

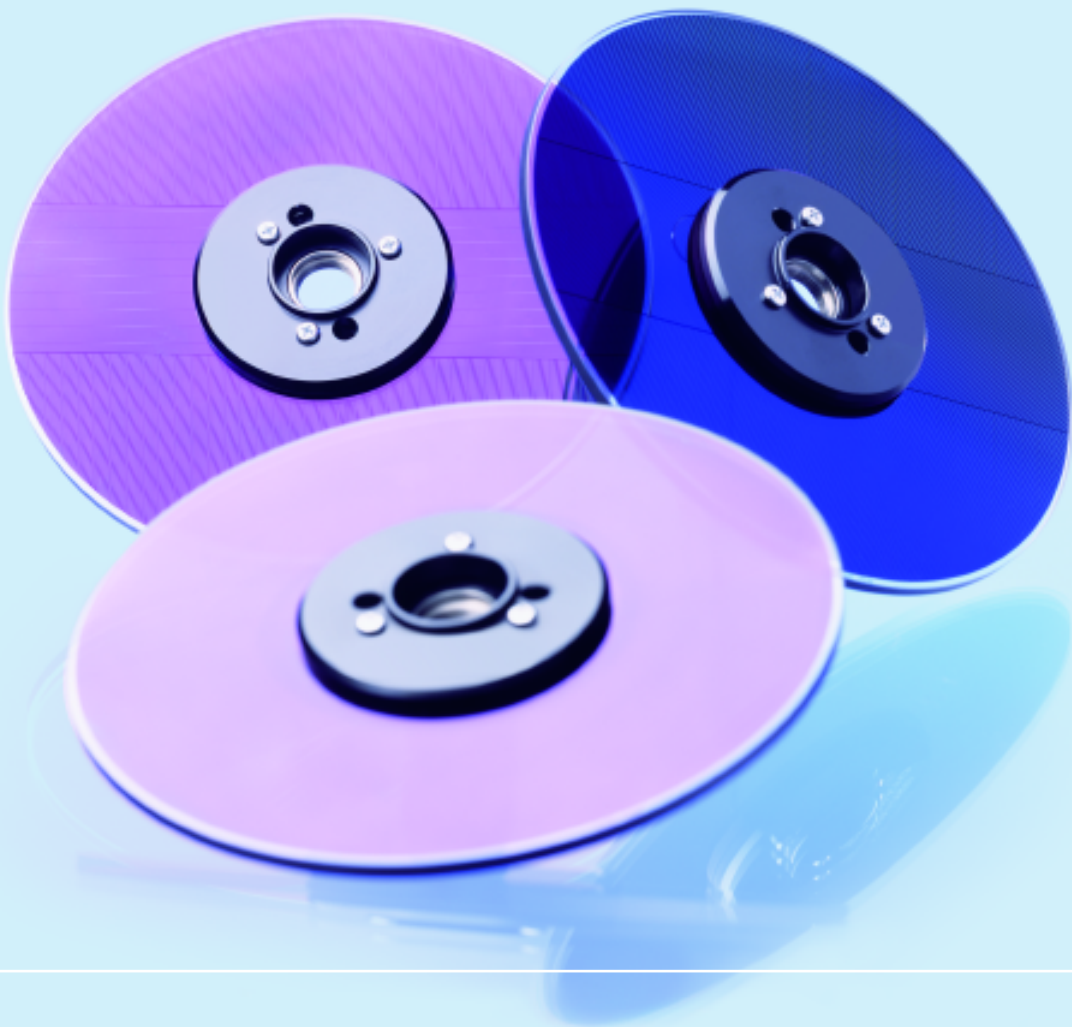
A positive spin on live-cell confocal imaging

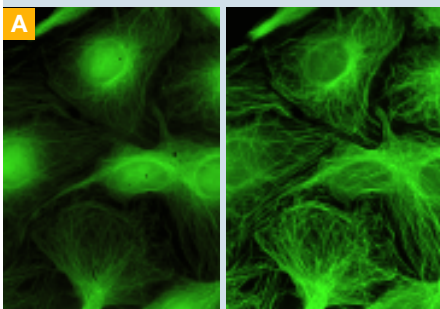


LOOK CLOSER: SEE CLEARER

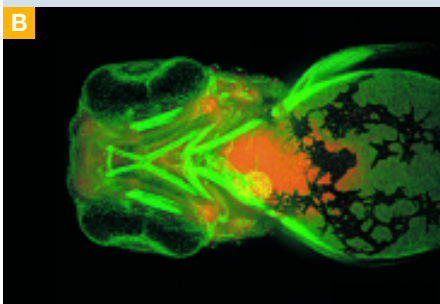
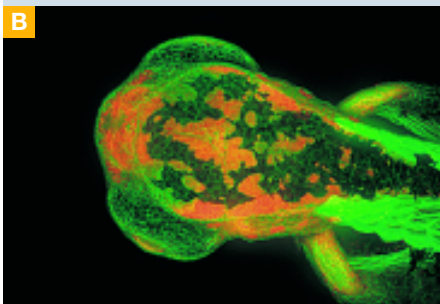
Putting a new spin on flexibility

Olympus works with its customers to develop microscopes, modules and systems to provide better solutions for all microscopy, imaging and analysis processes. As a result, all Olympus microscopes are designed as “optical benches” enabling a range of modules and peripherals to be added with great ease. This drive for flexibility has led to the development of the new Olympus disk-scanning unit (DSU), which provides excellent confocal optical sectioning and motorised operation, with the added versatility of an arc lamp excitation source. The slit disks themselves feature a unique, patent-pending design. As a result of this careful development, the Olympus DSU provides researchers with confocal images with excellent contrast and resolution compared to conventional widefield microscopy. By using arc lamp excitation sources, the Olympus DSU offers the maximum wavelength flexibility within an economical package.





A PtK2 cells: Conventional fluorescence microscopy (left). Excellent optical sectioning, superior resolution and removal of blur with disk-scanning confocal microscopy (right).



B Both images: Neuronal staining of 3-day zebrafish embryo, ventral view, different z-layers.

CONFOCAL CLARITY

In conventional widefield fluorescence microscopy, the inside structure of a thick specimen ($<20\ \mu\text{m}$) cannot be observed clearly because of the significant contribution of out-of-focus light from above and below the focal plane. The DSU makes it possible to reject out-of-focus light by placing a spinning disk with an alternating pattern of vertical and horizontal slits in the confocal plane of the microscope. The slit disk spins at 3,000 rpm creating virtual pinholes which have an effect similar to the pinholes used in confocal laser scanning microscopy (CLSM).

A B The improved resolution, contrast and S/N ratio due to the removal of out-of-focus haze becomes immediately obvious. This produces very crisp, confocal images with controllable depth of field and the ability to collect a series of optical sections (Z-stack) from specimens. Images are acquired using a CCD camera, meaning that no sophisticated processing is required.

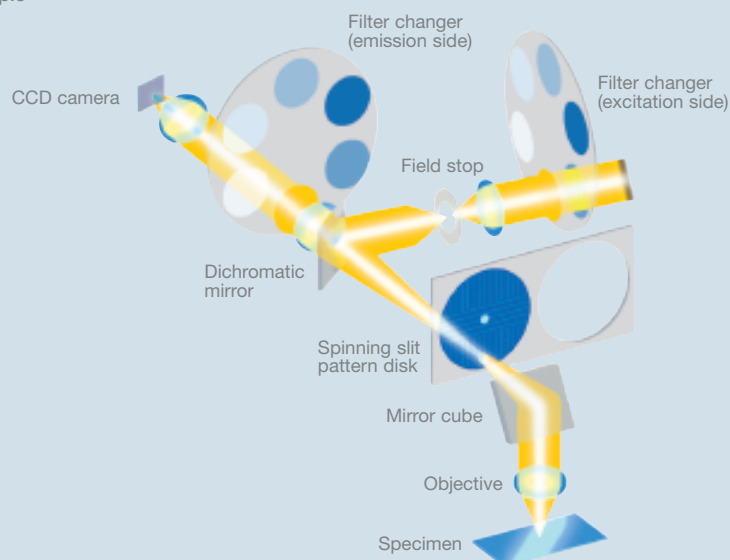
Directing light from a white-light source like a fluorescence lamp house or an MT10/MT20 fluorescence illumination system through the spinning disk results in an averaging of confocal and widefield illumination.

Principles of operation

C Fluorescence excitation light from a white-light source is first filtered for the required wavelength and then reflected via a dichromatic mirror. This reflected light passes through a unique, spinning slit confocal disk (which is located in a conjugate position to the objective's focal plane), through the objective and focused onto the specimen. Emitted fluorescence light from the specimen is then collected by the objective and sent back through the confocal disk. The passing of focused light back through the disk produces the required confocal effects. Fluorescence emission light is then selected for wavelength by a filter and focused on a cooled CCD camera to form visible images.

C Disk-Scanning Unit

Principle



D Orca-ER

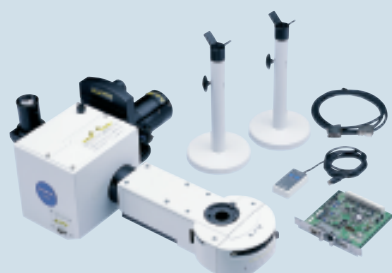
High-sensitivity digital b/w camera

**E F-View II**

Digital b/w camera

**F BX-DSU unit**

Simple installation

**The perfect disk for every purpose**

Five disks are available, each with varying slit width and spacing. They offer flexibility to accommodate varied numerical apertures and specimen thicknesses for objective magnifications from 20x–100x.

Brilliant performance over a wide range

The DSU disk and optical components are UV-compatible and deliver outstanding performance from 350–700 nm, making it suitable for most available fluorochromes. The DSU system supports DAPI excitation in the near UV without modification.

Easy operation

Disk operation is motorised, allowing a computer to switch remotely between wide-field and DSU modes. The system includes a motorised filter turret for the convenient change of fluorescence filter in DSU mode as well as a motorised filter wheel equipped with neutral density (ND) filters to maintain illumination intensity in different observation modes. The DSU can be combined with a motorised microscope such as the upright Olympus BX61 and the inverted Olympus IX81 for 3-D confocal imaging.

High speed, high sensitivity – less phototoxicity

D E The system offers full-frame CCD image capture at up to 15 frames per second with a cooled CCD camera, making the DSU an excellent tool for live-cell applications where speed of acquisition and minimal phototoxicity is paramount.

Excellent cost-performance ratio

By utilising white-light sources, the DSU is a cost-attractive alternative to laser-based systems. A lamp house with standard mercury burner, for example, can be used in combination with a suitable set of filter cubes. Moreover, high-quality filter-mirror sets for GFP and RFP, a manual filter turret and a motorised filter wheel with neutral density (ND) filters are already included in the basic DSU system.

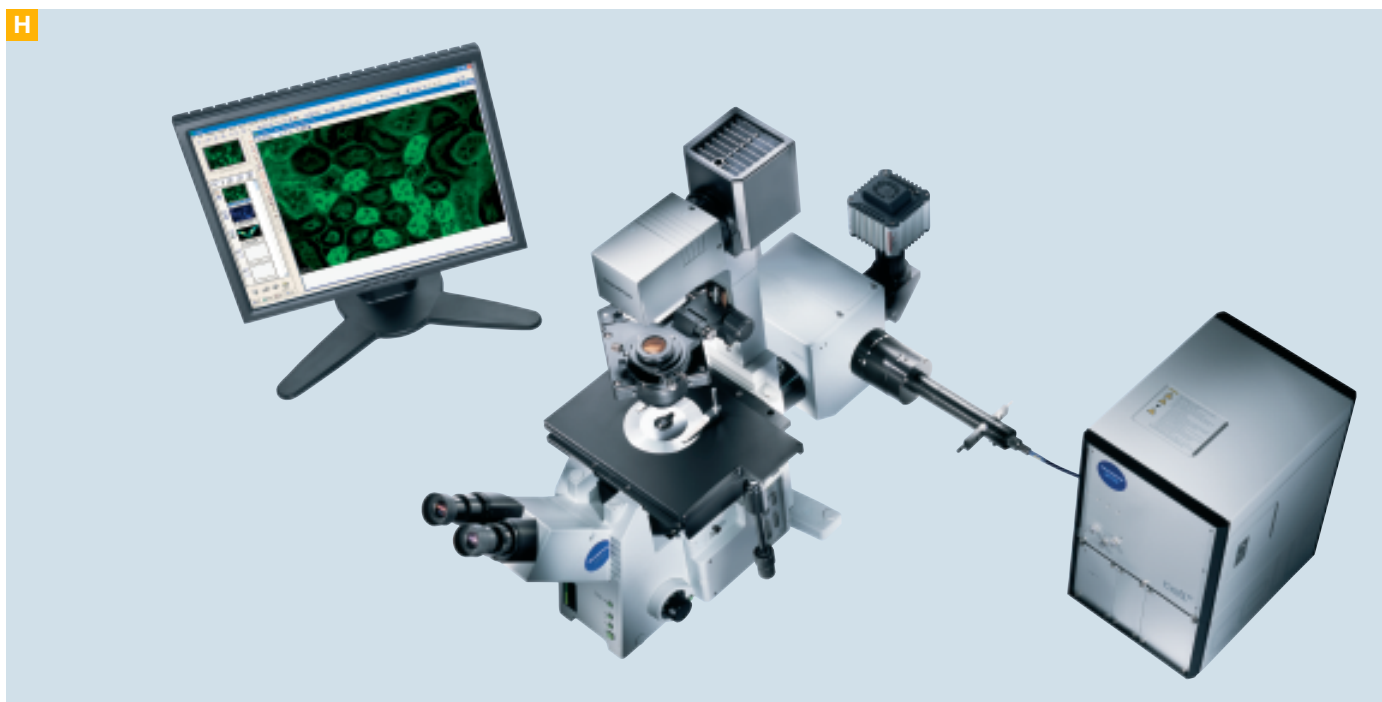
Furthermore, as your needs change, you can easily update the fluorescence excitation characteristics by adding new filters and dichromatic mirror sets to coincide with your new fluorochromes. Laser-based systems, on the other hand, often require a new laser source as well as filters and mirror sets for each new fluorochrome.

Modular design – full flexibility

F G The DSU module is available for inverted and upright microscopes, for manual or motorised types as well as for water-immersion microscopes for electrophysiology as IX71/81 and BX51/61/61WI. Manual microscopes as IX71 and BX51/BX51WI can be upgraded with a high-precision piezo-driven focus nosepiece for z-stack acquisition.

G

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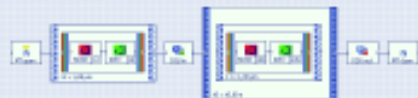


ADVANCED IMAGING WITH *cell*[™] AND *cell*[®]

H By integrating the DSU into the versatile imaging system *cell*[™] and the real-time imaging system *cell*[®], the DSU is an ideal device for optical sectioning in combination with a variety of imaging applications.

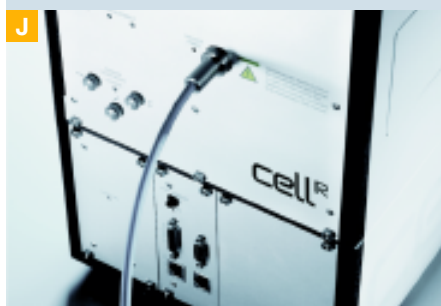
cell[™] and *cell*[®] are specifically designed to meet the experimental requirements for multicolour fluorescence time-lapse image acquisition. *cell*[™]'s system coordinator, a control board solely for controlling hardware, considerably increases imaging speed in comparison with systems driven by software alone. Synchronisation of all hardware and peripheral devices at microsecond accuracy is performed with the *cell*[®] hyper-precision real-time control board, making the modular *cell*[®] system particularly well suited for live-cell imaging and a broad range of life science experiments – including time-lapse imaging, multidimensional imaging, ratio imaging, FRET and TIRF microscopy and spectral unmixing.

I



Comfortable and clear design of complex experiments with *cell*[™]/*cell*[®] Experiment Manager

J



MT20 fluorescence illumination system

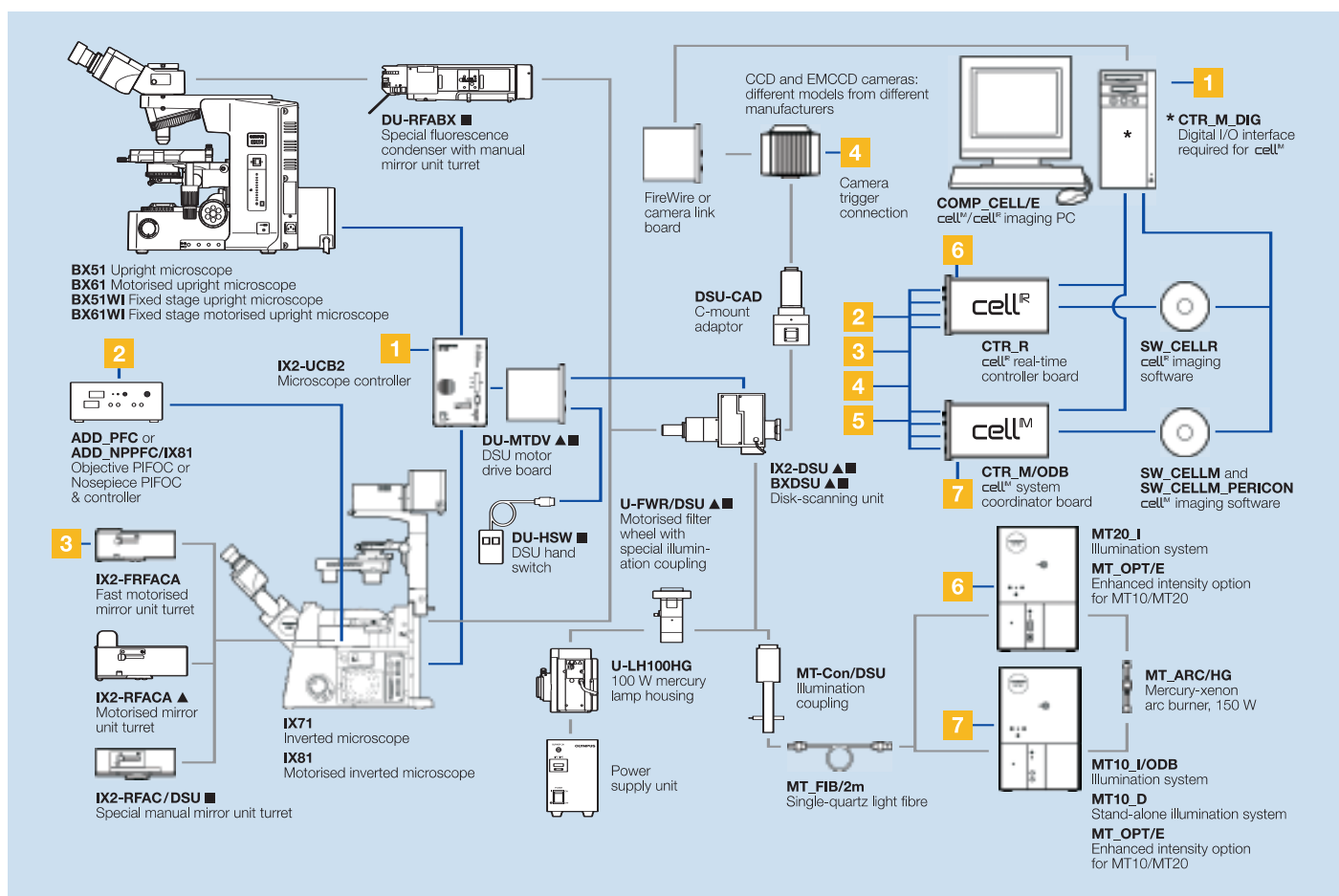
I The intuitively structured *cell*[™] and *cell*[®] Experiment Manager is a user-friendly graphical drag-and-drop interface, making setting up even the most complex experiments exceptionally quick and easy.

Complete light management with MT* illumination systems

J For more comfort and more speed, the DSU is available with the superior multi-functional illumination systems MT10 and MT20 instead of a standard lamp house. The MT10 features an integrated 8-position excitation filter wheel (≥ 85 ms), a shutter with less than 5 ms switching time and a 7-position attenuator to adjust light intensity without changing the colour temperature. The MT10 light source can be obtained as a stand-alone module or as an integral part of *cell*[™]. For real-time imaging with *cell*[®], the MT20 offers more speed and more precision. A fast shutter (< 1 ms) to avoid photobleaching when no image is acquired, an 8-position excitation filter wheel (≥ 58 ms) and a 14-position attenuator make it the perfect tool for high-speed experiments.

Specifications

Confocal scan method	Disk rotation method
Maximum scan speed	Image acquisition less than 33 msec/frame
Observation method	Fluorescence, phase contrast, DIC possible
Disks	5 disks are available matching different objectives, specimen thickness and immersion types; disk 2 always included
Observation mode	Exchange between confocal and non-confocal modes can be performed through the software
Hand switch	Included for observation mode change without software
Filter cubes	RFP and GFP high-quality filter set included
Excitation wavelength	350 nm–700 nm
Fluorescence wavelength at observation	At less than 450 nm, use HQ filter for observation
Objectives	Recommended UIS2 objectives
	UPLSAPO 20x oil
	UPLSAPO 40x dry
	UPLFLN 40x oil
	PLAPON 60x oil
	UPLSAPO 100x oil
	Please contact your local Olympus representative for water-immersion objectives and optimal disk-objective combinations
Motorised filter turret	Support of motorised observation filter turrets possible in combination with <i>cellTM</i> or <i>cell^{IR}</i>
ND filter for excitation	Motorised filter wheel included, with neutral density filters: ND25, ND12, ND6, ND3, ND1.5
Electromagnetic shutter for excitation	Can be controlled through the software
Illumination	100 W Hg lamp house, 150 W Hg-Xe MT10D, 150 W Hg-Xe MT20 in combination with <i>cellTM</i> or <i>cell^{IR}</i>
Recommended camera	Orca ER, EMCCD, F-View II possible
Environmental conditions	Temperature and humidity: 10 °C–35 °C, 30%–80%
Power	Provided through microscope controller
DSU dimensions (H x W x L mm)	BX-DSU min. 658 x 588 x 679 IX2-DSU min. 482 x 574 x 731



5 Controller for motorised stage ▲ Operation via IX2-UCB ■ Integral part of IX2-DSU and/or BX-DSU system

The manufacturer reserves the right to make technical changes without prior notice.

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OLYMPUS

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