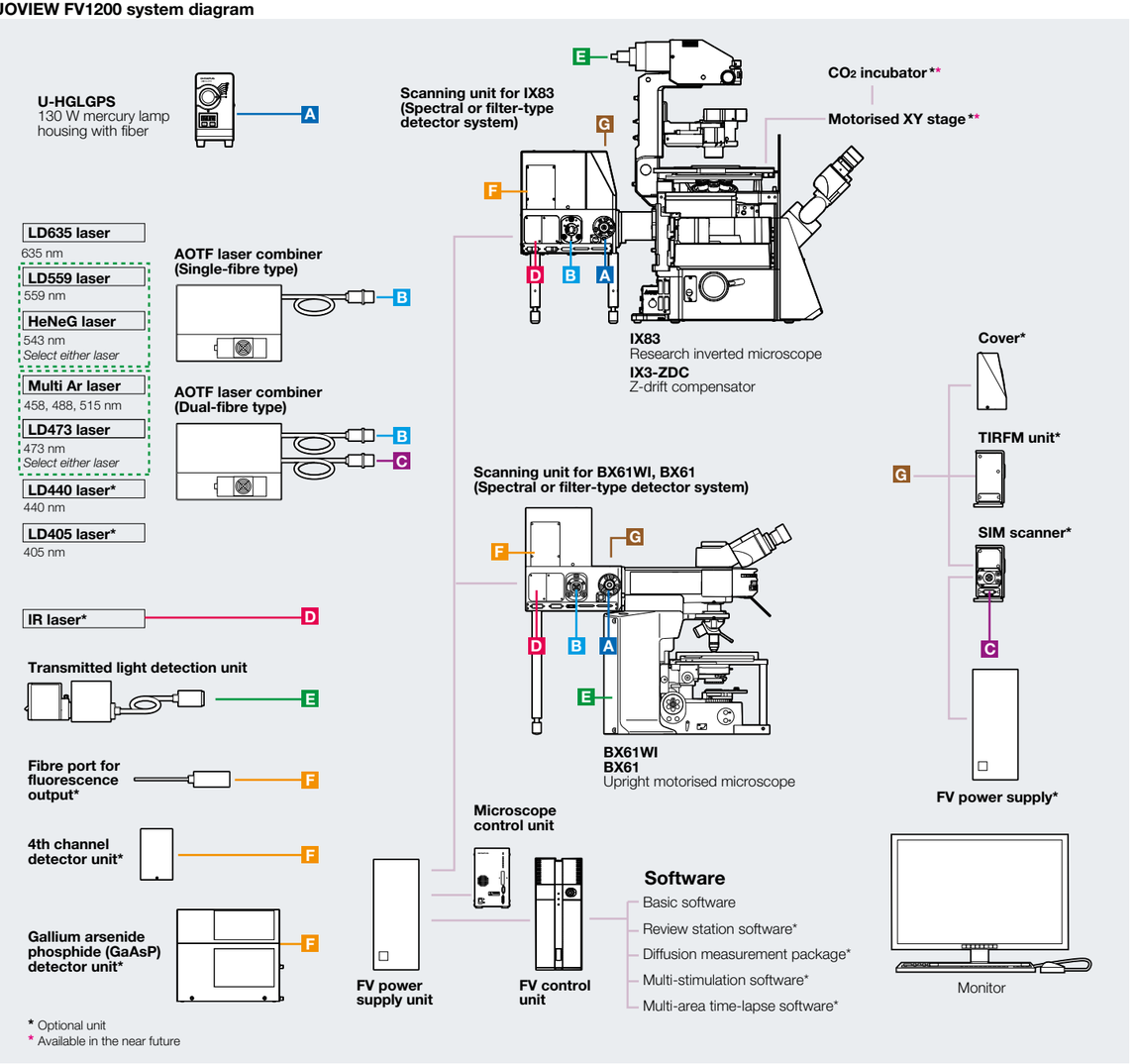
This motorised stage supports well plates, 35 mm diameter dishes, and slide chambers, and also comes complete with a universal sample holder.

*1 Available in the near future.




* Selected fluorescence dyes; white dot shows the absorption maximum, graphs show the dye emission spectra.

## FLUOVIEW FV1200 system diagram




* Optional unit
* Available in the near future

## Objectives for BX2 and IX3
### (using U-UCD8A-2, IX3-LWUCDA and U-DICTS)

| Model | NA | W.D. (mm) | Cover glass thickness | Immersion liquid | Correction ring | Condenser for BX2 U-UCD8A-2 optical element | Condenser for IX3 IX3-LWUCDA optical element | U-DICTS position |
|---|---|---|---|---|---|---|---|---|
| UPLSAPO4X | 0.16 | 13 | — | | | | | |
| UPLSAPO10X2 | 0.40 | 3.1 | 0.17 | | | U-DIC10 | IX2-DIC10 | normal |
| UPLSAPO20X | 0.75 | 0.6 | 0.17 | | | U-DIC20 | IX2-DIC20 | normal |
| UPLSAPO20XO | 0.85 | 0.17 | — | Oil | | U-DIC20 | IX2-DIC20 | normal |
| UPLSAPO30XS | 1.05 | 0.8 | 0.13–0.19 | Silicone | ✓ | U-DIC60HC | IX2-DIC30 | normal |
| UPLSAPO40X2 | 0.95 | 0.18 | 0.11–0.23 | | ✓ | U-DIC40 | IX2-DIC40 | normal |
| UPLSAPO40XS*1 | 1.25 | 0.3 | 0.15–0.19 | Silicone | ✓ | U-DIC40 | IX2-DIC40 | BFP1 |
| UPLSAPO60XO | 1.35 | 0.15 | 0.17 | Oil | | U-DIC60 | IX2-DIC60 | BFP1 |
| UPLSAPO60XW | 1.20 | 0.28 | 0.13–0.21 | Water | ✓ | U-DIC60 | IX2-DIC60 | normal |
| UPLSAPO60XS | 1.30 | 0.3 | 0.15–0.19 | Silicone | ✓ | U-DIC60 | IX2-DIC60 | normal |
| UPLSAPO100XO | 1.40 | 0.12 | 0.17 | Oil | | U-DIC100 | IX2-DIC100 | normal |
| PLAPON60XO | 1.42 | 0.15 | 0.17 | Oil | | U-DIC60 | IX2-DIC60 | BFP1 |
| PLAPON60XOSC | 1.40 | 0.12 | 0.17 | Oil | | U-DIC60 | IX2-DIC60 | BFP1 |
| UPLFLN40XO | 1.30 | 0.2 | 0.17 | Oil | | U-DIC40 | IX2-DIC40 | BFP1 |
| APON60XOTIRF | 1.49 | 0.1 | 0.13–0.19 | Oil | ✓ | U-DIC60 | IX2-DIC60 | BFP1 |
| APON100XHOTIRF | 1.65 | 0.1 | 0.15 | Oil | | U-DIC100 | IX2-DIC100 | normal |
| UAPON100XOTIRF | 1.49 | 0.1 | 0.13–0.19 | Oil | ✓ | U-DIC100 | IX2-DIC100 | normal |
| UAPON150XOTIRF | 1.45 | 0.08 | 0.13–0.19 | Oil | ✓ | U-DIC100 | IX2-DIC100 | normal |

*1 Scheduled to be available in 2013

## Objectives for fixed stage upright microscope
### (using WI-UCD, WI-DICTHRA2)

| Model | NA | W.D. (mm) | DIC prism | Revolving nosepiece |
|---|---|---|---|---|
| MPLN5X | 0.10 | 20.00 | — | WI-SSNP, WI-SRE3 |
| UMPLFLN10XW | 0.30 | 3.50 | WI-DIC10HR | WI-SSNP, WI-SRE3 |
| UMPLFLN20XW | 0.50 | 3.50 | WI-DIC20HR | WI-SSNP, WI-SRE3 |
| LUMPLFLN40XW | 0.80 | 3.30 | WI-DIC40HR | WI-SSNP, WI-SRE3 |
| LUMPLFLN60XW | 1.00 | 2.00 | WI-DIC60HR | WI-SSNP, WI-SRE3 |
| LUMFLN60XW | 1.10 | 1.5 | WI-DIC60HR | WI-SSNP, WI-SRE3 |
| XLUMPLFLN20XW | 1.00*2 | 2.0 | WI-DICXLU20HR | WI-SNPXLU2 |

*2 Note: these conditions are not met in confocal microscopy



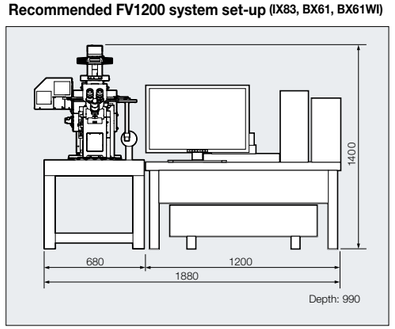
## FLUOVIEW FV1200 major specifications

| | | Spectral version | Filter version |
|---|---|---|---|
| Laser light | Violet/visible light laser | LD lasers: 405 nm: 50 mW, 440 nm: 25 mW, 473 nm: 15 mW, 559 nm: 15 mW, 635 nm, 20 mW<br>Multiline Ar laser (458 nm, 488 nm, 515 nm, Total 30 mW), HeNe(G) laser (543 nm, 1 mW) | |
| | AOTF laser combiner | Visible light laser platform with implemented AOTF system, ultra fast-intensity modulation with individual laser lines, additional shutter control<br>Continuously variable (0.1%–100%, 0.1% increment), REX: Capable of laser intensity adjustment and laser wavelength selection for each region | |
| | Fibre | Broadband type (400 nm–650 nm) | |
| Scanning and detection | Scanner module | Standard: 3 laser ports, violet to IR<br>Excitation dichromatic mirror turret, 6 position (High performance DMs and 20/80 half mirror), Dual galvanometer mirror scanner (X, Y)<br>Motorised optical port for fluorescence illumination and optional module adaptation, Adaptation to microscope fluorescence condenser | |
| | Detector module | Standard: 3 confocal channels (3 photomultiplier detectors)<br>Additional optional output port light path available for optional units<br>6 position beamsplitter turrets with CH1 and CH2<br>CH1 and CH2 equipped with independent grating and slit for fast and flexible spectral detection<br>Selectable wavelength bandwidth: 1–100 nm<br>Wavelength resolution: 2 nm<br>Wavelength switching speed: 100 nm/ms<br>CH3 with 6 position barrier filter turret | Standard: 3 confocal channels (3 photomultiplier detectors)<br>Additional optional output port light path available for optional units<br>6-position beamsplitter turrets with CH1 and CH2<br>CH1 to CH3 each with 6-position barrier filter turret (high-performance filters) |
| | Photo detection method | 2 detection modes: analogue integration and hybrid photon counting | |
| | Scanning method | 2 silver-coated galvanometer scanning mirrors | |
| | Scanning modes | Scanning speed: 512 x 512 (1.1 s, 1.6 s, 2.7 s, 3.3 s, 3.9 s, 5.9 s, 11.3 s, 27.4 s, 54.0 s)<br>bi-directional scanning: 256 x 256 (0.064 s, 0.129 s), 512 x 512 (0.254 s) | |
| | | X,Y,T,Z,Line scanning: straight line with free orientation, free line, Point scanning | X,Y,T,Z<br>Line scanning: straight line with free orientation, free line, Point scanning |
| | Pinhole | Single Motorised pinhole<br>Pinhole diameter ø 50–300 µm (1 µm step) | Single motorised pinhole<br>Pinhole diameter ø 50–800 µm (1 µm step) |
| | Field number (NA) | 18 | |
| | Optical zoom | 1x–50x in 0.1x increment | |
| | Z-drive | Integrated motorised focus module of the microscope, minimum increment of 0.01 µm or 10 nm | |
| | Transmitted light detector unit | Module with integrated external transmitted light photomultiplier detector and 100 W halogen lamp, motorised switching, fibre adaptation to microscope frame | |
| Microscope | Motorised microscope | Inverted IX83 (IX83P2ZF), Upright BX61, Upright focusing nosepiece and fixed-stage BX61WI | |
| | Fluorescence illumination unit | External fluorescence light source with motorised shutter, fibre adaptation to optical port of scan unit<br>Motorised switching between LSM light path and fluorescence illumination | |
| System control | Control unit | OS: Windows 7 Professional (English version), CPU: Intel Xeon E5-1620 (3.60 GHz) or higher, Memory: 8 GB (2 GB x 4), Hard disk: 1 TB or more for data storage,<br>Dedicated I/F board: built-in control unit, Graphics board: NVIDIA Quadro 600, Optical drive: DVD ± R/RW Super-Multi | |
| | Power supply unit | Galvo control boards, scanning mirrors and gratings, real-time controller | Galvo control boards, scanning mirrors |
| | Display | SXGA 1280 x 1024, dual 19-inch (or larger) monitors or WQUXGA 2560 x 1600, 29.7-inch monitor | |
| Optional unit | Sim scanner | 2 galvanometer scanning mirrors, pupil projection lens, built-in laser shutter, 1 laser port, fibre introduction of near-UV diode laser or visible light laser<br>Optional: 2nd AOTF laser combiner | |
| | TIRFM unit | Available laser: 405–635 nm.<br>Motorised penetration ratio adjustment.<br>Automatic optical setting for TIRFM objectives | |
| | Ultra high-sensitivity detector | Cooled GaAsP-PMT 2 channels | |
| | Fourth confocal detector | Module with photomultiplier detector, barrier filter turret, beamsplitter turret mounted with 3rd CH light path | |
| | Fibre port for fluorescence | Output port equipped with FC fibre connector (compatible fibre core 100–125 µm) | |
| **Software** | | | |
| Image acquisition | | Normal scan: 64 x 64, 128 x 128, 256 x 256, 320 x 320, 512 x 512, 640 x 640, 800 x 800, 1024 x 1024, 1600 x 1600, 2048 x 2048, 4096 x 4096<br>Clip rectangle scan, clip ellipse scan, polygon clip scan, line scan, free-line scan, point scan, real-time image | |
| | | 2-dimension: XY, XZ, XT and X λ<br>3-dimension: XYZ, XYT, XY λ, XZT, XT λ and XZ λ<br>4-dimension: XYZT, XZT λ and XYT λ<br>5-dimension: XYZT λ | |
| Programmable scan controller | | Time controller function | |
| 2D image display | | Each image display: single-channel side-by-side, merge, cropping, live tiling, live tile, series (Z/T/λ), LUT: individual colour setting, pseudo-colour, comment: graphic and text input | |
| 3D visualization and observation | | Interactive volume rendering: volume rendering display, projection display, animation displayed (save as OIF, AVI or MOV format)<br>Free orientation of cross-section display<br>3D animation (maximum intensity projection method, SUM method)<br>3D and 2D sequential operation function | |
| Image format | | OIB/ OIF image format<br>8/16-bit gray scale/index color, 24/ 32/ 4-bit colour, JPEG/ BMP/ TIFF/ AVI/ MOV image functions<br>Olympus multi-tif format | |
| Spectral unmixing | | 2 fluorescence spectral unmixing modes (normal and blind mode) | |
| Image processing | | Filter type: sharpen, average, DIC sobel, median, shading, laplacian<br>Calculations: inter-image, mathematical and logical, DIC background leveling | |
| Image analysis | | Fluorescence intensity, area and perimeter measurement, time-lapse measurement | |
| Statistical processing | | 2D data histogram display, colocalisation | |
| Optional software | | Review-station software, offline FLUOVIEW software for data analysis.<br>Motorised stage control software, diffusion measurement package, multi-stimulation software, multi-area time-lapse software | |

## Dimensions, weight and power consumption

| | | Dimensions (mm) | Weight (kg) | Power consumption |
|---|---|---|---|---|
| Microscope with scan unit | BX61/BX61WI<br>IX83 | 320 (W) x 580 (D) x 565 (H)<br>385 (W) x 835 (D) x 755 (H) | 41<br>59 | — |
| Fluorescence illumination unit | Lamp<br>power supply | 180 (W) x 320 (D) x 235 (H)<br>90 (W) x 270 (D) x 180 (H) | 6.7<br>3.0 | AC 100-240 V 50/60 Hz 1.6 A |
| Transmitted light detection unit | | 170 (W) x 330 (D) x 130 (H) | 5.9 | — |
| Microscope control unit | | 125 (W) x 332 (D) x 216 (H) | 5.2 | AC 100-120/220-240 V 50/60 Hz 3.5 A/1.5 A |
| FV power supply unit | | 180 (W) x 328 (D) x 424 (H) | 7.5 | AC 100-120/220-240V 50/60 Hz 4.0 A/2.0 A |
| FV control unit | | 136 (W) x 380 (D) x 329 (H) | 8.5 | AC 100/240 V 50/60 Hz 600 W |
| Display | 19 inches, dual (value per monitor) | 363 (W) x 216 (D) x 389.5–489.5 (H) | 5.9 | AC 100-120/200-240 V 50/60 Hz 0.65 A/0.4 A |
| | 29.7 inches | 694 (W) x 276 (D) x 489–589 (H) | 13.0 | AC 100-240 V 50/60Hz 2.0 A |
| Power supply unit for laser combiner | | 210 (W) x 300(D) x 100 (H) | 4.0 | AC 100-120/200-240 V 50/60 Hz 2.0 A/1.0 A |
| Laser combiner (with ar laser heads) | | 514 (W) x 504 (D) x 236 (H) | 45 | — |
| Laser combiner (without ar laser heads) | | 514 (W) x 364 (D) x 236 (H) | 40 | — |
| LD559 laser power supply | | 200 (W) x 330 (D) x 52 (H) | 1.2 | AC 100-240 V 50/60 Hz 30 W |
| Multi ar laser power supply | | 162 (W) x 287 (D) x 91 (H) | 4.4 | AC 100-240 V 50/60 Hz 20 A |
| Hene(g) laser power supply | | 130 (W) x 224 (D) x 62 (H) | 1.8 | AC 100-120 V 50/60 Hz 0.45 A |

### Recommended FV1200 system set-up (IX83, BX61, BX61WI)




(Unit: mm)