• OLYMPUS CORPORATION has obtained the ISO9001/ISO14001
• OLYMPUS CORPORATION has obtained the MD540624/ISO13485
• Illumination devices for microscope have suggested lifetimes. Periodic inspections are required. Please visit our web site for details.
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• Images on the PC monitors are simulated.
• Specifications and appearances are subject to change without any notice or obligation on the part of the manufacturer.

Photos courtesy of:
Atsushi Miyawaki M.D., Ph.D, Ms. Asako Sakagami, RIKEN Brain Science Institute Laboratory for Cell Function Dynamics (P8)
Yup Ari M.D., Ph.D, The 1st Department of Obstetrics & Gynecology School of Medicine, Toho University (P11)
Hikaru M. Ph.D, RIKEN Brain Science Institute Laboratory for Cell Function Dynamics (P12, P30)
Dr. Takeshi Awasaki and Dr. Kei Ito, Institute of Molecular and Cellular Biosciences, The University of Tokyo (P23 below, drosophila)
Dr. Kazuo Kurokawa, Department of tumor virology, Research institute for microbial diseases, Osaka university (P24 below, Kaede-Crk II protein expressed in a HeLa cell)
As new fluorochromes are developed and new methods of light excitation and manipulation become more popular for live cell experiments, more and more researchers will require the use of low phototoxicity near-IR wavelengths in addition to the conventional visible spectrum. Olympus has equipped its IX2 series microscopes with the new UIS2 optical system precisely to meet those demands. With high S/N ratio, compensation for chromatic aberration over a much wider wavelength range and flat, high transmittance, this new system sets a new world standard of fluorescence performance — efficiently detecting even faint fluorescence signals without damaging the cell, optimizing multi-color observation. Delivering unprecedented image quality over a super wide light spectrum, the IX2 inverted system microscope will be your choice of live cell imaging now and in the future.

Motorized inverted system microscope
**IX81/IX81-ZDC**
Motorized System

Research inverted system microscope
**IX71**
Manual System
UIS2 optics are designed to maximize S/N ratio and optical performance for live cell fluorescence imaging.

Superior S/N ratio delivers imaging excellence
UIS2 objectives’ fluorescence S/N ratio is improved by using selected low fluorescence glass material, and minimized autofluorescence obtained by anti-reflection coating and cementing material. Also numerical aperture (N.A.) has improved in addition to the reduction of autofluorescence. Weak fluorescence emissions are efficiently detected even from weak excitation light, which is friendly for the living cell. The ideal fluorescence imaging of live cells with the UIS2 systems!

High transmittances over a wider wavelength range
UIS2 objective for the IX71/81 achieves flat, high transmittance from visible to near-infrared light, thanks to new UV multi-coating which effectively cuts reflection over the super wide band spectrum. In particular, transmission in the near infrared range is significantly enhanced. Overall, performance all across the wavelength range is ideally suited for today’s most demanding research applications.

Effective compensation for chromatic aberration up to near-infrared
The UPLSAPO series is the highest class UIS2 objectives, whose super apochromatic features effectively compensate for chromatic aberration from the visible spectrum all the way to near IR. This means that just one objective covers imaging from UV to IR range. The series also offers outstanding image clarity without color shift for multi-color observations using fluorochromes covering a wide wavelength spectrum.

High N.A. objectives for fluorescence imaging
PLANAPO60XO and UPLSAPO100XO have outstanding N.A., 1.42 and 1.4 respectively, suitable for fluorescence imaging and bright-field observation as well. In addition to their high fluorescence S/N ratio, both these lenses are able to handle UV excitation light. The UPLSAPO100XO provides a transmission of down to 340 nm.

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Two-tier multi-port design ensures input/output flexibility.

### Improved near-infrared transmission

With the introduction of the new UIS2 optical system, the IX2 series offers improved IR transmittance for the side port, back port and bottom port, providing versatile, high-performance response to future research demands.

### Upper Tier Lightpath Selection (optional)

Located between objective and tube lenses so a parallel pencil of rays can be obtained or introduced. Primary image can be gained by adding a tube lens. Inserting optical components such as a dichromatic mirror does not produce a double image. (The alternative of the right side port)

### Lower Tier Lightpath Selection (included)

Located below the tube lens inside the frame, this tier allows primary image access to either the left side port or lower back port.

### Bottom Lightpath Selection

A direct primary image can be obtained without any reflections and any optical components.

### Two-tier optical design is also near-IR compatible

The input/output of a parallel pencil of rays and the multiple port structure for gaining the primary image are designed internally in the form of tiers. To maximize the possible wavelength width, the optical path branching of each tier is also compatible with the near-infrared spectrum. Even when more than one port is being used simultaneously, there is no change in the stage height; as a result, rigidity and illumination performance remain constant.

#### Improved near-infrared transmission

With the introduction of the new UIS2 optical system, the IX2 series offers improved IR transmittance for the side port, back port and bottom port, providing versatile, high-performance response to future research demands.

#### Optical Port system

- **IX2 Two-tier optical path**
  - Optical path as seen from the left side of the microscope
  - Optical path as seen from the front of the microscope
  - Objective
  - Mirror unit
  - Tube lens
  - Lower back port
  - Lower optical path selection
  - Left side port
  - Binocular port
  - Right side port
  - Dual port camera adapter / U-DPCAD® (C-mount, left side port)
  - Bottom optical path selection

- **IX2 Side port: Transmittance improved by new coating**

- **IX2 Side port**
  - Transmittance improved by new coating

- **Right side port / IX2-RSPC-2**
  - The right side port unit (IX2-RSPC-2: option, F.N.: 16) comes with a tube lens and accepts a C-mount CCD camera.

- **Left side port**
  - This port offers a high quality primary image, located in 102 mm distance from the microscope frame for maximum flexibility in mounting filter wheels or any kinds of camera adapters.

- **Dual port camera adapter / U-DPCAD® (C-mount, left side port)**
  - This unique dual port adapter enables the provision of two primary images suitable for live cell imaging.

### Upper Tier Lightpath Selection

- **Binocular port**
- **Right side port**
  - IR compatible

### Lower Tier Lightpath Selection

- **Lower back port**
  - IR compatible
- **Left side port**
  - IR compatible

### Bottom Lightpath Selection

- **Bottom port**
- **Bottom port / IX2-TVR (T-mount)**
  - Primary image access is also available at the microscope bottom.

### 102 mm from left side port mounting position to primary image.
 Improved S/N ratio enables efficient detection of even weak fluorescence.

Fluorescence Observation Units

Better S/N ratio delivers brighter, higher-contrast images in fluorescence observation.

The ideal microscope allows bright, high contrast fluorescence observation from the minimum amount of excitation light in order to minimize cell damage or fluorescence fading. To detect a weak fluorescence signal \( S \) efficiently, all other light noise \( N \) must be reduced. Therefore, it is very important for fluorescence observation to maximize the signal \( S \) and to minimize the noise \( N \).

**Measures to enhance the signal (S)**
- Fluorescence objectives with high N.A.
- Filters matched to the wavelength characteristics of individual fluorochromes

**Measures to reduce noise (N)**
- Objectives without autofluorescence
- No crossover between excitation & emission filters
- Optical system that prevents entry of stray light
- Ring slit illumination to reduce autofluorescence

**High S/N ratio objective with reduced autofluorescence**
- Olympus offers a range of other high numerical aperture objectives whose reduced autofluorescence and specially selected glass contribute to improved fluorescence S/N ratios. Especialy the FLAPON60XO has outstanding N.A., which is 1.42.

**High-performance fluorescence mirror units for fluorescent proteins**
- Olympus has developed outstanding filter coating technology, which gives the high efficient transmission and the reflection as well as sharp cut off characteristics. This newly developed coating results in optimized mirror units for the various fluorochromes included ECFP/EGFP/EYFP/DsRed.

**Improved performance of interference type fluorescence mirror unit**
- The S/N ratio of certain interference type fluorescence mirror units is now improved, thanks to the application of new coating technology to narrow the gap between excitation (Ex) and emission (Em). The line-up has been extended for wide variety of choice.

**Improved performance of interference type fluorescence mirror unit**
- The S/N ratio of certain interference type fluorescence mirror units is now improved, thanks to the application of new coating technology to narrow the gap between excitation (Ex) and emission (Em). The line-up has been extended for wide variety of choice.

**Glass reflector captures fluorescence of multiple color dyes**
- A multi-band dichromatic mirror is normally used to obtain multi-color images of multiple stained fluorescent samples by using filter wheels on the excitation and emission sides. However, this kind of mirror encounters the problem that each fluorescence image gets darker as the number of color dyes increase, because the transmission spectrum becomes narrower and the transmittance falls to lower than 90% at best. Olympus has therefore developed the world’s first glass reflector that is not wavelength-dependent, offering a high transmittance of 94% across a wide wavelength range from 430 nm to 700 nm. Used in combination with the filter wheels on the excitation and emission sides, a wider variety of color dyes can be used and fluorescence images are captured more efficiently.

**Ring slit illumination unit to reduce noise / IX2-RFRS**
- The ring slit illumination IX2-RFRS makes the ring shape illumination on the objective to allow excitation light to pass through the objectives outer portion not to excite the objective auto-fluorescence generated at the center of an objective.

**Stray light reduction function equipped on all mirror units**
- The slight transmission of stray light when excitation light is reflected in the dichromatic mirror causes a rise in the level of noise. Olympus mirror units absorb more than 99% of this stray light through their light absorber.

**Usage examples of the glass reflector**
- Simultaneous imaging of Sapphire, CFP, YFP, and RFP. HeLa cells were imaged for Sapphire-pm, CFP-CaM — 440DF20 Glass 480DF30 and DsRed-nu 546DF10 595RDF60. Used in combination with the filter wheels on the excitation and emission sides, a wider variety of color dyes can be used and fluorescence images are captured more efficiently.

**Optical components used for a 4-fluorophore imaging**

<table>
<thead>
<tr>
<th>Dye</th>
<th>ND Filter</th>
<th>Excitation Light Path</th>
<th>Reflector</th>
<th>Emission Light Path</th>
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<tbody>
<tr>
<td>Sapphire-pm</td>
<td>ND5045</td>
<td>460DF30</td>
<td>Glass</td>
<td>480DF32</td>
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<td>CFP-CaM</td>
<td>—</td>
<td>440DF25</td>
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<tr>
<td>YFP</td>
<td>ND5045</td>
<td>460DF30</td>
<td>—</td>
<td>550DF35</td>
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<tr>
<td>DsRed-nu</td>
<td>540DF32</td>
<td>590DF30</td>
<td></td>
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</tbody>
</table>
A wide range of accessories to enable different kinds of fluorescence imaging.

**Fluorescence illumination light source**

- **Bright excitation illumination for cell observation/manipulation**
  - The Olympus lineup for fluorescence illumination equipment meets a wide variety of needs including multi-color fluorescence, ratio imaging, photobleaching and uncaging observations. The brightness at low magnification is greatly improved.

<table>
<thead>
<tr>
<th>Lamp housings</th>
<th>Stage</th>
<th>Model</th>
<th>Aspherical*1 optics</th>
<th>Achromatic*2 lens</th>
<th>Average lamp life</th>
<th>Lamp centering</th>
<th>IR lamp illumination</th>
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</thead>
<tbody>
<tr>
<td>100 W mercury apo lamp housing/ U-LH100HGAP0</td>
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<td>✓</td>
<td>300 h</td>
<td>Required</td>
<td>Good</td>
<td></td>
<td></td>
</tr>
<tr>
<td>100 W mercury lamp housing/ U-LH100HG</td>
<td>✓</td>
<td></td>
<td>300 h</td>
<td>Required</td>
<td>Good</td>
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<td></td>
</tr>
<tr>
<td>75 W xenon apo lamp housing/ U-LHT75XEAP0</td>
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<td>✓</td>
<td>200 h</td>
<td>Required</td>
<td>Excellent</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*1: Can collect light more efficiently than conventional aspherical optics.
*2: Even illumination and no lamp focusing shift, even when changing excitation light wavelengths.
*3: Suitable for multi-color staining or ratio imaging because of flat light source spectrum.

- **Reflected light fluorescence illuminators**
  - **[L-shaped fluorescence illuminator/IX2-RFAL]**
    - Provides easy access to burner centration and removable aperture and field stops. The L-shaped design maintains access to both back frame ports.
  - **[Fluorescence illuminator/IX2-RFAL]**
    - This unique field stop allows the user to control the area of fluorescence excitation anywhere inside the visual field. For example, photobleaching and phototoxicity can now be limited to only the area that is being imaged by the CCD, improving overall brightness and cell viability over long term observations. The unit is attached at the field stop position of the fluorescence illuminator IX2-RFAL.

- **Illumination modular units**
  - **[Rectangular field stop/U-RFSS]**
    - Two light sources can be used simultaneously, so that light stimulation can be performed during observation.
  - **[Pinhole field stop/IX2-RFSPOT]**
    - Flexible field stop options IX2-RFSPOT pinhole field stop module can be mounted in the L-shaped illuminator for photobleaching experiments.
    - Use commercially available pinhole plate.

- **[Double lamp housing adapter/IX2-RFAL]**
  - Allows simultaneous attachment of two light sources such as halogen and mercury. Selection mirror is replaceable for custom applications.

**Configuration example**

**New FL system**

- **[L-shaped fluorescence illuminator/IX2-RFAL]**
  - Provides easy access to burner centration and removable aperture and field stops. The L-shaped design maintains access to both back frame ports.

- **[Fluorescence illuminator/IX2-RFAL]**
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**[Double lamp housing adapter/IX2-RFAL]**

- **[Pinhole field stop/IX2-RFSPOT]**
  - Flexible field stop options IX2-RFSPOT pinhole field stop module can be mounted in the L-shaped illuminator for photobleaching experiments.
  - Use commercially available pinhole plate.

**IR TV adapters**

- **[C mount TV adapters/ U-TV0.35XC-2, U-TV0.5XC-3, U-TV0.63XC, U-TV1X-2]**
  - These low-magnification camera adapters are attached to the left side port, and cover from visible light to near infrared red wavelength spectrum.
Nomarski DIC system offers the choice of optimal resolution or high contrast in live cell observation.

**Differential Interference Contrast**

Live cells specimens vary in thickness from that of a nematode worm such as *C. elegans* to a monolayer of cultured cells. The requirements for DIC are also varied according to the specimen from thinner cells being almost impossible to thicker specimens having a lot of inherent contrast. Olympus provides three DIC systems with varying amounts of shear. Small shear, high resolution sets are excellent for thicker specimens. High contrast prism with twice the normal shear are excellent for very thin specimens.

### DIC Sliders

- High resolution DIC slider for transmitted light/U-DICTHR
- High contrast DIC slider for transmitted light/U-DICTHC
- U-DICTHC slides for transmitted light/U-DICT

### Comparison of thick specimen (*C. elegans*), showing differences in shearing value

- DIC observation using U-DICTHC
- DIC observation using U-DICT/ U-DICTS

### Comparison of thin specimen, showing differences in shearing value

- DIC observation using U-DICTHC
- DIC observation using U-DICT/ U-DICTS

### New DIC system gives a wider choice

U2i expands the selection of DIC applicable objectives. Each condenser prism is compatible with more lenses making setup and configuration easier.

### Long working distance universal condenser/IX2-LWUCD

Combining a long working distance (27 mm) and a high numerical aperture (N.A. 0.55), the LWUCD condenser accommodates most incubation chambers and T-Flasks. The 5-position turret provides versatility with DIC or phase inserts. DIC components are specially designed to obtain high contrast, high-resolution images with 20X and 40X objectives.

### Top lens combination

- Objective N.A. 1.4 Oil
- Oil immersion adapter
- Condenser U-UCD8
- Condenser adapter/IX-ADUCD
- C. elegans

### HH/HC optical elements for IX2-LWUCD and applicable objectives

### General type optical elements for IX2-LWUCD and applicable objectives

### Condenser adapter/IX-ADUCD

This is the condenser adapter for upright microscope condensers on the IX2 including the 8-position turret condenser (U-UCD8) for maximum system flexibility. This combination allows the use of various optional elements with high N.A., just rotating the smooth turret for switching them easily. The IX2 Illumination pillar also offers a ‘condenser-only’ (b) mechanism to quickly allow access to the specimen without tilting the entire illumination pillar. The IX2-UCD8 can be used for U-UCD8.

### Gliding stage/IX2-GS

The Gliding Stage was designed for quick rotation of the specimen using your fingertips. With 20 mm of X-Y travel, 360 degree rotation and completely flat surface, a specimen such as the nematode worm *C. elegans* can be quickly brought into the correct position and alignment for injection or micromanipulations.
Special equipment for
relief contrast and phase contrast.

**Relief contrast equipment**

The Olympus Relief Contrast system provides a high contrast, 3-D image similar to DIC for specimens mounted in plastic vessels. Relief contrast is designed for use in cellular fertilization and making the nuclear envelope easier to see and penetrate.

**Phase contrast equipment**

Two types of objectives for relief contrast are selectable: cost-efficient Achromat models, or Plan Semi Apochromat objectives with high resolution and excellent focusing right up to the image perimeters. Condenser (IX2-MLWCD) also supports DIC and phase contrast observations for maximum flexibility.

**Relief contrast and phase contrast.**

**Ultra long working distance condenser/IX-ULWCD**

This universal condenser for phase contrast and brightfield observations offers excellent workability due to its long working distance (73 mm) and compatibility with large containers: it can be used in combination with 4X - 40X phase contrast objectives. Phase contrast observation is also possible with the IX2-ULWCD condenser, whose working distance is 27 mm.

**UIS2 Objectives**

<table>
<thead>
<tr>
<th>Model</th>
<th>N.A.</th>
<th>W.D. (mm)</th>
<th>F.N.</th>
<th>Cover glass thickness (mm)</th>
<th>Immersion</th>
<th>Spring</th>
<th>Correcion ring</th>
<th>Iris diaphragm</th>
<th>Water proof &amp; oil proof function</th>
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</thead>
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<td>10</td>
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*All UIS2 objectives and WbN objectives: lead-free eco-glass.*
High level basic performance makes a vital difference to experiment results.

**Capture of high-clarity primary image**

Since the UIS2 optical system is compensation-free (i.e. compensation is performed only by the objective lens), a clear primary image* can be captured through any camera port offering from IX2 system.  

* The “primary image” is the first image created by convergence of the luminous flux after passing through an objective. There is no loss in light quantity and no image deterioration.

**V-shaped optical path to reduce light loss**

In order to minimize light loss from reflection, a simple V-shaped optical system is employed. This restricts reflection inside the microscope to one-time-only, reducing light loss and allowing observation of even weak fluorescent signals.

**Thermally compensated relay lens optics**

Used for the observation optical path, thermally-compensated relay lens optics invoke combining lenses with different thermal characteristics to offset blurs caused by temperature change.

**Against thermal expansion to prevent defocusing**

**External power supply**

Time-lapse observation over a long period will cause some heat strain to the microscope, from temperature changes in the environment and air blown from an air-conditioner. Because such changes can cause blurring, the IX2 series design focuses on its structure in order to maximize rigidity and equips the external power supply for transmitted illumination on the outside of the microscope. Thereby IX2 series archives the highest level of thermal expansion compensation. Various accessories are provided to stabilize long-term time-lapses, such as an incubator that reduces temperature changes in the environment and the effects of air conditioning.

**High body rigidity**

In order to maximize rigidity of IX2 microscope frame, Olympus simplified or shortened mechanical structures from the focusing handle to the revolving nosepiece, thereby achieving to minimize the focus drift.

**Ease of use in a compact body**

[Compact body]

Compact body design allows wide port space for both left and right sides, the bottom and on the back. It allows you to use the variety of peripherals with offering an excellent operability.

- [Tilting binocular tube/U-TB190]
  A tilting observation tube with 35-85° elevation angle. This tube offers ergonomics operation for both sitting and even standing position.

**Focus free collection ring**

The newly developed LUCPLFLN40X (N.A. 0.6, W.D. 3.4 mm)* and LUCPLFLN60X (N.A. 0.70, W.D. 1.5-2.2 mm) are compatible with various container thickness. Turning the correction ring does not blur the focus when correcting spherical aberration caused by different container thickness. A simple correction operation optimizes the observation image.* When using 1 mm thickness container.

**Oil immersion protection function**

Prevents immersion oil infiltrating through the tip of the objective.

**Magnification changer**

This intermediate magnification changer offers different magnification without switching the objective lens. 1.6X is standard (IX71/81) and 2.0X is optional.

**Glass stage insert plate/IX2-GCP**

The objective type and its magnification can easily be recognized through this glass stage insert.

**Fluorescence indicator**

Bright, easy-to-see self-illuminated labels are used to denote fluorescence filter sets, easily visible in a dark room.

**Fluorescence turret confirmation window**

The fluorescent mirror unit can be confirmed from the space between the left and right eyepieces of the observation tube.
Motorized system for live cell imaging.

Controlling functions via PC, handset or operating buttons on the microscope body

Motorized universal condenser/IX2-LWUCDA2
This condenser has six built-in optical components to enable brightfield, phase contrast and Nomarski DIC observations. Software allows switching optical components to be synchronized with the objective. (Manual AS included.)

Motorized shutter/IX2-SHA
Can be mounted in both transmitted and reflected light paths.

Motorized filter wheel/U-FWR and U-FWO
6 positions motorized filter wheel is offered for both excitation and observation.

Motorized sextuple revolving nosepiece
Up to 6 objectives are mounted simultaneously, included with microscope frame.

Motorized fluorescent cube turret/IX2-RFACA
Accepts up to 6 fluorescence filter cubes, making it easy to switch between them during fluorescence observation of multistained specimens. (Manual shutter included)

Handset/U-HSTR2
A remote handset controls all motorized functions via a convenient and programmable interface.

Focus handle/U-FH
The remote focus handle duplicates the feel and function of the microscope’s focus knobs. Additional controls include fine/coarse focus selection, lamp on/off, shutter open/close, and camera vs. visual observation.

Motorized bottom port unit with C-mount/IX2-TVRAC

Example: Switching from fluorescence observation to Nomarski DIC.
- Open shutter for transmitted illumination
- Exchange FL mirror unit for DIC mirror unit
- Close shutter for fluorescence illumination

Internal motorized focus drive
With minimum movement of 0.01 µm, the user has precise focus control.

Objective escape and zero-return buttons
Moves objective to lower focus limit. Allows setting of default focus position. *Included on each side of microscope frame.

Setting sensitivity of the fine focus movement for each objective magnification
Users can set the amount of the fine focus movement per rotation of the focus adjustment knob.

Parfocal compensation function among objectives
This function allows the focus point to be matched from low to high magnification objectives. Refocusing each time the magnification is changed is no longer necessary.

Malfunction prevention
Motorized units ensure that complicated operations are performed without error. Once the usage conditions are set, the setting screen can be hidden to avoid accidental change leading to faulty operation.

System controller/IX2-UCB2
All motorized units are powered by this external system controller. Included is an RS232C connection for PC commands and expansion slots for future system upgrades.

Motorized units

- Motorized shutter/IX2-SHA
- Motorized filter wheel/U-FWR and U-FWO
- Motorized sextuple revolving nosepiece
- Motorized fluorescent cube turret/IX2-RFACA
- Handset/U-HSTR2
- Focus handle/U-FH
- Motorized universal condenser/IX2-LWUCDA2
- Remote handset controls all motorized functions via a convenient and programmable interface.
- Internal motorized focus drive
- Objective escape and zero-return buttons
- Setting sensitivity of the fine focus movement for each objective magnification
- Parfocal compensation function among objectives
- Malfunction prevention
- System controller/IX2-UCB2
- Motorized bottom port unit with C-mount/IX2-TVRAC
- Motorized units

* Included with the system controller IX2-UCB2
Maintaining long-term stability for live cell observation.

Focus drift compensation function for time-lapse experiments.

Motorized inverted research microscope with focus drift compensation/IX81-ZDC
This landmark microscope model makes it easy to reproduce any preset focus position. 785 nm weak laser light is introduced through the additional optical path between the tube lens and an objective to measure the distance between the objective and the reflection plane, which is normally the boundary of the reflective index difference such as the boundary between cover glass and cell. Therefore this system never cause unnecessary photobleaching of the specimen.

Live cell imaging system

Accessories to improve stability in long-duration observations

[CO2 incubators/MIU-IBC-I, MIU-IBC-IF]
Highly precise incubator control keeps the environment inside a laboratory dish completely stable, at just below 37°C temperature, 90% moisture and 5% CO2 concentration (when using a CO2 5% concentration bomb). In this way, live cell activity can be maintained for about 2 days. A special designed structure is employed to minimize the focus drift during temperature control. This is the ideal solution for time-lapse experiments under both a confocal laser scanning microscope and a wide field observation. The opening hole located on the top heater is available for the cell injection.

* Built-in stage warming plate
* Objective heater
* Supply tube with 4 mm outer diameter, 2 mm inner diameter and 400 mm length.
* Not available in some areas

[Thermoplate/MATS series]
This thermoplate maintains the temperature of the sample at 37°C.
* Tokai Hit Company products

[Frame plate adapter/IX2-FP]
This is used to fix the microscope frame to the anti-vibration stand.
* Screws (available separately) are required for fixing.

[Nosepiece stage/IX2-NPS]
This simple mechanical stage is designed for long time observations to minimize the distance change between the specimen and the objective in other words “focus drift.” It works by minimizing the effect of temperature change and prevents blur during long observations. Attach one objective in use.

[Comparison of normal observation images]
Change of focus when environmental temperature (25°C) changes by ±5°C. *When the microscope is used without an incubator.

[Comparison of fluorescence images]
Time-lapse observation images. *When the microscope is used without an incubator.
### Micromanipulation system/ON3

Olympus’ original micromanipulator offers high stability and excellent stability because of its compact body. Motorized coarse and oil hydraulic fine axes operation are designed in its compact and rigid body with hanging down ergonomic joystick control. ON3 micromanipulator is securely fixed through the screw holes on IX2 microscope frame.

### Human embryo

Images of Kaede-expressed cells demonstrating the photoactivation acquired every 300 msec and observed via 405 blue diode laser illumination with twin scanners.

### ON3-99D

ON3-99D with return mechanism (UT-R) Manual combination

### Manual combination

ONM-2D+ONO-301D+UT-D+UT-R

### TIRFM

(Total Internal Reflection Fluorescence Microscopy)

Since 1997, Olympus has been a market leader in objective based Total Internal Reflection microscope that allows an evanescent wave illumination approximately 200 nm into the specimen beyond the coverslip interface. Olympus extends that leadership role by offering four objectives for TIRFM including the world’s highest N.A. objective, the 100X N.A. 1.65 objective.

The incredibly thin optical section created by TIRFM allows an extremely high signal to noise image to be collected. Popular applications include vesicle trafficking, cellular adhesions and single molecule events.

- Olympus’ original high N.A. objectives make it easy to produce an evanescent wave field. So little light is leaked that a high-contrast image can be obtained against a dark background.
  - N.A. 1.65, 100X objective (APO100XOHR)
    - (Use special cover glass and immersion oil)
  - N.A. 1.49, 60X objective (APON60XOTIRF)
    - (Use normal cover glass and immersion oil)
  - N.A. 1.49, 100X objective (UAPON100XOTIRF)
    - (Use normal cover glass and immersion oil)
  - N.A. 1.45, 150X objective (UAPON150XOTIRF)
    - (Use normal cover glass and immersion oil)

- Once the initial alignment of the laser optical path is set, it is just simple operation switching between TIRF and widefield illumination.

* TIRFM is a class 3B laser product.

### Laser Scanning Confocal

Simultaneous laser light stimulation and imaging.

Confoocal laser scanning microscope/FLUOVIEW FV1000 system

The Fluoview/FV1000 is a next-generation imaging system designed for high-resolution, confocal observation of both fixed and live cells. The FV1000 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.

In addition, the FV1000 offers a revolutionary synchronized laser scanning system called the SIM Scanner. While one laser stimulates, the second laser simultaneously provides high resolution imaging. This coordination of laser stimulation and imaging makes the FV1000 an ideal choice for FRAP, FLIP and photoactivation.

* FV1000 is a class 3B laser product.
Spinning Disk Confocal

Obtaining confocal images easily by use of an arc light source.

Disk Scanning Confocal Microscope System

The Olympus Disk Scanning Unit (DSU) offers confocal images using a white light, arc excitation source and CCD camera. The heart of the system is a unique slit disk pattern, that offers excellent light throughput and thickness of optical sectioning. Compatible with any IX71 and IX81.

- Compliance with various fluorochromes with different spectral characteristics.
- Since an arc light source is used, the unit can meet different fluorochrome requirements across a wide wavelength spectrum by simply switching a standard mirror unit.
- Minimize excitation light damage to the specimen and maximize emission light throughput.
- The excitation light volume is reduced to around 5% as a result of passing through the disk. So, there is almost no fading of fluorescence emission from the surface of the focused sample.
- Construction of 3D images. Brilliant 3D image can be easily captured with excellent optical characteristics.
- Easy switching between confocal and reflected light N.A. objectives. Wide variety of the objectives, included oil or water immersion high magnification objective support.
- Low and high magnification objective support. Five DSU disks are available of varying slit spacing and width for the sectioning with high precision motorized Z axis of IX81.
- Easy switching between confocal and reflected light fluorochrome requirements across a wide wavelength spectrum by simply switching a standard mirror unit.
- Minimize excitation light damage to the specimen and maximize emission light throughput.
- The excitation light volume is reduced to around 5% as a result of passing through the disk. So, there is almost no fading of fluorescence emission from the surface of the focused sample.
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- Low and high magnification objective support. Five DSU disks are available of varying slit spacing and width for the sectioning with high precision motorized Z axis of IX81.
- Easy switching between confocal and reflected light.

TIRFM (Total Internal Reflection Fluorescence Microscopy) system with arc lamp source

Featuring the Olympus-developed total internal reflection illumination system and slit mechanism to provide evanescent wave illumination from an arc lamp source. High signal to noise fluorescence observations with extremely thin optical sectioning can now be easily performed at the specimen-cover slip interface. The arc lamp is focused on an off-center slit using a wedge prism and focused on the outer edge of the back focal plane of the objective, thus causing the excitation light to exit the objective beyond the critical angle resulting in Total Internal Reflection. The wedge prism and slit can be easily removed from the light path via a slider for wide field fluorescence observation. Through the use of filters, this system enables a wider choice of excitation colors than current laser base system.

World’s first evanescent illumination system from an arc lamp source.

High-precision fluorescence turret / IX2-RFACEVA Turret includes three, highly precise, empty fluorescence filter cubes that permit dichromatic mirror switching while maintaining excitation light position on the back focal plane of the objective. This system makes multi-color observations easy and alleviates the additional adjustment of the excitation source when switching mirror units. Up to six mirror units can be installed.

Main specifications

- Observation: Research inverted system microscope (3D)
- Fluorescence illuminator: Research inverted system microscope (3D) with U-RFL-T/ U-LH75XEAPO for xenon lamp / U-LH100HG/ U-LH100HGAPO for mercury lamp
- Motorized filter wheel: Motorized filter wheel (3D)
- Lamp light source: 75 W Xenon lamp, U-LH75XEAPO
- Microscope: IX71 Research inverted system microscope
- Camera: S2-ARCEVA
- Sandwiched 3-way mirror, wire mirror, projection of flat optical section

Application System

Conventional fluorescence observation

TIRFM observation

Fluorescence turret

TIRFM observation

Kaede-Crk II protein expressed in a HeLa cell

Microtubule of an NG108-15 cell labeled with Alexa488 through indirect fluorescence antibody test

High precision fluorescence turret / IX2-RFACEVA

Turret includes three, highly precise, empty fluorescence filter cubes that permit dichromatic mirror switching while maintaining excitation light position on the back focal plane of the objective. This system makes multi-color observations easy and alleviates the additional adjustment of the excitation source when switching mirror units. Up to six mirror units can be installed.
Bright, simultaneous two-wavelength imaging using the primary image.

FRET Split imaging system
• Simultaneous two-color split imaging with one CCD camera.
• Unique design splits the primary image for the highest efficiency and light transmission necessary for weak fluorescence signals such as CFP/YFP FRET experiments.
• Compact and space-saving design takes advantage of the 70 mm of free space between the microscope frame and the primary image plane found on all Olympus Research Upright and Inverted Microscopes.
• Simple cassette mechanism makes it easy to switch between split and full frame imaging.
• Unit is up to 10% brighter than similar relay lens based, image split and full frame imaging.
• Simple cassette mechanism makes it easy to switch between Microscopes.

FRET changes are observed through histamine stimulation, and images are acquired at intervals of 5 min.

Photoactivation illuminator for inverted microscopy.

The photoactivation illuminator allows the exposure by UV light to specific regions of a cell for photoconversion, the uncaging of compounds and the photoactivation of specific fluorochromes.
• A specified area of the cell can be exposed to UV light while observing the targeted cell by fluorescence or transmitted (DIC) method.
• Compliance with FRAP or FLIP experiments by special order.
• Easy system upgrade by attaching double lamphouse illuminator IX2-RFAL to IX2 series inverted microscope.

The novel Kaede gene is useful in biology because it exhibits photoconversion. Normally, the Kaede gene shows green fluorescence but after exposure to UV light exhibits red fluorescence. By using UV light to only a tiny region while a labeled cell and then moving the illumination of red light to that region, observations of internal cellular dynamics can easily be made. The photo on the right shows a nerve cell that is right after exposure to a 10 µm diameter spot of UV light for 60 seconds, thus changing the gene from green to red. Note the translocation of the red shifted gene outside of the 10 µm spot thus indicating intracellular transport mechanisms.

**Setting up example for Kaede**

1. **Excitation filter**
   - BP330-385 excitation filter equipped
2. **Field stop position**
   - The field stop position is the same position as the focus point of the sample
3. **Sample**
   - Use S530/D excitation filter in the filter wheel 1 and S575LP
   - Fluorescence filter in the filter wheel 1 and T530LP
4. **Filter wheel 1**
   - Such as Lambda10-2 and Lambda10-3
5. **Pinhole and slit**
   - Pinhole or slit are available on the market

**IX-RFAL specifications**

- **Lamp house illumination**
  - Double lamp house illuminator IX2-RFAL
- **Filter wheel 2**
  - 2-step exchange (pinhole or slit/vacant hole)
- **Filter wheel 1**
  - 3-step exchange (shutter/filter pocket/vacant hole)
- **Pinhole slider**
  - 2-step exchange (pinhole or slit/vacant hole)
- **Objective**
  - UPLFLN40XO
- **Excitation filter**
  - *2
- **Excitation filter slider**
  - 5-step exchange (4-step filter pocket/vacant hole)
- **Filter size**
  - Excitation filter: ø25 mm, thickness: 6 mm and below
- **Filter size**
  - Emission filter: ø25 mm, thickness: 1 mm and below

**IX series**

- **Dimensions Width:** 710 mm
- **Power consumption:** 7.4 A
- **Filter size**
  - Excitation filter: ø25 mm, thickness: 6 mm and below
  - Emission filter: ø25 mm, thickness: 1 mm and below

* Not available in some areas