OLYMPUS

Your Vision, Our Future

Inverted Research System Microscopes

IX71/IX81

IX2 Series

Discover a New Dimension in Live Cell Research



NanoString Exhibit 1033.001

EVERY NEW BEGINNING IS A MIRACLE

From vision to reality: a natural process

A living cell in all its wondrous complexity can be the starting point for almost endless discoveries. However, scientists nowadays not only study individual cells and their components. They also examine cellular networks in cultures, tissue and even whole organisms – gaining fundamental insights into their distinct functions. The combination of molecular biological techniques, e.g. labelling proteins with GFP, with advanced light microscopy has boosted this field of research enormously. Olympus supplies scientists all over the world with sophisticated equipment for highly demanding projects – to help them turn their visions into reality.

Your vision

It all starts with an idea. By investigating this idea further, you turn it into a hypothesis – which needs to be proved or disproved. To do this, you need to visualise and create the right platform for your idea – but there is an overwhelming choice of research equipment. How do you find the right set-up?

You are not alone

Our ambition is to understand our customers, their needs and every detail of the work they do. Because we want to offer you the best support possible, consulting and building personal relationships are essential parts of the Olympus philosophy. Our network of in-house and field specialists assists you in finding the right solution for your research – individually and accurately.

Your vision develops

Step by step, the development of your idea takes shape. The process might start with discussions about basic necessities for frame and optics – and could end with a system solution for multi-dimensional data acquisition and analysis. Tests might be necessary to find the best solution for a specific experiment. Whatever you need, you can count on your partner Olympus to be with you all the way.

Your vision comes true

Our goal is to help you with simple system solutions you can operate intuitively. Nevertheless, modern microscope acquisition and analysis systems can be very complex. This is where the Olympus start-up and after-sales support comes in: it guarantees that you can always collect and analyse as many results as possible with your equipment – helping you to successfully reach your goals.

Olympus – your partner for successful research.

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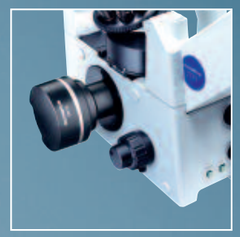
YOUR RESEARCH PARTNERS: THE OLYMPUS IX71/IX81 MICROSCOPES

Ready for live cell action

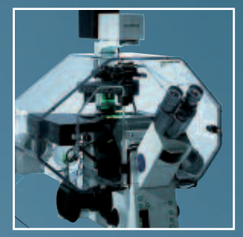
Flexibility is the word that best summarises the concept behind the Olympus IX71/IX81 microscopes. Outstanding optical performance is only the beginning of what the IX71/IX81 can do to take your research to the next level – and efficient automation for a broad range of tasks is by no means the end.

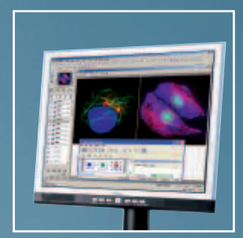
Working with them, you will soon find out that the Olympus IX71/IX81 are far more than microscopes: they are reliable and competent partners for your research.













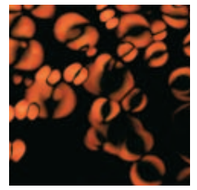
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EVERYTHING YOU NEED: A SUCCESS STORY

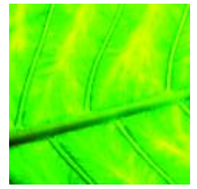
Everything under control: from basics to systems

The processes in living cells and organisms are endlessly fascinating – and also very complex and dynamic. Observing and unravelling them requires a microscope system with outstanding capabilities. To satisfy the complex and diverse needs of live cell research, Olympus microscopes and their accessories are setting a new standard in optical performance, flexibility and system compatibility – giving you the freedom to focus on your research rather than on your equipment.



The Basics of Cell Imaging 8–13

Every cell imaging system is based on a single crucial component: its optics. The new high-performance Olympus UIS2 optics enable researchers to view the structure and functions of biological systems in ways that were previously unimaginable. This means they are now visible in all their details.



The Platform 14–19

Expertly constructed, the slim and rigid frame of the IX71/IX81 combines optimal alignment and stability with ergonomic handling – guaranteeing the success of even the most complex experiment. The unique multi-port system and modular motorisation allow maximum flexibility – enabling you to readily perform experiments today and tomorrow.



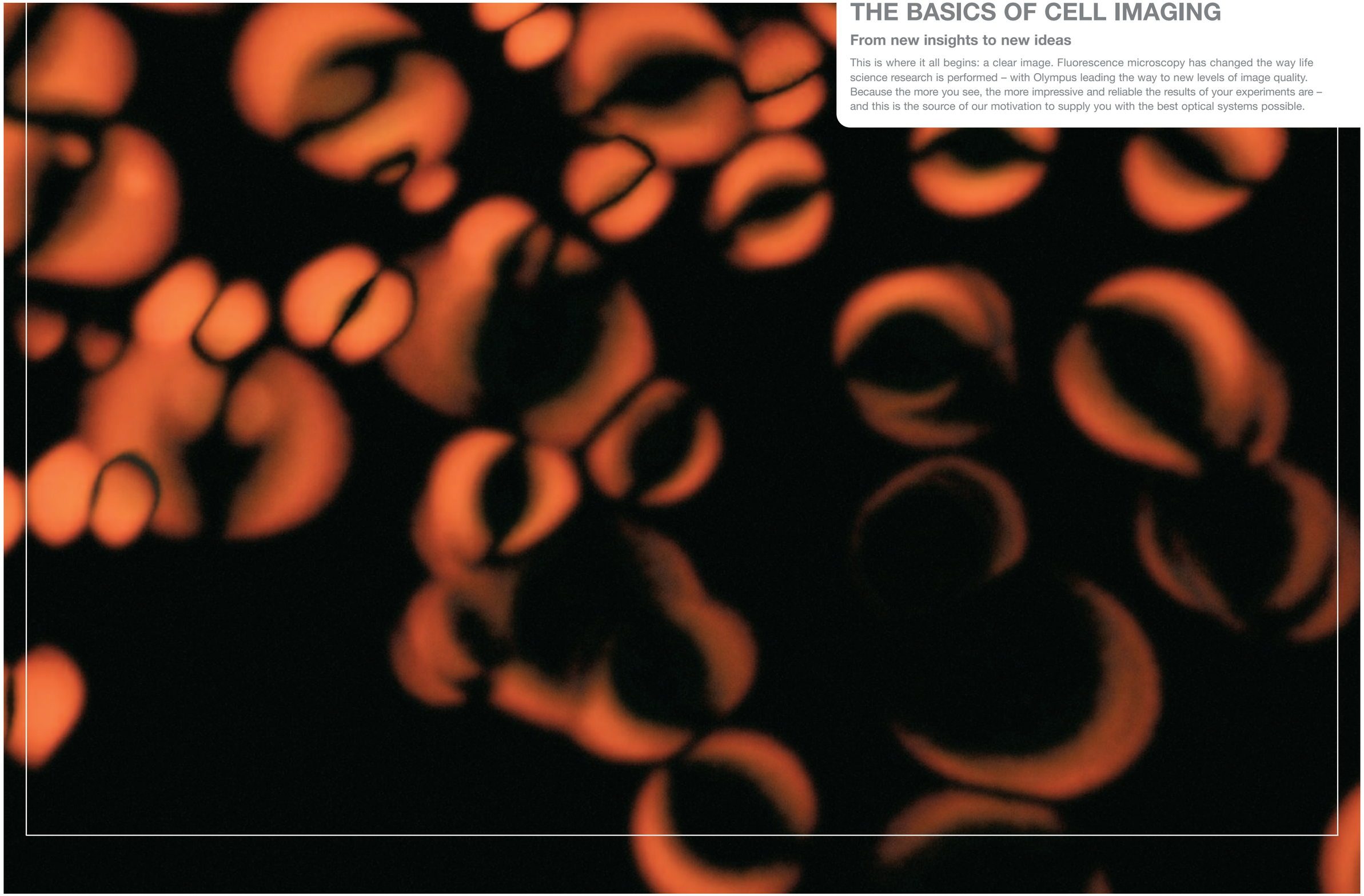
The Experiment 20–33

Olympus offers a range of imaging systems and software to meet all your needs – from routine observations to complicated intracellular imaging of cellular and dynamic molecular processes. Sophisticated microdissection systems enable the removal of intact organelles for further study while high-content screening reveals morphology and multiple molecular parameters in parallel – making sure you always get the most out of your experiments.

Your successful future

As your partner for advanced cellular research, Olympus is dedicated to making state-of-the-art microscopes and accessories that are the best in their class for live cell experiments. Our capabilities in R&D and quality manufacturing, and our attentive and informed customer support, are totally focused on success for your current and future experiments – turning your visions into reality.

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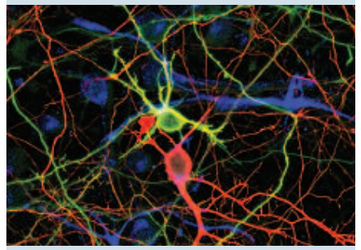


THE BASICS OF CELL IMAGING

From new insights to new ideas

This is where it all begins: a clear image. Fluorescence microscopy has changed the way life science research is performed – with Olympus leading the way to new levels of image quality. Because the more you see, the more impressive and reliable the results of your experiments are – and this is the source of our motivation to supply you with the best optical systems possible.

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OUTSTANDING SIGNAL PERFORMANCE

As fluorescence microscopy becomes more and more sophisticated, Olympus is continually improving its products to meet the rising demands. Unrivalled in their sensitivity, protection of live cells and organisms, and flexibility, our optical systems offer scientists unmatched quality and performance. However, improvements and advances are not just restricted to the optics, but include all microscope system components. Expertly constructed, Olympus microscopes are impressively easy and comfortable to use – while offering maximum cost-effectiveness.

Cell protection

Image noise that overlays the signal information is a major obstacle in fluorescence microscopy. Noise originates from several sources including the specimen's inherent background, out-of-focus signals, autofluorescence from optical components and readout noise from cameras. To solve this problem, Olympus is continually devising innovative solutions that focus on noise reduction throughout the entire optical system.

Shorter exposure time – prolonged observations: a high signal-to-noise ratio (S/N ratio) significantly reduces data image acquisition time. Furthermore, this reduction in illumination intensity greatly decreases the damaging phototoxic effects on cells – and allows observation periods to be increased. Superior optics coupled with high-stability frames and a wide range of accessories like incubators enable detailed observations of living cells and organisms over prolonged periods.

Tuned for the best results

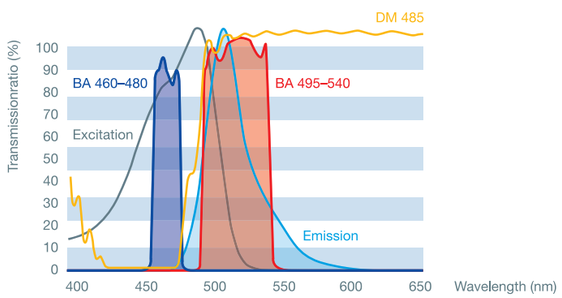
All components of the light path contribute to the extraordinary performance of the Olympus fluorescence system.

Illumination unit

A Olympus's standard light sources deliver high intensity and stability coupled with a long burner lifetime, while an aspherical fluorescence collector bundles the light with minimum intensity loss.

B Illumination sources with pre-aligned lamps are also available which display rich spectral excitation and a totally uniform illumination of the field of view. No heat is transferred to the specimen due to external light guide coupling. For live cell experiments that require fast wavelength switches, Olympus developed the superior multi-functional illumination systems MT10 and MT20 which are an integral part of cell^M and cell^R imaging stations. Fast shutters (< 5 ms / < 1 ms) control the illumination of the specimen to avoid photobleaching when no image is acquired.

Characteristics of the HQ filter set for GFP



Fluorescence filter

C Benefit from more precise signal separation and higher-contrast images with the new Olympus HQ filter sets. Thanks to a new ion coating technique, Olympus HQ filters have an accuracy of +/- 2 nm, combined with exceptional edge steepness and low autofluorescence. To enhance the S/N ratio, the filter cubes of all Olympus filter sets are also equipped with a stray light noise destructor.

Reaching the limit

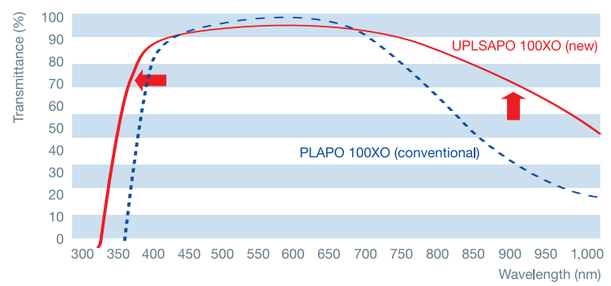
To protect them from harmful light, some sensitive specimens might need the S/N ratio tuning to the uppermost level. Olympus offers high-quality optics, user-friendly elaborated accessories to meet this requirement.

UIS2 objectives

D Using the latest technologies and materials, UIS2 objectives deliver low autofluorescence with maximum numerical aperture, resulting in an excellent S/N performance. With high transmission from UV to IR and unparalleled chromatic aberration correction, UIS2 objectives are ready to take research into a new dimension of fluorescence microscopy.

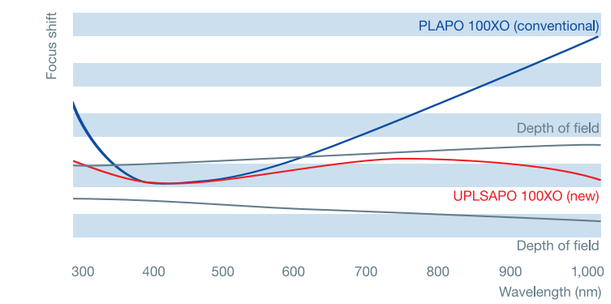
Transmittance

E



Chromatic aberration

E



A Light source
Bright, even illumination



B X-Cite 120
With adjustable iris

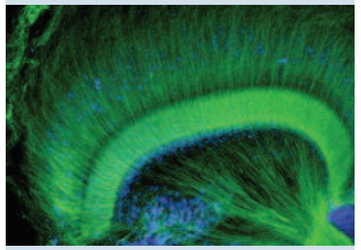


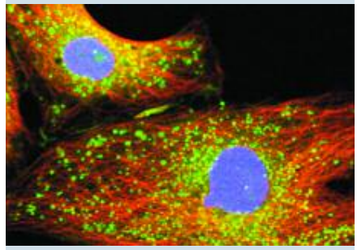
C HQ fluorescence cubes
Precise signal separation



D LUCPLFL objektive
Excellent working distance, low autofluorescence







E UPLSAPO 100XO
High UV and IR transmission without focus shift

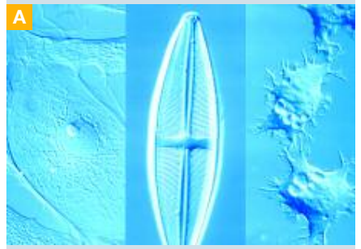


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HIGHEST IMAGE QUALITY FOR MORPHOLOGICAL ANALYSIS AND MICROMANIPULATION

Different applications require different contrast methods: while phase contrast is easy and efficient for cell culture observations, differential interference contrast (DIC) is necessary when high resolution without any compromises is required. Providing DIC-like images, the Olympus relief contrast is the ideal solution for observation in plastic vessels. Olympus also devotes its creativity to developing solutions for highly specific applications: enhanced condensers such as the IX2-DICD, for example, excel in the clarity they give to electrophysiology experiments.

A



Excellent DIC results for various specimens

From cell to organism: DIC with maximum flexibility

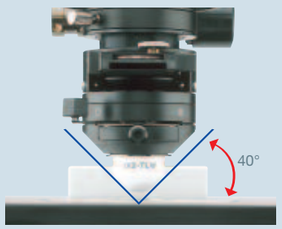
Live cell research is not restricted to individual cells or cell cultures. Observations of tissues and whole organisms such as *Caenorhabditis elegans* or fruit fly embryos are becoming increasingly important. Olympus has developed a range of different high-precision DIC prisms that offer superb performance, from cell observation up to thick specimens.

Contrast tailored to the specimen

A Olympus has customised its prisms by optimising them for different specimen types. The high-contrast DIC prism rectifies the low contrast typically observed in thin specimens to reveal fine structures, while the high-resolution DIC prism produces crisp, clear images without glare and noise in thick specimens. The universal prisms cater for these extremes in specimen thickness. They are suitable for a broad range of specimen thicknesses to produce images with a good balance between contrast and resolution.

B **High-resolution condenser**

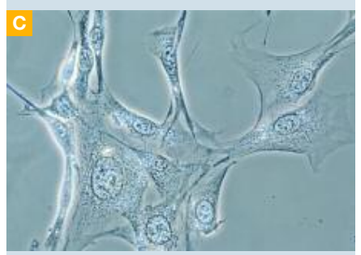
Slim design with outstanding numerical aperture



Adding clarity to electrophysiological experiments

B The IX2-DICD slim condenser with its outstanding numerical aperture of 0.9 efficiently collects light to give a better resolution and enhances the clarity in specialised, demanding applications, including micromanipulation and patch clamping. It is suitable for brightfield, phase contrast and DIC observations. To match your experimental requirements, front lenses are available for oil and water immersion and for dry observations.

C



Live cell observation with phase contrast

Phase contrast: simply efficient

C Phase contrast is the standard contrast observation method for cell cultures. Consequently, all condensers for the IX71/IX81 are suitable for phase contrast observation.

Excellent contrast through incubation chambers and T-flasks

D Combining a long working distance (27 mm) and an NA of 0.55, the IX2-LWUCD condenser accommodates most incubation chambers and T-flasks. The five-position turret provides versatility with DIC or phase inserts.

Extended working

Olympus has designed the 73 mm ultra long working distance universal condenser IX-ULWCD, ensuring excellent image contrast for any sample from thin to thick cells and easy operation.

Micromanipulation made easy: Olympus relief contrast

E Clear 3-D-like images are crucial for accurate and easy manipulation. The 45 mm long working distance relief contrast condenser for the IX71/IX81 greatly facilitates micromanipulation, providing consistent oblique illumination across all magnifications with optimised visualisation of cellular membranes. It also gives an excellent contrasting performance in brightfield, phase contrast and DIC observations.

To the point with ON3 micromanipulators

F In vitro fertilisation, patch clamping, injection – modern standards in easy-to-operate micromanipulators offer the right model to meet every specific need. The ON3 series features pipette holders, microinjectors and both manual and motorised micromanipulators with up to three-axis movement. Different adaptors and joints are available to customise the microscope for micromanipulation.

(Note: Other micromanipulators on request)

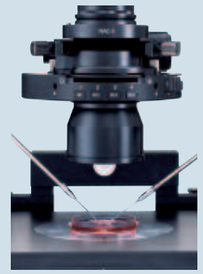
D **Long working distance condenser**

Combines versatility with optical excellence

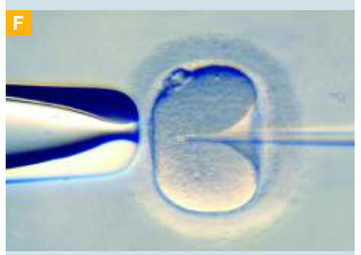


E **Relief contrast condenser**

Optimised visualisation of cellular membranes



F



Gentle but highly precise: intracytoplasmatic sperm injection

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THE PLATFORM

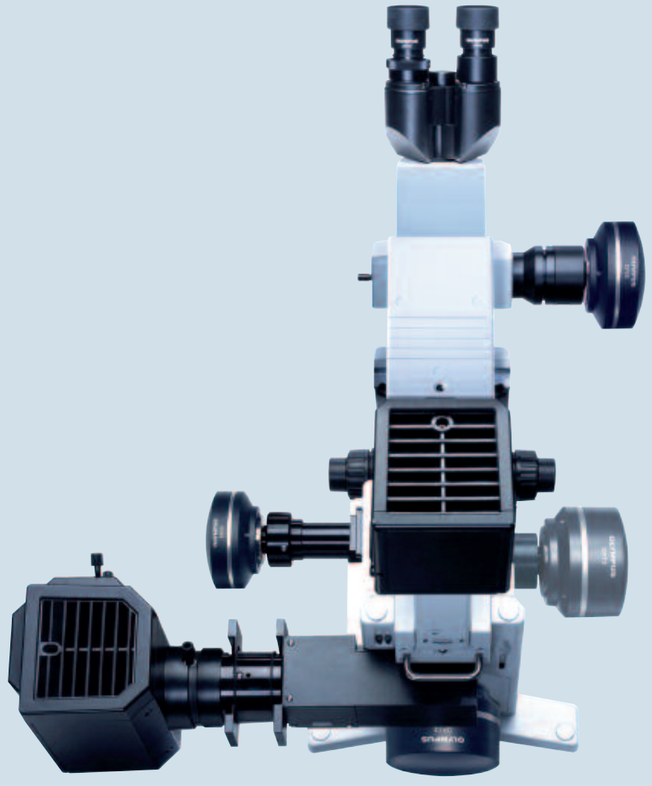
Anything is possible

Sometimes the hardest part of doing research is transferring an idea from your head into your laboratory. Olympus is continually developing microscopy systems that make this task easier – so you can focus on your ideas instead of having to worry about the right equipment and technology. This way, your original idea always remains intact – with Olympus, there is no need to make compromises.



NanoString Exhibit 1033.008

A



BE INSPIRED BY THE POSSIBILITIES

Multidimensional analysis requires a flexible microscope system. But how can you combine laser illumination with standard fluorescence illumination? Or use three different detectors at the same time? The unique multi-port concept of the IX71/IX81 microscopes gives an innovative answer to these questions.

Multi-port concept

A No other microscope system offers you greater flexibility: the IX71/IX81 frames are equipped with input/output ports for a wide variety of light sources and detectors. This unique Olympus design permits more than ten port configurations for each microscope. Our technical sales representatives look forward to advising you on the best port combination to meet your needs.

Primary image or parallel light access with the right side port

The right side port offers a variety of possibilities for usage. Together with the included telan lens, the port is a fully functional camera port suitable for mounting a second camera onto the frame. It also provides parallel light access, for example, enables the coupling of a light source, e.g. a laser for uncaging experiments, or the placement of a detector, e.g. a spectrometer, in the light path. The right side port features a field number of 16 and a 1x C-mount.

Double flexibility

C D To further increase flexibility and application support, the dual-port C-mount adaptor facilitates the attachment of two cameras. The adaptor has a filter holder that ensures easy adaptation for different wavelength ranges. The double lamp housing adaptor offers the same flexibility for illumination.

Saving space for your ideas

A The IX2 L-shaped illuminator is a great space-saving device. The ultra compact design of both illuminator and microscope offers increased flexibility for configuring peripheral devices such as the lamp house, micromanipulators, incubator and camera. Moreover, the L-shaped illuminator improves ergonomics, providing easy access to burner centration and aperture/field stop.

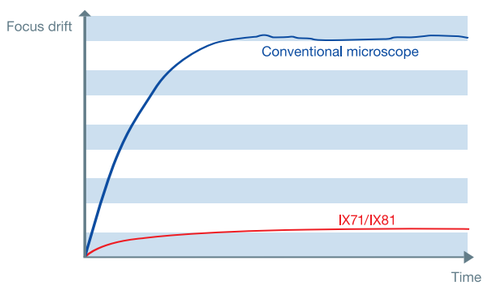
Everything under control

The investigation of fast processes in the nano scale, long exposure times to catch the weakest emissions, or time-lapse observations over several hours or days all need a stable platform ensuring that, once defined, target positions will be perfectly kept despite vibrations and environmental changes.

Thermal stability

Slim and rigid appear to be mutually exclusive requirements for a light microscope. Olympus successfully met this challenge by using its innovative product engineering in combination with state-of-the-art materials. The result is a compact microscope with maximum rigidity and minimum thermal expansion – a stable platform for all applications, including the most demanding time-lapse observations.

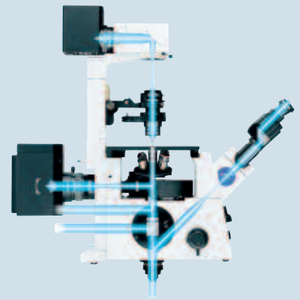
Thermal stability after switching on the light source



Focus stability

E The IX2-NPS nosepiece stage (patent pending) provides ultimate focus stability – even under different environmental conditions. This stability extends to all applications, including TIRF, where even the smallest of changes in the Z-position can significantly interfere with obtaining experimental results.

B IX71/IX81
Light path



C Dual-port C-mount
One port – two cameras



D Double lamp house adaptor
Easy switching between xenon and mercury



E Nosepiece stage
Ultimate focus stability



NanoString Exhibit 1033.009

A IX71
Frontal control panel



B IX81
Programmable frame keys



C Motorised nosepiece
Ergonomy and security



FROM MANUAL TO FULLY AUTOMATED

Motorisation is essential for full process automation. Consequently, all major microscope functions can be motorised – including focus, illumination, objective change and optical path selection. In addition, the Olympus modular motorisation allows you to choose a level of automation that perfectly matches your requirements. The innovative experiment manager of cellᴹ and cellᴿ imaging systems integrates the motorised microscope functions with image acquisition control and other automated options, facilitating the automation of both simple and complex experimental workflows.

IX71 – nearly auto

A The optical specifications of the manual IX71 microscope and the fully automated IX81 are identical. The main difference is that the IX71 has a lower level of motorisation (optional). Motorised filter wheels, filter cube turret, condenser, light intensity control, shutters and X/Y stage offer a high level of flexibility for a broad range of automated tasks. Individual user settings can be assigned to the keys of the remote handset.

IX81 – the fully motorised platform

B High-precision Z-motor, motorised six-position nosepiece, light path changer, intensity control and user-programmable keys for the frame and hand switch are integral parts of the automated IX81. All motorised units are driven by the IX2-UCB control box, which connects to a PC to access software control provided by the RS232 interface.

High-precision internal Z-motor
10 nm step size and 1 µm reproducibility independent of movement direction. Fine and coarse movement with 3 mm/sec. maximum speed.

Motorised nosepiece
C The integrated motorised six-position nosepiece with a computer-controlled automated objective escape function maximises security for both specimen and objective.

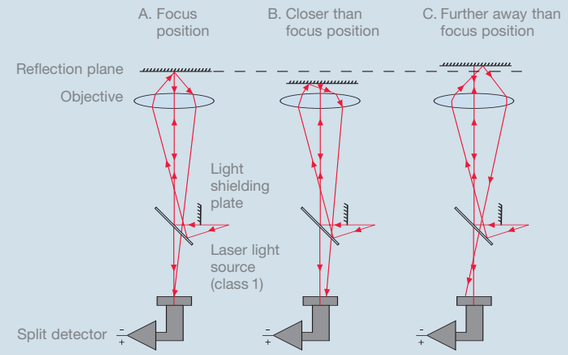
Light path changer
Switch between binocular observation and camera detection with 8% or 100% of the light being directed to the camera port, depending on the frame configuration. LED indication enables you to readily view the light path status. Motorised bottom port with mounted camera allows convenient control of image acquisition.

Programmable frame keys
All keys for the frame as well as the keys for the handset remote control are user-programmable. Depending on individual preferences and needs, the keys can be programmed and used for any desired mircoscope function.

The environment might change – but never the focus

D A laser-based fast Z-drift compensator (ZDC) system enables long-term observations, screening of multiwell plates and other specimen containers – allowing a fast adjustment time and specimen photoprotection. The IR laser focused to a small spot (1 to 3 µm) on the glass surface of e.g. a slide is reflected. The spot image is analysed by a photosensor and the focus is automatically adjusted. Individual thresholds for different slide thicknesses allow focusing on the plane of interest.

D



Motorised modules for maximum flexibility

All motorised modules are designed to fit the IX71/IX81 frames perfectly. The easy attachment to the frame offers the option to add new motorised modules to tune the system to the latest experiment requirements even later on.

PIFOC nosepiece
This unique piezoelectric nanofocusing device moves the entire objective revolver with 10 nm precision and a switching time of 30 ms (for steps smaller than 10 µm) over a total range of 80 µm. What's more, unlike piezo steppers for single objectives, it is compatible with DIC optics. The PIFOC nosepiece, as an alternative or addition to the motorised Z-drive, is an ideal option for fast and precise Z-stack and 3-D time-lapse acquisition.

E **Filter wheels**
Different six-position filter wheels are available for excitation and observation, holding filters of 25 mm or 32 mm in diameter. Switching time between neighbouring positions: 0.6 sec. A special fast observation filter wheel enables rapid wavelength switches in multi-wavelength observations, for use with cellᴹ and cellᴿ imaging stations, eight positions for filters, 25 mm in diameter, replaces C-mount adaptor; minimum switching time 58 ms.

Fluorescence filter cube turrets
Six-position turrets with quick lock mechanism for fast filter cube exchange. A fast filter cube turret (< 300 ms switching time) is available for live cell experiments in cellᴹ and cellᴿ.

Shutter
Vibration-free shutter to be mounted in the reflected or transmitted light path. Two shutters can be mounted in parallel.

Condenser
Six-position condenser. Designed for brightfield, phase contrast and DIC observations. Switching time between neighbouring positions: 0.6 sec.

F **Lamp house**
Always the right brightness – automatically. While changing magnification or contrast method, utilising the motorised nosepiece and condenser, the light is automatically set to the desired intensity (PC control).

G **X/Y stage**
XY
High-precision stages controlled via joystick and/or PC. Different frame inserts for various culture vessels are available.

E Filter wheels
For excitation and emission



E Fast observation filter wheel
With C-mount adaptor



F Light control
Automatic light intensity setting



G Motorised stage
Precise and convenient

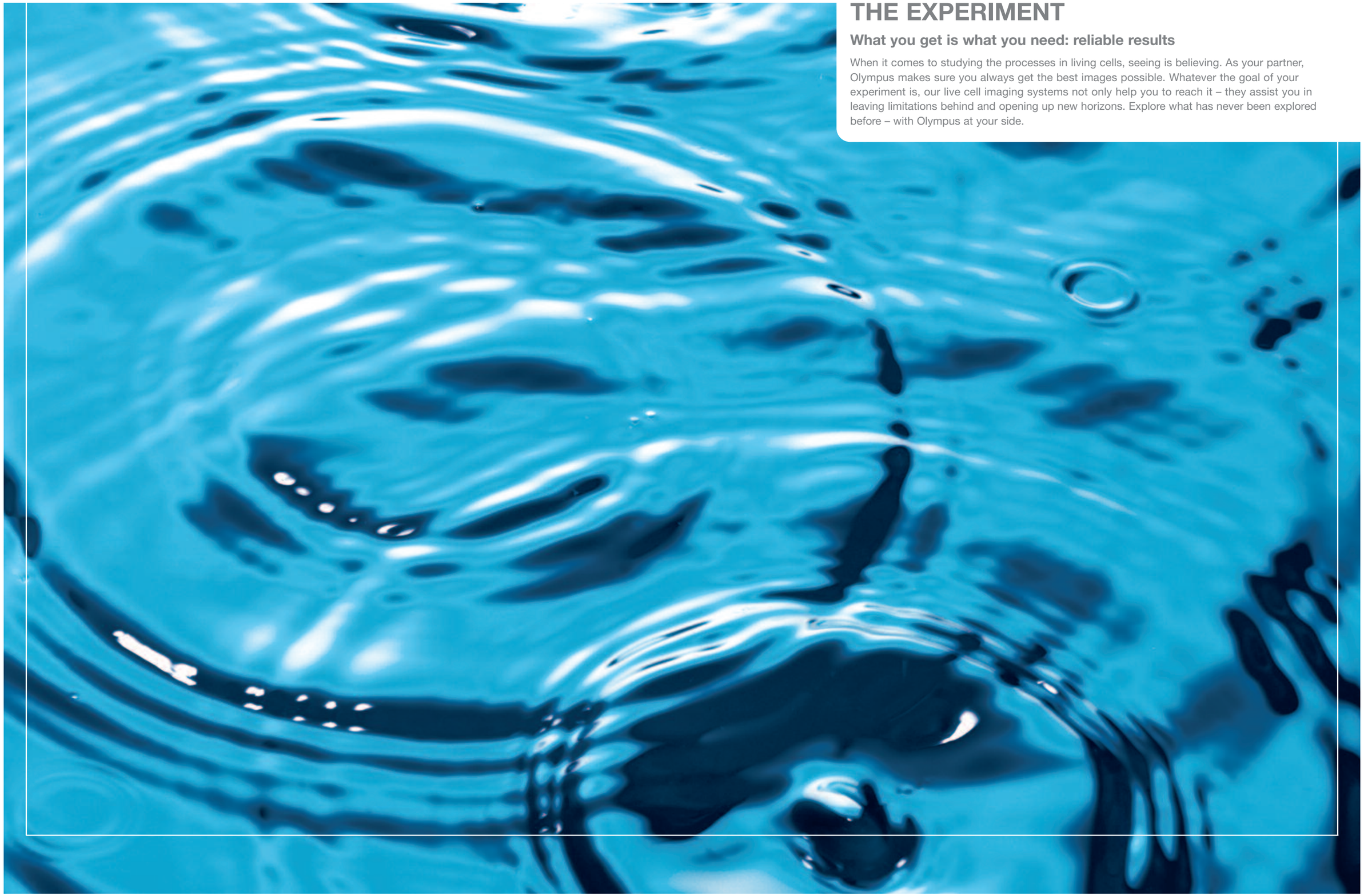


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THE EXPERIMENT

What you get is what you need: reliable results

When it comes to studying the processes in living cells, seeing is believing. As your partner, Olympus makes sure you always get the best images possible. Whatever the goal of your experiment is, our live cell imaging systems not only help you to reach it – they assist you in leaving limitations behind and opening up new horizons. Explore what has never been explored before – with Olympus at your side.



NanoString Exhibit 1033.011



EASY ACQUISITION AND ANALYSIS

With the imaging software packages of the cell* family, you can concentrate on your work without worrying about all the overwhelming possibilities of modern microscopes and cameras. All technical functions are translated into an intuitive user interface which caters for the working process during life science experiments. Once an image has been stored, cell* will allow you to discover much more detail than you would have imagined before.

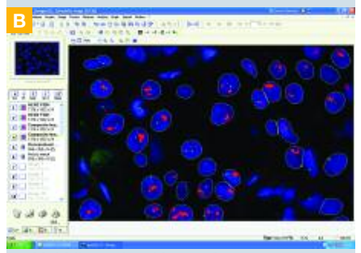

Microscope control

Control made easy

A Intuitive software allows easy control of all microscope and camera functions – putting you in total control of all experimental parameters while guaranteeing the acquisition of reproducible, high-quality results.

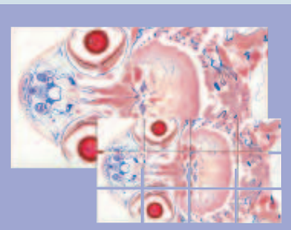
Multidimensional data handling

B All series of acquisitions are saved together with all experimental parameters in a multidimensional image format. This means that a single image file can consist of multiple images taken at e.g. different Z-positions and at different times or acquired with different wavelengths. The images can be processed further and visualised as desired. A specially designed navigation tool is implemented.


Multidimensional image formats

The basic image acquisition and documentation tools cellR and cellB

C More than a microscope and camera control, cellR is the solid, comprehensive entry level to imaging systems for biological microscopy. The basic documentation package cellB encompasses all functions of cellR, with the addition of archiving in a structured database, standard measurement functions, as well as a convenient standards-compliant report generation tool. Acquisition and processing features, such as a panorama function for multi-image alignment (MIA) for creating overview images in high resolution, are also available.


High-resolution overview images are easily created with multi-image alignment (MIA)

Rapid image acquisition with cellD

D cellD provides documentation and control, representing a comprehensive system for image acquisition, archiving and documentation in the biological field. cellD offers more advanced functions, allowing rapid image acquisition, direct Web transfer, numerous processing operations and the full capacity of interactive measurements.

Fluorescence image acquisition and processing with cellF

E cellF is the optimal system for fluorescence applications. It enables documentation, visualisation, processing and analysis of multi-channel fluorescence images (mFIP), such as those created using GFP variants. For enhanced spectral resolution of multi-channel images, a spectral unmixing tool is incorporated, as are tools for fluorescence image evaluation, such as co-localisation. cellF also features Z-sectioning and image acquisition at different focal positions to visualise specimens in 3D.

Get more with cellP

F The outstanding cellP package offers all the benefits of cellF and more. Dynamic processes can be registered by the image sequence processing module (ISP), automating the complete process from microscope control through to data archiving. Advanced tools for haze reduction of 3-D images, time-lapse photography and quantitative image analysis enable the user to carry out and analyse a range of complex and highly sophisticated experiments.

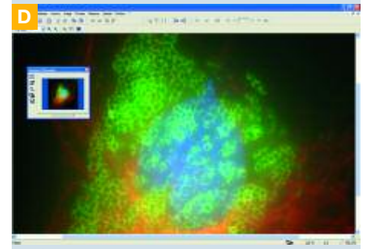
Discover your potential

G Experiments often need to be repeated to generate statistically relevant data – this is why automation considerably increases reliability. Extend your cell* system with a motorised stage and optional software modules for automated stage navigation and screening of culture vessels, multiwell plates and slides to automatically repeat experiments and collect data conveniently and reproducibly. Using the particle detection cell* module, thousands of objects can be analysed within an image in seconds. Objects can be automatically tracked in time-lapse series with the motion analysis module TrackIt and 3-D image stacks can be deconvoluted for high-resolution 3-D reconstruction.

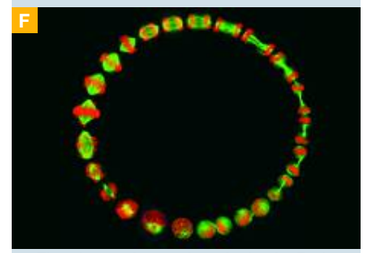
[1]* Courtesy of Dr Jeremy C. Simpson, EMBL, Heidelberg, Germany.

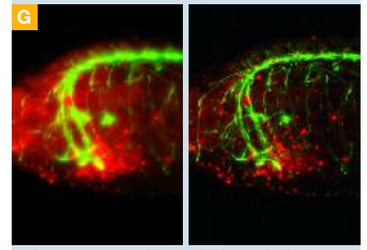
[2]* Courtesy of Per Homfeldt, Martin Gullberg Laboratory, Molecular Biology Dept., Umea, Sweden.

[3]* Courtesy of Dr Uwe Walldorf, Homburg/Saar, Germany.


Graphical user interface


Acquisition and processing of multicolour fluorescence images*1


Time-lapse observation of mitosis. Red: DNA with propidium iodide; green: microtubules with anti-alpha-tubulin antibody conjugated with Alexa-488*2


Image stack of Drosophila. Dual-labelled with Cy3 and FITC; left: original image; right: after deconvolution*3

NanoString Exhibit 1033.012

A



NEW INSIGHTS INTO CELLULAR PROCESSES

Microscopy in life science has progressed significantly: from static morphological observations to the characterisation of the 3-D architecture of cellular structures and the real-time investigation of dynamic molecular processes in living cells. Moreover, new fluorescence methods such as TIRF and fluorescence resonance energy transfer (FRET) microscopy or GFP labelling are providing exciting insights into the complex dynamic processes in living organisms.

B



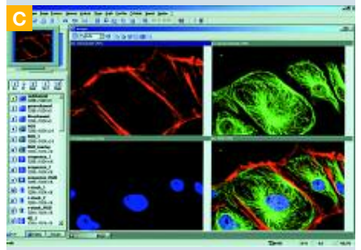
cell[M] fast and flexible, multi-purpose station

cell[M] is specifically designed to meet the experimental requirements for multicolour fluorescence time-lapse image acquisition. A key feature is the all-in-one MT10 illumination system for wavelength switch, attenuation and shuttering. The system coordinator, a control board solely for controlling hardware, increases imaging speed considerably in comparison with systems driven by software alone. cell[M]'s intuitively structured Experiment Manager is a user-friendly graphical drag and drop interface. This makes setting up even the most complex experiments exceptionally quick and easy.

cell[R] real-time imaging station

A cell[R] heads our live cell imaging system family: a fully integrated, modular system for a broad range of life science experiments – including time-lapse imaging, multidimensional imaging, ratio imaging, FRET and TIRF microscopy and spectral unmixing. We listen to the demands of our customers and their needs, constantly enhancing the system family to match new and emerging applications.

C



MT20 illumination system

B This multifunctional, all-in-one illumination system for fast wavelength switch and attenuation is designed to meet the requirements for fast multicolour real-time acquisition by highly sensitive cameras. Two types of light sources are available: high-stability 150 W Xe or Hg/Xe mixed-gas arc burners. The device provides wavelength switches within 65 ms and shutter times of 1 ms. The integrated light attenuator offers 14 grades of illumination intensity between 1% and 100%. All modules operate in parallel to ensure optimised light management. A unique mechanism (patent pending) facilitates the fast and easy exchange of excitation filters – without requiring any tools.

D



cell[M] and cell[R] imaging software

C This powerful modular software platform features user-definable database storage to archive multidimensional data sets. It also includes a comprehensive collection of tools for acquisition, documentation, processing and analysis, and fully supports sophisticated routines for time sequence analysis such as ratio and deltaF/F image calculations. The report generator enables automated reporting with layout control of text, graphics and images.

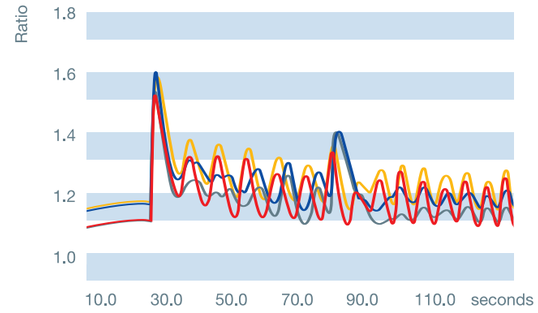
Hyper precision control

D An additional independent plug-in CPU board ensures interruption-free data capture by the cell[R] imaging computer during an experiment. All integrated devices work in parallel and are synchronised with sub-millisecond precision for optimised timing and minimal photobleaching.

Experiment Manager

E A unique graphical interface and intuitive drag and drop programming make the design and execution of experiments very easy. The complete experimental design is readily visible at a glance and is automatically stored together with the captured data in the archive database.

CFP/YFP channel overlay and pseudo-coloured ratio imaging



Application solutions

The full control of illumination systems, microscope, and signal detection systems enables Olympus to offer application solutions that transform complex routines into easy-to-handle tools.

FRET and spectral unmixing

F Spectral unmixing is a unique tool of the cell[R] imaging software for colour resolution enhancement. It separates the signals of fluorochromes with pronounced spectral overlap that could otherwise not be distinguished, providing sharply contrasted images for less common fluorescent protein combinations such as GFP/YFP. In FRET studies, the occurrence of molecular interactions becomes more immediately obvious even before quantitative analysis. Furthermore, co-localisation studies become more reliable because bleed-through artefacts are avoided.

TIRF

Total internal reflection fluorescence microscopy enables the investigation of surfaces with extremely high Z-resolution and without interfering background. Illumination combiners for up to three lasers and the MT20 illumination system allow fast switching (1 ms) between the different light sources and thus combined TIRF and widefield applications.

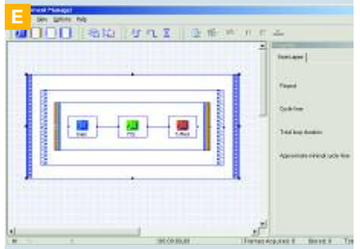
Ratio imaging

The fluorescence behaviour of many dyes is influenced by the concentration of certain ions such as calcium (FURA-2) or the pH value (BCECF). The detection, quantification and analysis of changes in fluorescence intensity allow the indirect study of certain cellular processes such as signal transduction.

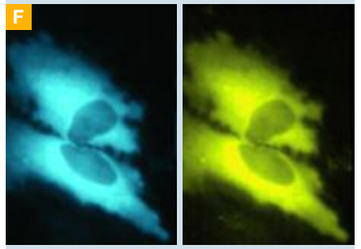
*1 HeLa cells labelled with CFP/YFP chameleon, triggered with histamine. Courtesy of Dr Hideaki Mizuno and Dr Atsushi Miyawaki, Brain Science Institute, RIKEN, Wako, Saitama, Japan.

*2 Courtesy of Dr Paulo Magalhaes and Prof. Dr Tullio Pozzan, University of Padua, Italy.

E

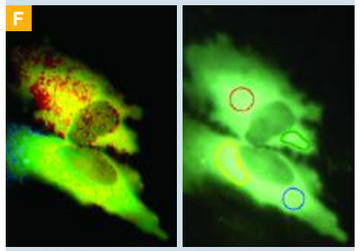


F



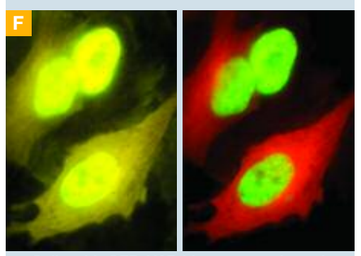
Pseudo-coloured CFP/YFP double-emission image acquired with Dual-View™ Micro-Imager *1

F



CFP/YFP channel overlay and pseudo-coloured ratio image *1

F



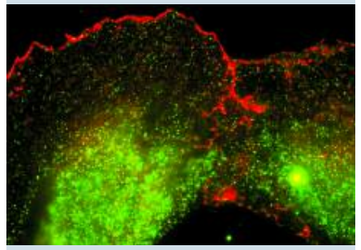
Cells with GFP-H2B histone protein and YFP-tubulin. Left: original image, acquired with an imaging station, filters: GFP and YFP exciters, YFP dichroic mirror and emitter; right: after spectral unmixing *2

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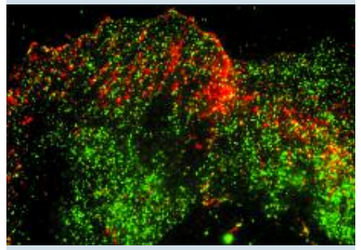
A **TIRF objectives**

Unprecedented numerical aperture – outstanding visible performance





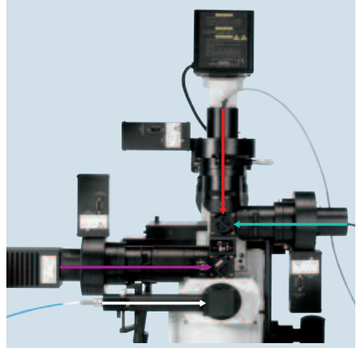
Conventional fluorescence observation



Total internal reflection fluorescence observation; courtesy of M. Faretta, Eur. Inst. Oncology (IEO-IFOM), Milan, Italy

B **TIRF illumination combiner**

Coupling up to three laser lines and an MT10/MT20 widefield illumination system



EXCITING THE PERIPHERY WITH VERSATILE TIRFM PLATFORMS

Total Internal Reflection Microscopy (TIRFM) is an elegant optical technique for extremely high-resolution cell surface imaging without the disturbing out-of-focus haze characteristic of widefield fluorescence microscopy. In 1998 we introduced a TIRFM illuminator and an objective with sufficiently high numerical aperture as the first commercial solution for objective-based TIRFM. Now, based on our long-standing experience and expertise, we are offering a range of TIRFM objectives, single- and multi-port illuminators, as well as a choice of lasers to enable life science researchers to exploit the potential of TIRFM for their application.

Objective-based TIRF microscopy

The basic principle of TIRFM is that a laser beam is focused to the periphery of the back focal plane of the objective. If the objective numerical aperture (NA) is larger than 1.38, the beam exits the objective at a very shallow angle and is totally reflected at the glass interface of the sample. The reflected light causes a near-field effect that selectively excites fluorochromes that are within 100 and 700 nm of the surface, yielding images with very high S/N ratios. High-performance objectives and innovative illumination systems give Olympus a leading position in this cutting-edge field.

cell^M and cell^R fully integrated turnkey solutions for TIRFM

Olympus offers modular illumination combiners to couple up to three laser beams and an MT10/MT20 white-light source to the microscopes, allowing convenient adjustment of the laser beam incident angle. Providing all laser safety features a series of specially designed laser systems is the optimal TIRFM excitation source for the entire range of fluorophores. By integrating the TIRFM equipment with full software support into the versatile cell^M and cell^R imaging stations, Olympus offers easy-to-use, turnkey solutions to enable researchers to exploit the entire potential of total internal reflection microscopy.

A brilliant solution: the first white-light TIRFM system on the market

Achieving a breakthrough in microscopy, Olympus developed the world's first fluorescence excitation light from a standard white-light source (xenon or mercury arc lamp) for TIRF. We offer TIRF microscopy at a moderate cost with high flexibility in fluorochrome selection.

TIRFM specialists

A **B** The new 60x plan apochromat objective with an NA of 1.45 provides optimum imaging through a temperature correction collar, making it highly responsive to changing environmental conditions.

Our 100x apochromat objective combines an unprecedented NA of 1.65 and a high S/N ratio, guaranteeing an outstanding visible performance. It allows extreme TIR angles and adjustments over a wide angle range. Thus, the depth of excitation can be lowered down to yield a Z-section as narrow as around 50 nm at short wavelengths.

With its extraordinarily high magnification, the 150x universal apochromat (NA 1.45) is the only TIRFM objective of its kind on the market and was specially developed for single-molecule applications. It features a compensation collar for temperature and cover glass thickness.

The 100x plan apochromat TIRFM objective with 1.45 NA guarantees high-resolution TIRFM images and completes the series of dedicated TIRFM objectives.

C



OPENING NEW FRONTIERS – FV1000/FV1000MPE LSM-SYSTEMS

C The FluoView FV1000 confocal and FV1000MPE multiphoton systems deliver all the key performance functions required from a confocal laser scanning microscope – plus the unique dual scanner, allowing stimulation and observation at the same time. It minimises specimen damage during high-speed imaging of living organisms and accurately captures a full range of related information. With high sensitivity, high speed and high precision, the FV1000 is ready to meet the demands of all your applications.

Don't miss anything – reliable capture of reactions

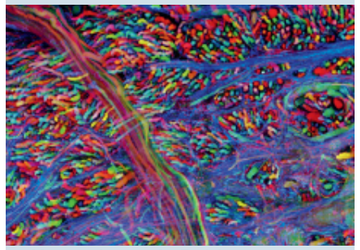
D The FV1000 with the unique SIM (SIMultaneous) scanner incorporates two independent, fully synchronised laser scanners in a single compact design for simultaneous laser light stimulation and high-resolution confocal observation. This unique scanning capability ensures that confocal image observation is no longer interrupted during laser light stimulation, e.g. photoactivation, or laser manipulation, e.g. photobleaching.

Benefit

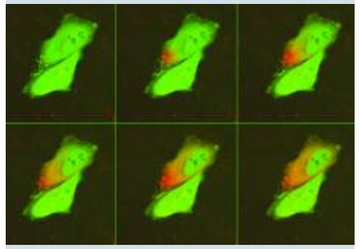
You will not miss rapid fluorescence changes that occur during or immediately following laser stimulation or manipulation.

Applications

The unique SIM concept offers distinct advantages for sophisticated applications – including FRAP (fluorescence recovery after photobleaching), FLIP (fluorescence loss in photobleaching), TIRFM (total internal reflection fluorescence microscopy), FLIM (fluorescence lifetime imaging), photoactivation, photoconversion, uncaging, laser ablation and many more.



Montage image of a Brainbow transgenic mouse brain stem, showing large caliber axons of the auditory pathway. In Brainbow mice, neurons randomly choose combinations of red, yellow and cyan fluorescent proteins, so that they each glow a particular color. This provides a way to distinguish neighboring neurons and visualize brain circuits.*1



Time series of Kaede-expressed HeLa cells. Photo conversion done via local 405 nm laser illumination with the SIM scanner. Confocal image observation documented every three seconds with 488 nm/543 nm laser excitation and dual-channel (red/green) detection.*2

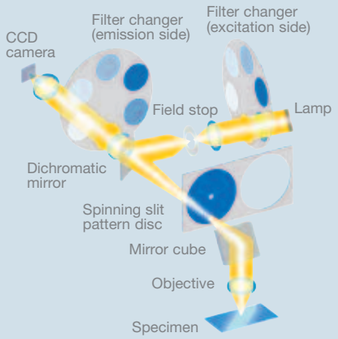
*1 Image courtesy of Jean Livet, Harvard University, Cambridge, MA, USA.

*2 Data courtesy of Ms Ryoko Ando, Dr Atsushi Miyawaki, Brain Science Institute, RIKEN, Wako, Saitama, Japan.

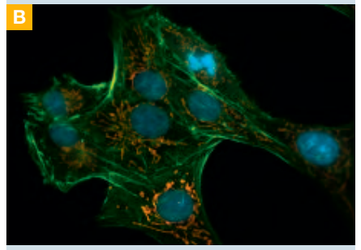
NanoString Exhibit 1033.014

A Disc Scanning Unit

Principle

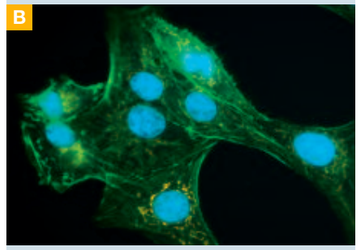


B



Conventional fluorescence microscopy
PtK2 cells

B



Disc scanning confocal microscopy.
Excellent optical sectioning, superior resolution and removal of blur

OLYMPUS INNOVATION

Olympus is always looking for new ways to enable discoveries, helping researchers to reveal pathways and unravel mechanisms. We have developed an innovative system with patent-pending slit disc technology for fluorescence-based applications. Our Disc Scanning Unit (DSU) provides semi-confocal optical sectioning with a maximum in wavelength flexibility at a favourable price.

Fast image acquisition with semi-confocal spinning disc

The Olympus disc scanning semi-confocal modules use an arc lamp as an illumination source for a wide range of excitation wavelengths, combining the advantages of widefield fluorescence microscopy with confocal-like improved contrast and resolution at a reasonable price. Integrated into our imaging systems like cell^M and cell^R, they are ideal devices for optical sectioning applications.

A In conventional widefield fluorescence microscopy, the inside structure of a thick specimen cannot be observed clearly because of the significant contribution of out-of-focus light from above and below the focal plane. The Disc Scanning Unit makes it possible to reject this image-degrading out-of-focus light by placing a rotating slit disc in the confocal plane of the microscope, producing crisp, confocal-like images including controllable depth of field and the ability to collect serial optical sections from specimens.

The Disc Scanning Unit (DSU)

B Directing light from a white-light source like a fluorescence lamp house or an MT10/MT20 through a spinning slit disc results in an averaging of confocal and widefield illumination. The slit disc spins at 3,000 rpm, creating pinholes which have a similar effect to the pinholes used in confocal laser scanning microscopy. This allows accelerated high-resolution semi-confocal imaging and optical sectioning without lasers. A single image is acquired with a CCD camera while no sophisticated processing is required at all. The improved resolution, contrast and S/N ratio due to the removal of out-of-focus haze becomes immediately obvious.

Integrated into our cell^M and cell^R imaging systems, the DSU is an ideal device for optical sectioning in combination with a variety of imaging applications.

Flexibility

Five discs with different slit widths are available to match the NA and resolution of different objectives and specimen thickness. Exchanging discs is easy, enabling observations of different types of specimens within one simple set-up. As your needs change, you can easily update the fluorescence excitation characteristics by adding new filters to coincide with your new fluorochromes.

Semi-confocal microscopy with excellent cost-effectiveness

By using a standard light source instead of lasers, the Olympus Disc Scanning Unit offers semi-confocal microscopy at a favourable price. The excitation wavelength range of the DSU system spans from 350 to 700 nm – making it suitable for most available fluorochromes.

STABLE CONDITIONS ENSURE RELIABLE RESULTS

As parameters like temperature, pH, humidity and CO_2 concentration influence biological processes, maintaining stable environmental conditions is essential for reproducible results. Olympus offers the full range of devices for environmental parameter control – from simple heating plates up to fully integrated incubator systems.

Specimen temperature control – precise and stable

All temperature control devices are made from materials that ensure even thermal conductivity and thermal distribution, providing a constant temperature for live cell imaging.

C For the greatest flexibility in culture vessel fitting, heating plates are available which provide direct heating and temperature control from below the sample. For more sophisticated live cell experiments, e.g. laser scanning confocal microscopy applications, heating stage inserts with covers are available which display optimum heat distribution around and below the sample. Specialised heating stages with high thermal capacity and stability are perfectly suited for temperature-controlled electrophysiological experiments. What is more, the observation opening for the objectives is as small as possible to reduce the non-heated area.

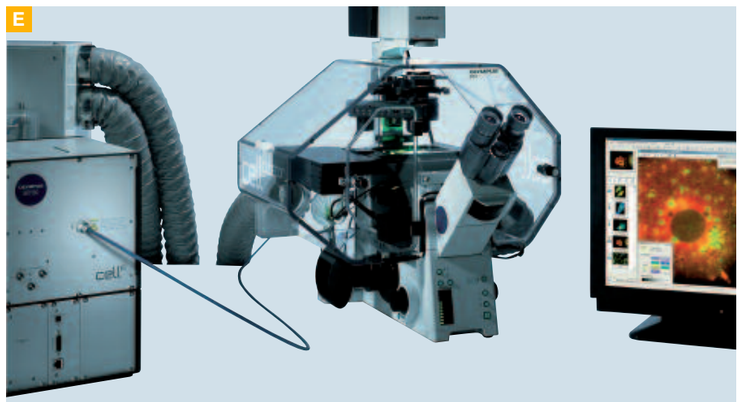
Stage incubator

D For longer experiments, stage incubators can keep the environment inside a laboratory dish completely stable. Olympus offers several types of stage incubators. Temperature and CO_2 concentration within the small chamber is precisely controlled by closed-loop control units. The easy handling and quick installation make stage incubators a good choice for many live cell experiments.

CellCubator – full environmental control in experiments with living specimens

E The frame-mounted climate chamber allows the rapid control of all environmental parameters: temperature setting from ambient to 42° C in 30 min., CO_2 from ambient to 10% in less than 2 min. and humidity from ambient to 70% in 2 min. (optional). The incubator is equipped with anti-scratch coating and a heating aggregate. All peripherals can be autoclaved. The air supply is filtered through a HEPA filter to minimise the risk of contamination.

E



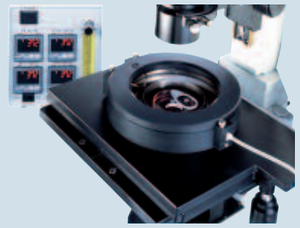
C Heating plate

Temperature control



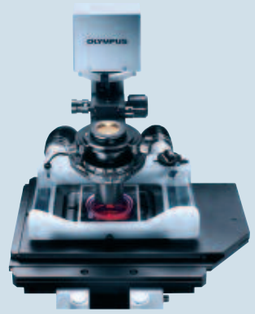
D Stage incubator

Stable environmental conditions



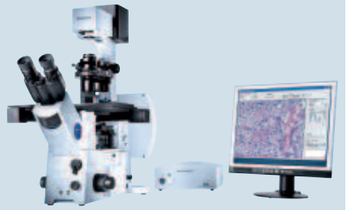
D Stage incubator

Incubator for stages with rectangular opening



NanoString Exhibit 1033.015

A CellCut
Laser microdissection system





Microdissection of living cells



Target material from colon tissues with extracted targets

MERGING MICROSCOPY WITH MOLECULAR BIOLOGY AND CYTOMETRY

Combining the knowledge of different research fields often leads to the breakthrough that makes real discoveries possible. In the same way, Olympus has created systems that merge microscopy with other technologies, allowing new insights into the mechanisms of life.

Non-contact laser microdissection

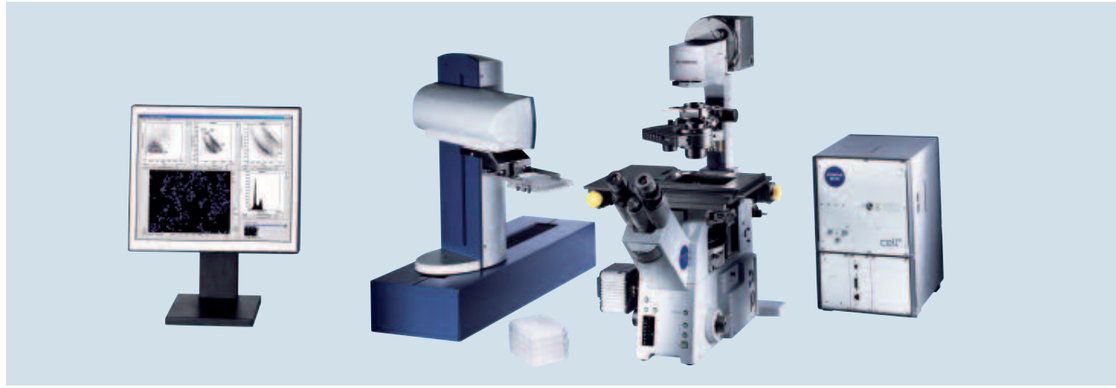
A The CellCut system is the most precise and versatile laser manipulation system, offering a broad range of applications: laser microdissection, laser-induced microinjection, cell fusion and "contamination-free" removal of target cells and subcellular structures from paraffin or cryo sections, smears, cytospins and cell cultures. Precise laser ablation as a single shot can make holes in cell membranes, organelles or cell walls, enabling microinjection of drugs or genetic materials. Cell clusters or single cells can be isolated and even single chromosomes or chromosome parts can be dissected. A cut target element can be easily and quickly removed from the specimen to a microfuge tube cap using a unique sandwich preparation in conjunction with CapLift technology. This provides non-contaminating capture without any contact to the target, ready for downstream analysis.

Precise, quick and intuitive

Laser microdissection combined with extraction of target structures offers a precise and gentle process designed to protect the extracted components. Based on a solid-state bUVa laser with picosecond pulses, cutting of target areas is performed very quickly and without any negative impact on subsequent DNA and RNA extraction or protein analysis. The versatile system controlled by system software with intuitive graphical user interfaces and a unique touch screen is suitable for all specimens, including tissue slides, stained specimens, smears, cytospins and living cells.

Fully configurable to meet your needs

The CellCut systems are available in different configurations based on the inverted microscope frames IX71 and IX81 – all fully tailored to meet your needs. Easy to handle, they include a highly precise motorised stage, outstanding UIS2 optics and comprehensive control software for the system operation and specimen screening process. Fluorescence illumination for simultaneous observation of fluorescence-labelled specimen structures and laser microdissection is possible without any limitations due to a dual-level coupling of the cutting laser. Further options are also available, such as MultiSlide, MultiCap and CellExplorer.



Fully automated cellular high-content analysis

Cellular high-content screening has been an established method in pharmaceutical compound screening and drug development for many years. Due to the lack of flexible and economical technologies, microplate readers or flow cytometers have mostly been used for cell population assays in basic and applied research. To combine the powerful possibilities of fluorescent population assays with the outstanding spatial resolution of microscopy, Olympus has developed an extremely flexible and reliable screening system for a wide range of cellular applications in functional genomics, cancer research, neuroscience and drug development.

Automated, high-throughput image acquisition with unrivalled flexibility

In modern assay development and cellular screening, complex biological reactions have to be monitored in whole cell populations with high resolution and speed. The scan^R system offers a user-friendly image acquisition portal for fast and reliable raw data collection enabling almost every cellular assay type. An unlimited number of different dye channels, fast and long-term time loop experiments, Z-stacks and parallel differential interference contrast or phase contrast modes are only a few options. A highly stabilised illumination system in combination with fast hardware and software autofocus routines guarantees the maximum accuracy in quantitative analyses. The integration of robotic microplate handlers and dedicated environment control systems expand scan^R's possibilities in throughput and live cell applications.

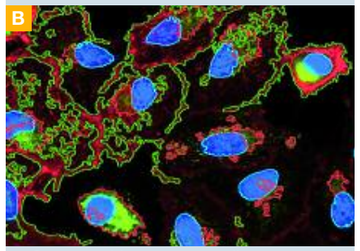
Accurate multi-step cell segmentation and object analyser

B Extracting reliable quantitative and morphological information from complex cell culture models is the most challenging step in high-throughput, high-content analysis. With the scan^R analysis module, Olympus has succeeded in combining a user-friendly interface with the highest level of flexibility. Most standard assay types are predefined and can be adjusted to new conditions with minimal effort. For special applications, an open graphical interface enables the quick and flexible integration of further object detection and object analysing modules from huge libraries.

Cytometry-like data display is combined with image-data linking

C As in flow cytometry, the extracted data are displayed in scatter plots and histograms. Selected data sets can be further investigated using gating procedures, where only data fitting a specific criterion are selected. A series of 'gates' can therefore be used as a hierarchical filter to select data points that fall within precise boundaries. Images, objects and sub-objects are linked directly to any data related to them, meaning that by clicking on a data point or image, the reciprocal information is highlighted alongside. Selected image sets can also be displayed in a gallery window for easier comparison. In combination with the accurate quantification of fluorescent signals, the scan^R perfectly interconnects the cytometry of whole cell populations with the high-resolution data of modern microscopy.

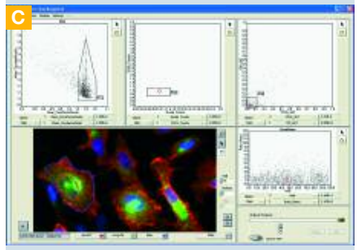
B



Genome wide screen on cell arrays. Detection and separation of labels. Blue DAPI-stained nuclei are circled in cyan; green CFP-tagged VSVG protein in the golgi is circled in red; red Cy-5 VSVG antibodies on the cell surface are circled in blue *

* Courtesy of Dr Rainer Pepperkok, EMBL, Heidelberg, Germany.

C



Gating, classification and data evaluation *

NanoString Exhibit 1033.016

A XC30
3-megapixel cooled camera head



B DP72
Multi-purpose camera



C XM10
Monochrome cooled CCD



DIGITAL REVOLUTION

If your aim is to record and analyse microscopy samples on the basis of excellent images, you need high-resolution digital cameras with sophisticated dynamics, sensitivity and resolution. Olympus supplies both black-and-white cameras for fluorescence and colour cameras for all other applications. All models can be fully controlled by the cell^ family of imaging software.

XC30 – perfect colour match

A The Olympus XC30 offers a 3.2-megapixel resolution and fast frame rates with the added benefit of 2x and 3x colour binning. The versatile CCD camera is ideal for brightfield applications and can also be used for high-intensity fluorescence. The Peltier cooling mechanism maintains the CCD chip at a constant 10 ˚C (at 25 ˚C ambient temperature) to guarantee perfect colour images that are rich in contrast, with excellent colour fidelity and extremely low background noise.

The CCD chip offers 14 bits per colour channel and can be switched between various frame rates for easier use. As well as two binning modes with frame rates up to 35 fps, the XC30 also offers a partial readout mode where a segment of the entire field of view can be defined by the user and only this image segment is read out by the camera. This enables faster focusing on and imaging of the features of interest within the field of view.

The unique Olympus True Colour (OTC) system ensures perfect colour fidelity from the specimen to the monitor.

DP72 – one for all

B The Olympus DP72 digital camera offers unmatched versatility for microscopists, combining a 12.8-megapixel resolution with the highest sensitivity, very fast image acquisition rates and colour match performance.

The Olympus DP72 digital camera uses the latest interface technology and a high-sensitivity CCD to provide the fastest image acquisition rates of any comparable camera. In live mode, full-frame images (1,360 x 1,024 pixels) can be viewed at 15 frames per second, making it ideal for viewing, discussion and documentation. A real-time frame-averaging function minimises noise and optimises the display, resulting in low-noise live images. Still images, at pinpoint resolutions of up to 12.8 million pixels, can be obtained in less than 2.5 seconds with Olympus' unique piezo-shift technology.

With superior hardware-driven image processing capabilities, the DP72 is especially suitable for applications such as pathology, where faithful colour reproduction is essential. In applications such as fluorescence microscopy, where a specimen is wholly or partially dark, the DP72 records black-and-white images with exceptional sensitivity. The custom monochrome mode allows the user to optimise the recording sensitivity according to the fluorescent dye in the specimen.

XM10 – perfect black and white

C The XM10 offers all of the properties required to provide dependable fluorescence microscopy images: high resolution, extremely high sensitivity, a cooled 1.4-mega-pixel CCD chip, variable resolutions and an optional external trigger function.

The XM10 is extremely sensitive, low in electronic noise and supports long integration times of up to 160 seconds. The chip has a pixel size of 6.45 µm x 6.45 µm, which, in combination with the camera cooling, ensures that the XM10 is ideal for recording even the faintest fluorescence signals in your specimen. The XM10 uses a CCD chip cooled to 10 ˚C (at 25 ˚C ambient temperature) with a 14-bit dynamic range and 15 fps at full resolution. It offers three binning modes, resulting in increased sensitivity and excellent frame rates in live mode.

OBJECTIVES

Using the latest technologies and materials, the new UIS2 optics were designed by Olympus experts to offer contrast and image resolution without compromises. This enables you to capture the most intricate of details from your experiments – making your work more efficient and your results more reliable.



UPLSAPO high fidelity for advanced fluorescence applications

A High-performance universal plan wide-range apochromatic-corrected objectives with unsurpassed numerical aperture values deliver the best resolution, contrast and field flatness for any microscope technique. In combination with the lowest auto-fluorescence of all objective series, they are the best choice for advanced fluorescence applications.

LUCPLFLN objectives for tissues and cell cultures

B Semi-apochromatic objectives, designed for tissue culture observations in flasks and dishes. Excellent contrast and resolution in brightfield, phase contrast, DIC and fluorescence observations.

UPLFLN universal objectives

C Affordable semi-apochromatic universal objectives that deliver superb resolution, contrast and image flatness with any microscopic technique.

ORC objectives

D Olympus relief contrast (ORC) objectives were designed for observing living cells including oocytes in glass and plastic vessels, and have found widespread use in micromanipulation work.

TIRF objectives

E With their extremely high numerical apertures of 1.45, 1.49 or even 1.65, these objectives have been developed especially for total internal reflection fluorescence (TIRF) microscopy, which enables high-resolution visualisation of cell surface signals on the nanometer scale.

UAPO/340 objectives

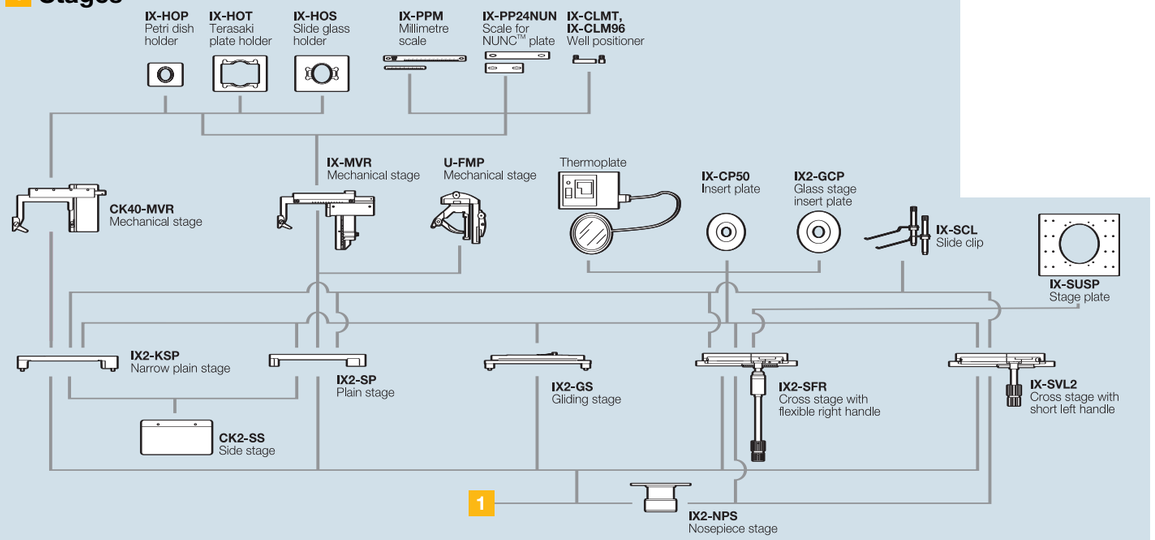
F High transmission in the near-UV wavelength (340 nm) makes these objectives perfect for applications such as ratio imaging or measurement of intracellular pH with UV-excitable fluorochromes.

	Objective	NA	WD (mm)	Cover glass correction (mm)
A	UPLSAPO 4x	0.16	13	–
	UPLSAPO 10x	0.4	3.1	0.17
	UPLAPO 10xO	0.4	0.24	0.17
	UPLAPO 10xW	0.4	0.43	0.17
	UPLSAPO 20x	0.75	0.6	0.17
	UPLSAPO 20xO	0.85	0.17	–
	UPLSAPO 40x	0.9	0.18	0.11–0.23
	UPLAPO 40xOI	0.5–1	0.12	–
	UPLSAPO 60xO	1.35	0.15	0.17
	PLAPON 60xO	1.42	0.15	0.17
	UPLSAPO 60xW	1.2	0.28	0.15–0.2
	UPLSAPO 100xOI	1.4	0.13	0.17
B	CPLN 10xPH	0.25	10	1
	LCACHN 20xPH	0.4	3.2	1
	LCACHN 40xPH	0.55	2.2	1
	CPLFLN 10xPH	0.3	9.5	1
	LUCPFLN 20x	0.45	6.6–7.8	0–2
	LUCPFLN 20xPH	0.45	6.6–7.8	0–2
	LUCPFLN 40x	0.6	2.7–4	0–2
	LUCPFLN 40xPH	0.6	3–4.2	0–2
	LUCPFLN 60x	0.7	1.5–2.2	0.1–1.3
	LUCPFLN 60xPH	0.7	1.5–2.2	0.1–1.3
C	UPLFLN 4x	0.13	17	–
	UPLFLN 4xPH	0.13	17	–
	UPLFLN 10x	0.3	10	–
	UPLFLN 10xPH	0.3	10	–
	UPLFLN 20x	0.5	2.1	0.17
	UPLFLN 20xPH	0.5	2.1	0.17
	UPLFLN 40x	0.75	0.51	0.17
	UPLFLN 40xO	1.3	0.2	0.17
	UPLFLN 40xPH	0.75	0.51	0.17
	UPLFLN 60xO	0.9	0.2	0.17
	UPLFLN 60xOI	0.65–1.25	0.12	0.17
	UPLFLN 60xOIPH	0.65–1.25	0.12	0.17
	UPLFLN 100xO	1.3	0.2	0.17
	UPLFLN 100xOI	0.6–1.3	0.2	0.17
	UPLFLN 100xOPH	1.3	0.2	0.17
D	CPLFLN 10xRC	0.3	9	1.5
	CPLN 10xRC	0.25	9.7	1.5
	LCPLFLN 20xRC	0.45	6.6–7.8	0–2
	LUCPLFLN 40xRC	0.6	3–4.2	0–2
	LCACHN 20xRC	0.4	2.8	1.5
	LCACHN 40xRC	0.55	1.9	1.5
E	PLAPON 60xOTIRFM	1.45	0.1	0.13–0.19
	PLAPO 100xOTIRFM	1.45	0.1	0.17
	APO 100xOHR	1.65	0.1	0.15
	UAPO 150xOTIRFM	1.45	0.12	0.13–0.21
	APON 60xO	1.49	0.1	0.13–0.19
F	UAPO 20x/340	0.75	0.55	0.17
	UAPO 20xW/340	0.7	0.4	0.17
	UAPO 40x/340	0.9	0.2	0.11–0.23
	UAPO 40xOI/340	0.65–1.35	0.1	0.17
	UAPO 40xW/340	1.15	0.25	0.13–0.25

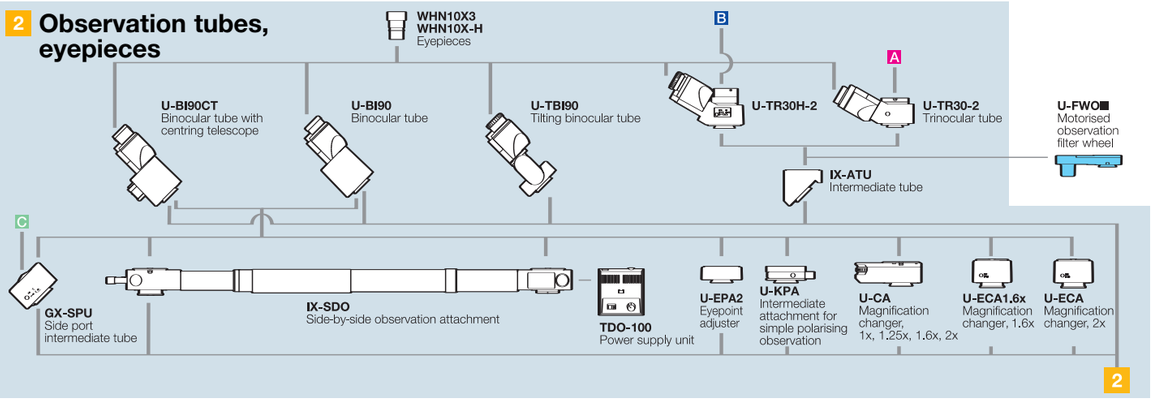
For further information on our UIS2 objectives, please visit our homepage www.olympus-europa.com

NanoString Exhibit 1033.017

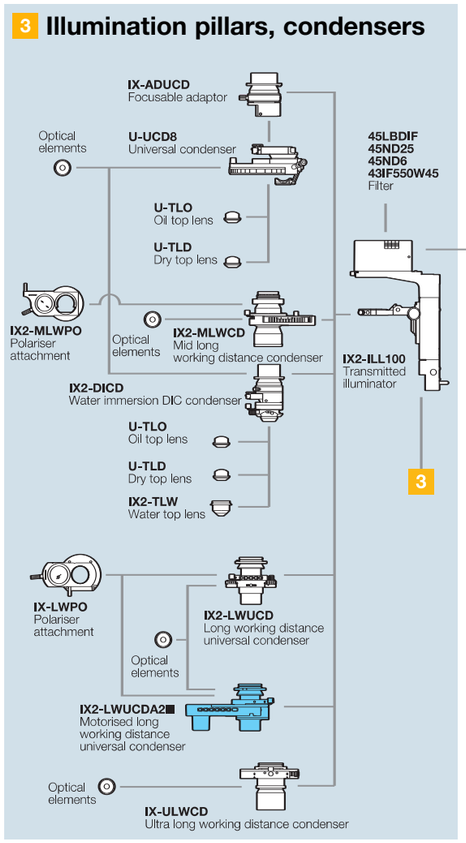
1 Stages



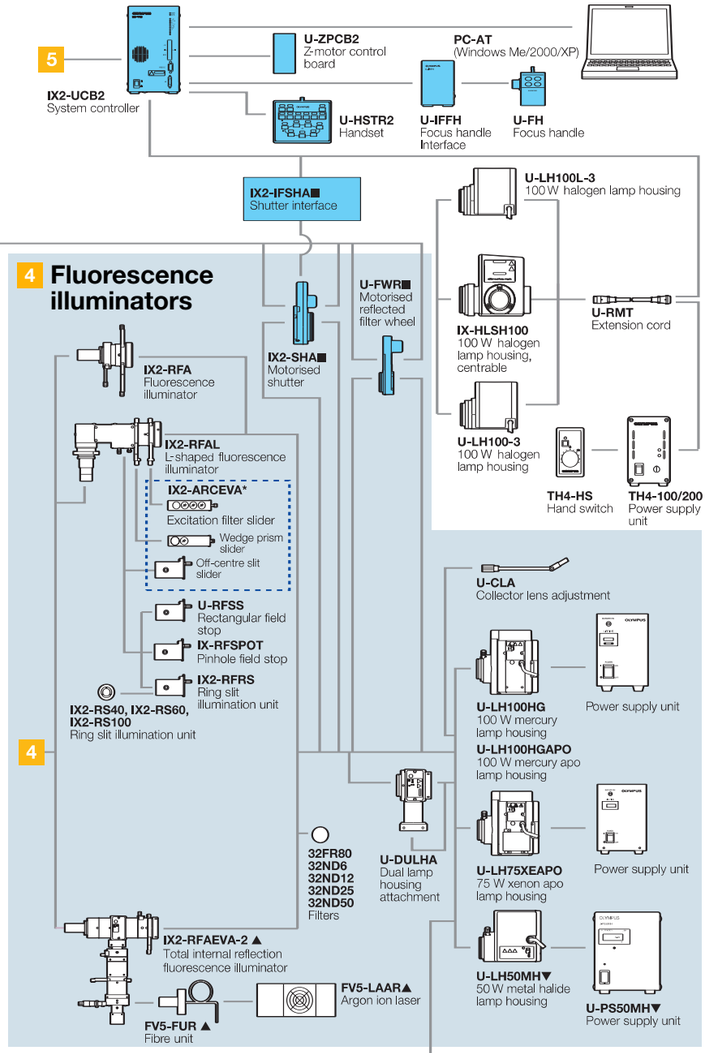
2 Observation tubes, eyepieces



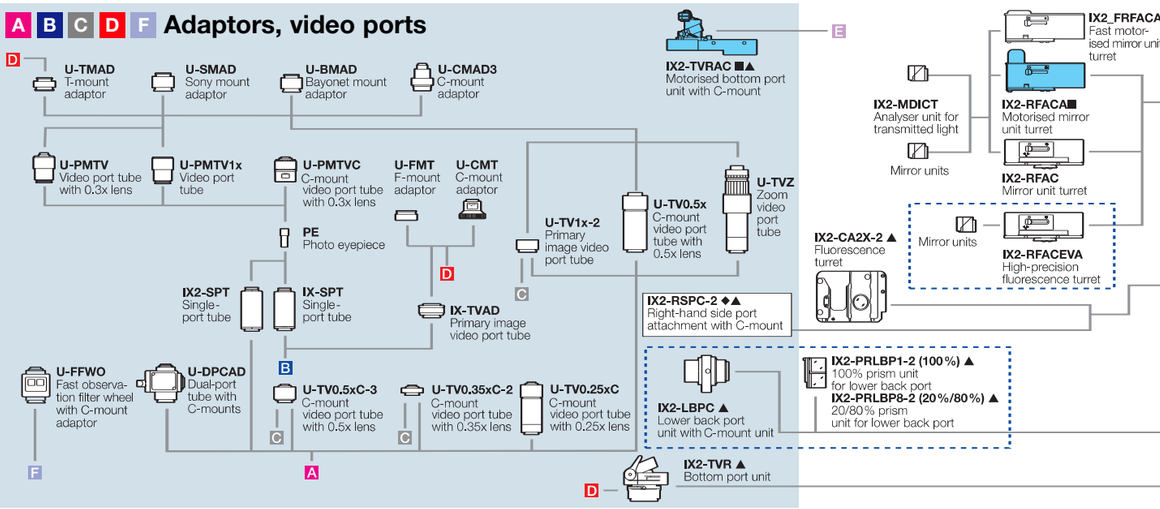
3 Illumination pillars, condensers

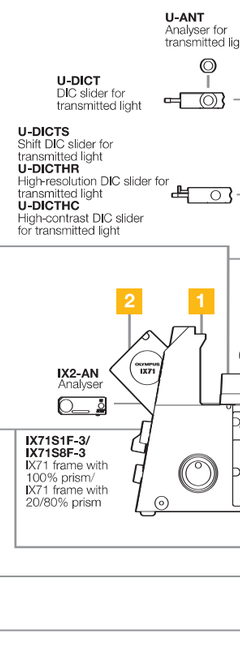


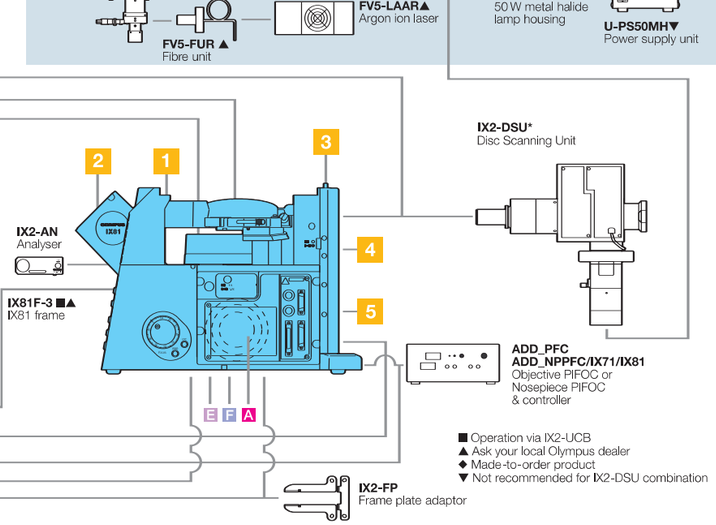
4 Fluorescence illuminators



A B C D F Adaptors, video ports







■ Operation via IX2-UCB
▲ Ask your local Olympus dealer
◆ Made-to-order product
▼ Not recommended for IX2-DSU combination

NanoString Exhibit 1033.018

IX71/IX81 specifications

Item		IX71	IX81
Microscope body	**Optical system**	UIS2	
	Focus	Vertical stage movement: 9 mm stroke with upper limit stopper, coaxial coarse and fine focusing knobs (minimum fine focus graduation: 1 µm, full rotation of fine focusing knobs: 100 µm), torque adjustment for coarse drive controls	Vertical stage movement: 9 mm stroke with upper limit stopper, coaxial coarse and fine focusing knobs (minimum fine focus graduation: 1 µm, full rotation of fine focusing knobs: 100 µm), torque adjustment for coarse drive controls
	Primary image port	Lower branch: standard left side port: S1F 100% or S8F 80% or lower back port selectable (2-step light path selection), upper branch: optional right side port or upper back port selectable when built-in magnification changer 1X/1.6X is replaced (2-step light path selection), bottom port optional	
	Frontal operation	Light path selector, transmitted light intensity control and light ON/OFF switch, TTL pulse control switch	Light path selector button, transmitted light intensity control buttons and light ON/OFF switch button, fine/coarse selector button, TTL pulse control (auxiliary) buttons
Revolving nosepiece		Sextuple, simple waterproof mechanism incorporated	Sextuple motorised with objective lens retraction in PC mode, simple waterproof mechanism incorporated
Transmitted light illuminator		– 100 W halogen lamp	
		– Illumination pillar tilt mechanism with 30° inclination angle and vibration-reducing mechanism	
		– Condenser holder with 50 mm stroke included, swing-in/out mechanism	
		– Field iris diaphragm adjustable	
		– 4 filter holders (ø45 mm, t = 6 mm or less)	
Observation tube	**Widefield (FN22)**	– Widefield tilting binocular, inclined 35–85°, eyepoint height range: 406 mm–471mm, interpupillary distance adjustable between 50–76 mm, dioptre adjustment function, erect image	
		– Widefield binocular, with centring telescope, inclined 90°, interpupillary distance adjustable 50–76 mm, dioptre adjustment function	
		– Widefield binocular, inclined 90°, interpupillary distance adjustable 50–76 mm, dioptre adjustment function	
		– Widefield trinocular, inclined 30°, 3-step optical path selectable (100:0, 20:80, 0:100), interpupillary distance adjustable 50–76 mm, dioptre adjustment function	
Stage		– Ceramic-coated coaxial stage with right-hand drive control, 50 mm (X) x 50 mm (Y) stroke, stage insert plate exchangeable (ø 110 mm)	
		– Ceramic-coated coaxial stage with short left handle, 50 mm (X) x 43 mm (Y) stroke, stage insert plate exchangeable (ø 110 mm)	
		– Ceramic-coated plain stage, 232 mm (X) x 240 mm (Y) stage size, stage insert plate exchangeable (ø 110 mm)	
		– Specimen guide to be used with plain stage, 130 mm (X) x 85 mm (Y) stroke	
		– Ceramic-coated narrow plain stage, 160 mm (X) x 240 mm (Y) stage size, stage insert plate exchangeable (ø 110 mm)	
		– Specimen guide to be used with narrow plain stage, 120 mm (X) x 78 mm (Y) stroke	
		– Ceramic-coated upper circular stage, 360° rotatable, 20 mm (X/Y) travel	
Condenser		– Universal, 8 positions for optical devices (5 positions for ø 30 mm, 3 positions for ø 30 mm), aperture iris diaphragm adjustable, with dry front lens NA 0.9/WD 1.5, with oil immersion front lens NA 1.4/WD 0.6	
		– Long universal working distance, 5 positions for optical devices (3 positions for ø 30 mm and 2 positions for ø 38 mm), aperture iris diaphragm adjustable, NA 0.55/WD 27 mm	
		– Long working distance relief contrast, 4 positions for optical devices (for ø 50 mm, relief contrast optical devices rotatable), aperture iris diaphragm adjustable, NA 0.5/WD 45 mm	
		– Ultra long working distance phase contrast, 4 positions for optical devices (for ø 29 mm), aperture iris diaphragm adjustable, NA 0.3/WD 73 mm	
		– DIC, single position for optical device (include 2 optical device holders), 40° injection pipette or electrode insertion angle, aperture iris diaphragm adjustable, with water immersion front lens NA 0.9/WD 3.7 mm, with dry front lens NA 0.9/WD 1.5, with oil immersion front lens NA 1.4/WD 0.6	
			Motorised universal long working distance, 6 positions for optical devices (3 positions for ø 30 mm and 2 position for ø 38 mm), aperture iris diaphragm adjustable, NA 0.55/WD 27 mm
Reflected light fluorescence unit		– L-shaped fluorescence illuminator, exchangeable F.S. and A.S. modules, 2 filter holder sliders (2 positions, ø 32 mm, t = 6 mm or less)	
		– Straight fluorescence illuminator with field iris diaphragm, filter holder slider (2 positions, ø 32 mm, t = 6 mm or less)	
		– Fluorescence cube turret, 6 positions in a rotating turret, built-in shutter	
		– Fast motorised turret, 6 positions, built-in shutter, switching speed ≤ 300 ms, requires cell^{M} or cell^{R}	
		– 100 W Hg lamp housing and transformer, or 75 W Xe lamp housing and transformer	
			Motorised turret with 6 positions, built-in shutter

IX81 ZDC specifications

Focusing position	**Dry objective**	Interface between air and cover glass
	Oil immersion objective	Interface between sample (cultured liquid) and cover glass
Offset method	**Controlled by software**	Compensation for shift of observation position toward the focusing plane is by Z-axis control
Observation methods		
Dichromatic mirror IN/OUT method for AF laser introduction		Manual exchange
F.N. limitation		Light volume is low at the image perimeter for F.N. 22 when using 2x, 4x, 10x objectives
Focusing speed		< 1 s from near focusing position (not including offset time through software)
		Speed also varies according to the start position of autofocusing and individual PC performance
Focusing accuracy		± 0.3 µm when environmental temperature change is within 5° C)
Laser safety standard		Class 1 (JISC6802, IEC825, CDRH)
Laser safety function		Front monitor method (laser light volume by special PD) IEC60825

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

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Art. code: E0430389 · Printed in Germany 06/2009

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