

# Creating the ideal environment



## **ZEISS Incubation Solutions for Life Sciences**

Environmental Control Tailored to the Requirements of Your Samples



Seeing beyond

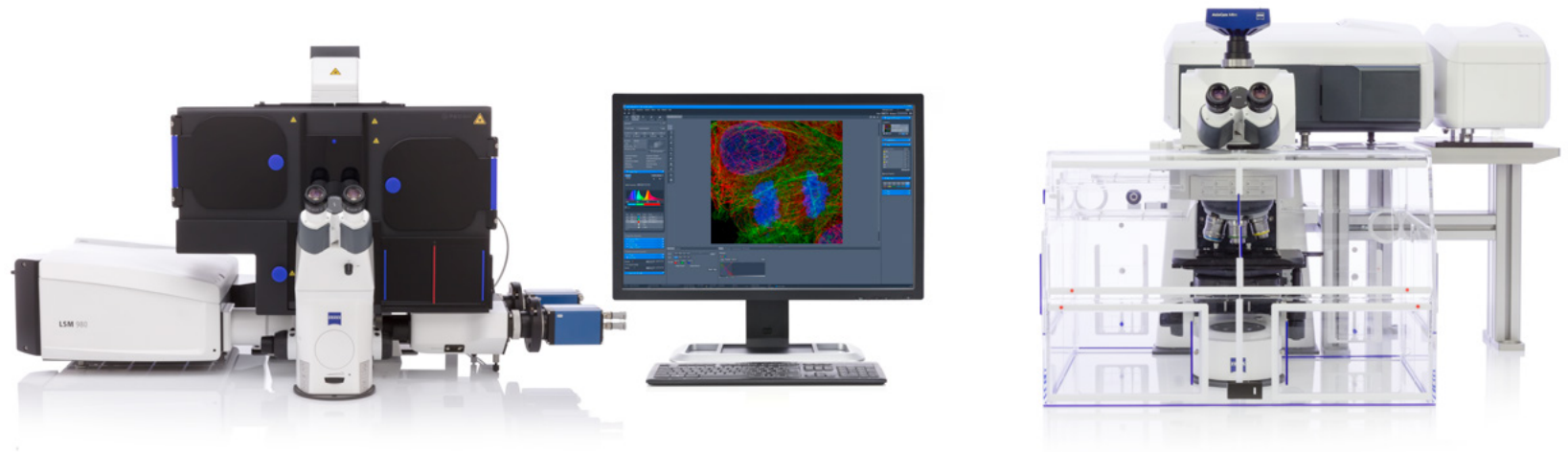
# Environmental Control Tailored to the Requirements of Your Samples

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Experiments with living cells or organisms are gaining more attention as numerous processes can be studied only on living samples. Stem cell differentiation, cell migration, tissue and organ development, kinetic studies in drug screenings and observation of molecular processes are examples of such experiments that also reflect the complexity of modern life science research.

You expect your imaging systems to support these experiments without the burden of technical difficulties and time-consuming monitoring tasks. Cultivation conditions stimulating the living organisms must be created precisely and kept stable over hours, days and sometimes weeks.

With ZEISS incubation systems, you create the optimal environment for even the most sensitive specimens. The solution portfolio allows the flexibility to combine different housings, incubators, and sample holders as required. Simple setup procedures and precise control over environmental parameters help you to create meaningful, reproducible results.



# Stable. Flexible. Precise.

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## Stable conditions

In-vivo experiments often yield new insights to dynamic biological systems. Some processes take less than a millisecond while others require days or even weeks to complete. Because the specimen is alive, it responds to changes in temperature, pH or gas levels. For this reason, the stability of the environmental conditions is one of the most important factors for a successful experiment. Any unwanted fluctuation will inevitably lead to a less conclusive results.

ZEISS incubation equipment creates stable environmental conditions, so you know your experiments are proceeding as intended and you can correctly interpret the results.



## Flexible setups

The requirements placed on sample carriers, environmental parameters and imaging conditions may vary with each experiment. For example, environmental parameters like temperature, O<sub>2</sub>, pH and humidity must be controlled simultaneously to ensure the viability of living specimens.

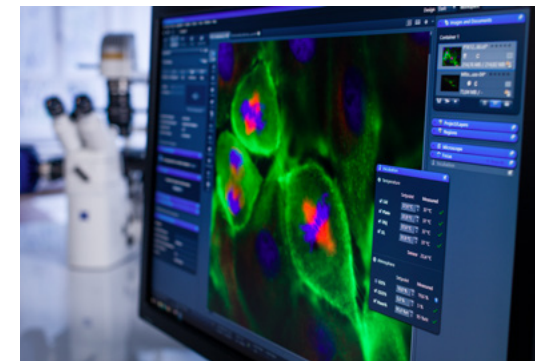
To support a great variety of studies, ZEISS allows you to control the incubation components individually. Combine components to achieve the level of precision, sophistication and flexibility required by your experiment. With a large selection of compatible components within the ZEISS incubation portfolio, you can build a system that meets your current experimental needs while being assured of compatibility for future applications.



## Precise control

Precisely controlled environmental conditions are required to make experiments reproducible. Built-in feedback systems ensure correct regulation. Integrating your incubation equipment with the ZEN imaging software allows you to control and record all conditions through a unified user interface. Also you can directly adjust parameters on the microscope TFT.

Sensors and controls are seamlessly integrated and important parameters are recorded together with the imaging data to enable you to trace a result to a specific condition. Being able to recall these data later and plot them significantly assists you in documenting and interpreting your results.



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The broad portfolio of ZEISS incubation solutions allows you to choose the ideal configuration for each experiment.



*A selection of the ZEISS incubation accessories*

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## Sample Holders

Shape and size of your samples may vary greatly; therefore, a wide range of sample carriers have been created over the years, each addressing the specific needs of both typical and unique applications.

Select the sample holder that fits your sample carrier and stage. Most sample holders include suitable lids for humidification and pH/gas control, whether you use dishes for cell or tissue culture, multi-well plates, chamber slides or

perfusion chambers. Heated holders allow easy execution and precise control for temperature-sensitive experiments.

Sample holder use clamps, magnets or springs to secure your sample.

The universal mounting frame K-M is designed to fit almost every type of multi-well plate. In addition, it can accommodate a variety of click-in inserts that convert it into a holder for slides, chamber slides, and dishes of different diameters.

If higher throughput is required and multi-wells are not an option, you can choose holders that allow for more than one slide or petri dish. Additionally, all sample holders can be used with a piezo stage for demanding applications requiring high travel speed and precision.



Heatable universal mounting frames



Universal mounting frame K-M with click-in inserts



Universal mounting frame K-M with adapter and CO<sub>2</sub>-lid



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## Environmental Control

Matching the physiological conditions of organisms is crucial for live cell experiments; however, microscope components can be affected by these same environmental parameters, especially temperature. ZEISS Incubator solutions ensure a stable and homogeneous temperature for your specimen as well as for the microscope.

The new XL Incubator was designed to provide a homogeneous temperature, easy startup, and maximum experimental flexibility – no matter if you use a cover glass, a petri dish, or a multi-well plate. You always have direct access to your sample, room for additional accessories and a homogeneous temperature in the entire compartment.



*The transparent sliding door and LED lights allow you to observe your sample without disturbing the environmental conditions.*



Silicon-sealed openings for tubes and cables allow all connections to remain in place for a fast and convenient setup. Large sliding doors at the front and at the side provide you with convenient access for changing your specimen or replacing sample medium. The foldable lid at the top of the incubator enables the condenser to be moved backward for full access to the sample area, allowing you to modify even the most complex experimental setups inside the incubator.

The XL Incubator is available in black or transparent versions. The black XL Incubator transforms your microscope into a fully equipped dark room, with LED light to illuminate the incubator interior when needed. It features an additional transparent sliding window allowing you to view your sample without disturbing the environment. Internal shelves for preheating media and storing the CO<sub>2</sub> lid permit an efficient setup with a small footprint. Convert your microscope into an isolated laboratory and perform demanding live cell, low light fluorescence experiments, no matter where it is located.

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## Temperature

All organisms are adapted to the environmental conditions in which they live. If the deviation from these ideal parameters becomes too great, the organisms react and change their behavior. For this reason, it is crucial to create and maintain optimal conditions to study the natural behavior of your specimens.

The temperature must match the needs of the organism, otherwise processes like cell adhesion, proliferation and protein expression can change significantly. Also, biophysical parameters such as membrane phase, fluidity and rigidity are temperature-dependent and will alter the activity of membrane proteins and subsequent cellular processes.

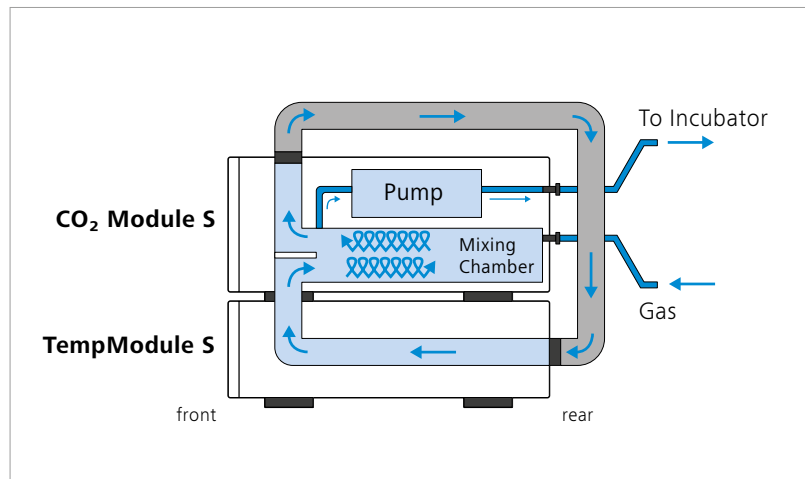
ZEISS incubation solutions allow you to maintain a stable temperature for your specimen, no matter if you want to use large volume incubators or smaller stage top chambers.

## Atmospheric O<sub>2</sub> and CO<sub>2</sub> levels

Controlling the atmosphere is necessary for live cell experiments. Depending on the type of cell line, the level of oxygen needed to maintain cell function varies greatly. While tumor cells are known to profit from low oxygen levels, most other cell types suffer when oxygen concentration is depleted.

Carbon dioxide levels must be adjusted to maintain the required pH level in carbonate buffered culture medium. Levels of CO<sub>2</sub> that are too low will lead to a degassing of CO<sub>2</sub> from the solution into the atmosphere, acidifying the medium. In physiological studies a stable medium pH is important, as most cells and organisms will react to a change in pH level.

ZEISS incubation solutions allow you to precisely define atmospheric O<sub>2</sub> and CO<sub>2</sub> levels tailored to your research and keep them stable.



*Schematic illustration showing how the carbon dioxide level is adjusted and the mixture is tempered. Pure CO<sub>2</sub> from a bottle is mixed with air until the CO<sub>2</sub> level reaches the level set in the software. The mixed gases circulate and are heated. A pump then pumps the tempered gas mixture to the incubator. This allows equilibration in the sample, with gas having the correct CO<sub>2</sub> level and temperature. Concentration or temperature gradients are effectively eliminated.*

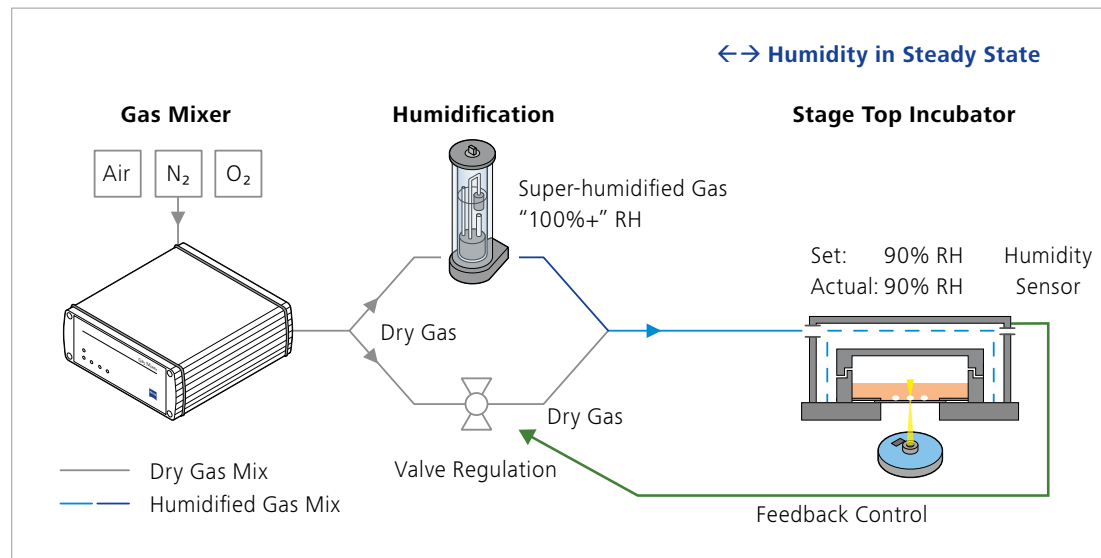
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## Relative Humidity

Humidity is an often neglected parameter which indirectly has a strong influence on cellular physiology. If high humidity is not maintained, water evaporation from the sample dish will occur. This changes the concentration of salts and nutrients inside the cell media, subsequently leading to an osmotic pressure between cell and medium. Osmotic pressure stresses cells, changing their normal behavior and shape. This impacts gene expression and cell proliferation or may trigger apoptosis.

ZEISS humidification equipment uses a feedback control system to precisely regulate the humidity in the incubator, thereby avoiding artifacts. You can be confident that changes in cell shape, gene expression or proliferation are the result of your experiment and not unstable environmental conditions.



Schematic illustration showing how the humidity of the atmosphere is controlled. A dry gas flow is split into two streams. A valve regulates if the dry gas can enter the incubation chamber directly or needs to pass a humidification chamber first. If the relative humidity is too low, the valve closes, and the gas passes the humidification chamber. The humid gas then reaches the incubation chamber, increasing the relative humidity of the atmosphere. If the relative humidity is too high, the valve opens and only dry gas enters the incubation chamber, decreasing the relative humidity.



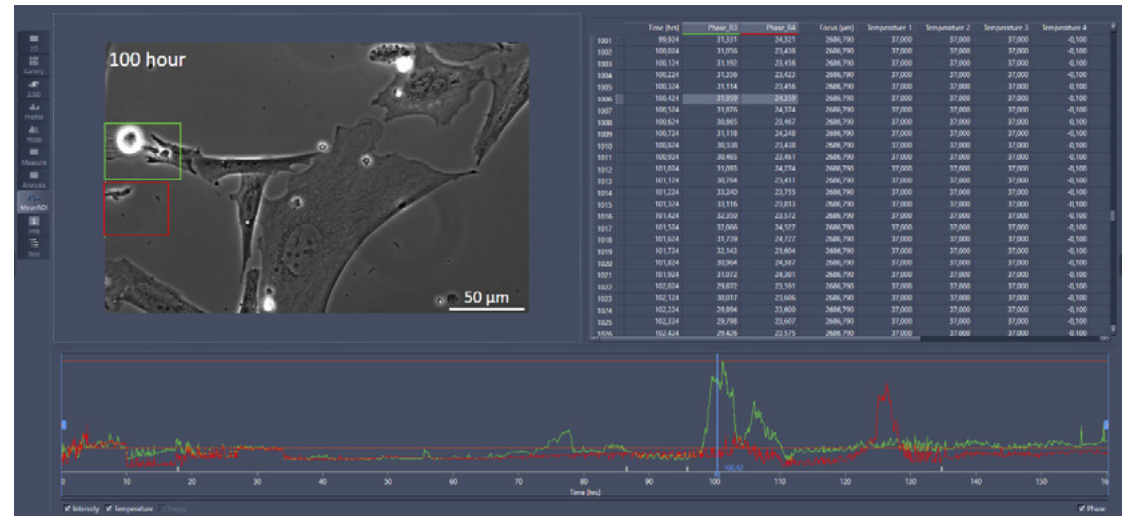
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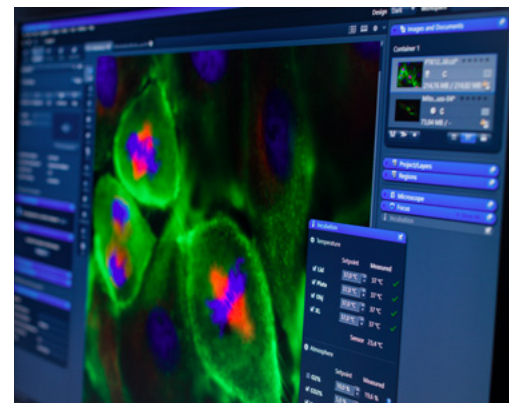
## Software Integration

Access to all experimental parameters is necessary for both validating processes and interpreting results. ZEISS incubation solutions are fully integrated in the ZEN software environment to streamline data collection. Temperature and atmospheric parameters for each experiment are recorded in a single file which prevents mismatched information and ensures reproducible experiments.

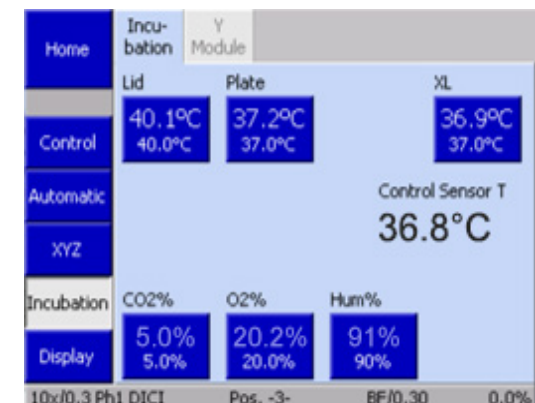
ZEN also allows you to manage all aspects of your experiment from a single interface. This simplifies operation and increases efficiency. Set the desired environmental conditions with just a few clicks and access microscope control panels from the same interface. The system automatically makes adjustments according to your input.



Relevant parameters like temperature, atmosphere levels and intensity are stored with the image file in ZEN and can be plotted or exported.



ZEISS ZEN user interface with integrated incubation solution



Control panel of a ZEISS microscope providing access to all incubation parameters.

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Typical Applications	Task	ZEISS Solution
Label-free live cell cultures	Evaluation and documentation of cell culture status	Single file format for environmental and experimental data, PlasDIC, Definite Focus 3
Transfected live cell cultures	Evaluation and documentation of transfection rate and transfection stability using fluorescent markers	Incubator XLmulti S1/S2, stable pH, stable temperature, gentle excitation with Colibri, PlasDIC, Definite Focus 3
Reproductive or adherent cells and cell cultures	Mechanical manipulation of cells (e.g., injection of germ cells), injection of dyes and other biologically active substances	Heated microscope stages and mounting frames, Incubator XLmulti S2 DARK with space for many accessories, support for micromanipulators
Living neuronal or muscular cell culture or tissue slices	Observation of fast densitometric, radiometric and electrical signals	Incubator XLmulti S2 DARK to efficiently exclude light, Colibri for gentle excitation, fast and sensitive Axiocam cameras
Multi-labelled living tissue section, organs, organoid, spheroid, or cell culture preparations	Short-term or long-term observation of physiological and morphological parameters in 2D/3D during growth, differentiation, motility, and interaction	Autocorr, LCI objectives optimized for live cell imaging, LD objectives for large specimen, arivis Vision4D for multichannel, 3D visualization
Working with tumor cells, hypoxia studies (analyzing the effects of hypoxia)	Working in reduced O <sub>2</sub> concentrations	Reduced O <sub>2</sub> concentrations, 1%–21%, stable pH
Investigating cell migration in chemotaxis assays or wound healing assays	Tracking of cell movement	Stage-top incubator, stable atmospheric control, stable pH, stable temperature, Definite Focus 3, LCI objectives optimized for live cell imaging, BioApps Confluency
Studying angiogenesis with tube formation assays	Observation of tubular networks, analysis of network shape and size	Heated microscope stages and mounting frames, PlasDIC, ZEN Intellesis
Measuring cell proliferation over time	Quantification of dividing cells	Stage-top incubator, stable atmospheric control, stable pH, stable temperature, LCI objectives optimized for live cell imaging, BioApps Confluency
Analyzing inter- and intracellular signaling using specific fluorescence staining and high-resolution microscopy	Detection of fast, transient events	Fast multichannel imaging with Colibri, fast and sensitive Axiocam cameras, arivis Vision4D, Incubator XLmulti S1/S2: stable atmospheric control, stable pH, stable temperature
Gaining insight into the cytoskeletal dynamics	Observation of transient changes in cytoskeletal morphology	Heated microscope stage and mounting frames, gentle fluorescence with Colibri, fast and sensitive Axiocam cameras, ZEN Intellesis
Fast processes in live cell cultures	Imaging of Calcium waves, muscle contractions, blood flow, beating cilia	Incubator XLmulti S1/S2, heating inserts for stable temperature, Airyscan 2 with Multiplex mode for gentle imaging at very high frame rates at confocal resolution
Dynamics in cell compartments	Acquire information about dynamics and concentration of molecules in living cells	Incubator XLmulti S1/S2, heating inserts for stable temperature, LSM 980 with 7 channel FCS
Image Living organisms and animals	Capture the interaction of cells within living tissue	LSM 980 NLO on Axio Examiner with Incubator XLmulti S1/S2. Use multiphoton excitation for deep tissue imaging

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## Stage-top incubation

- Robust temperature and pH stabilization for short and long-term experiments
- Fully integrated in ZEN for convenient experiment setup and data logging
- Supports high NA immersion objective for demanding applications
- Suitable for slides, chamber slides and petri dishes

## Heating plate

- Well suited for combination with micromanipulation accessories
- Compatible with all petri dish sizes
- Optimized for processing large batches of samples
- Control via external control panel for convenient operation



Axio Vert.A1 with manual stage combined with heating plate and micromanipulation setup



Axio Vert.A1 with transmitted light illumination, manual stage and stage-top incubation system



Axio Observer with scanning stage, Colibri fluorescent illumination and stage-top incubation system

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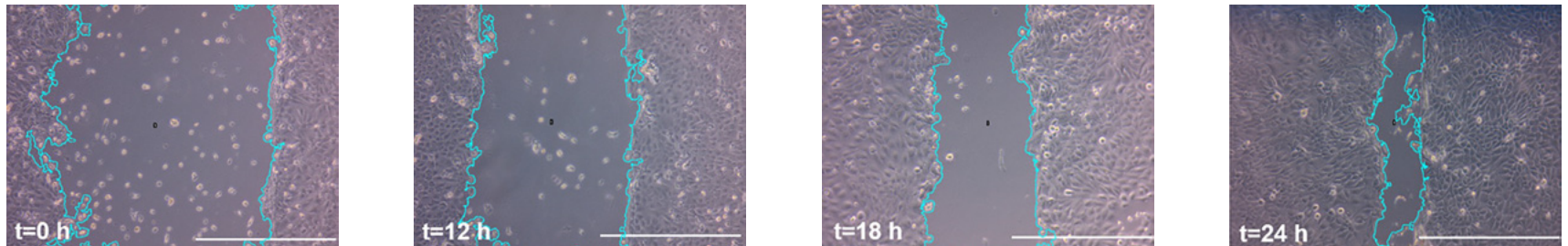
Assisted Reproductive Technology (ART) includes various microscopic procedures such as microinjection of spermatozoa into oocytes and examination of embryo quality and development. It is critical that these precious specimens are maintained at a constant temperature during observation and manipulation.

Scratch or wound healing assays are used to study the collective and coordinated movement of cells, a process important to understanding cancer metastasis. This standard in-vitro assay is used in many disciplines and is based on the creation of a cell-free area in a confluent monolayer. The cells then collectively migrate into this cell-free area to close the gap. The migrating cells are imaged with a low magnification objective over several hours up to two days to study this coordinated movement. A constant environment is the foundation for meaningful and reproducible results.

In the development of novel drugs for disease treatment, genetically modified organisms are widely used as disease models. Transgenic animals can be generated by microinjection of DNA, embryonic stem cells, or more recently via the CRISPR/Cas9 system. Such procedures can benefit from a temperature-controlled environment at the microscope.



*Phase-contrast image of an Oocyte with Zona pellucida*



*Time lapse of wound healing closure in HaCaT exposed to hAdMSCs conditioned medium. Wound healing size tool test comparing HaCaT exposed to hAdMSCs conditioned medium and HaCaT cultured only with basic medium (DMEM +1%P/S) as control of the assay. <https://doi.org/10.1371/journal.pone.0232565.g004>*

# Environmental Control for Research Microscopy

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## General features

- Variety of sample holders allow diverse experiments
- Automatically logs incubation conditions in ZEN with your acquired images
- Stage-top incubation systems for robust temperature stabilization during both short and long-term experiments
- Heated microscope enclosure compensates for fluctuations in room temperature
  - Ensures a constant temperature at the specimen
  - Equilibrates microscope components to match sample temperature to prevent focus drifts

## Temperature control

- Feedback control for all heated components to maintain stable temperature
- System calibration using a temperature probe directly at the sample

## Atmospheric stabilization

- CO<sub>2</sub>-gasing to stabilize pH by carbonate buffer system
- O<sub>2</sub> control for simulation of body conditions/tissue conditions
- Humidification of all gasses to avoid evaporation at the sample for stable osmotic conditions



*Axio Observer with stage-top incubation including temperature control and atmospheric stabilization*



*LSM 980 confocal microscope on Axio Observer combined with Incubator XLmulti S2 DARK for environmental control, light protection and system stabilization*



# Environmental Control for Demanding Long-term Experiments

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Long-term experiments have proven to be a valuable tool for gathering scientific data on complex processes like the development of whole organisms or slowly growing cells.

The correct interplay of different experimental aspects ranging from stable environmental parameters, gentle imaging conditions and a reliable focus strategy, are crucial for successful experiments. ZEISS incubation solutions allow you to control all relevant parameters from a single software solution. Benefit from the robust design of ZEISS microscopes and full traceability by saving all imaging and environmental parameters in a single file format.



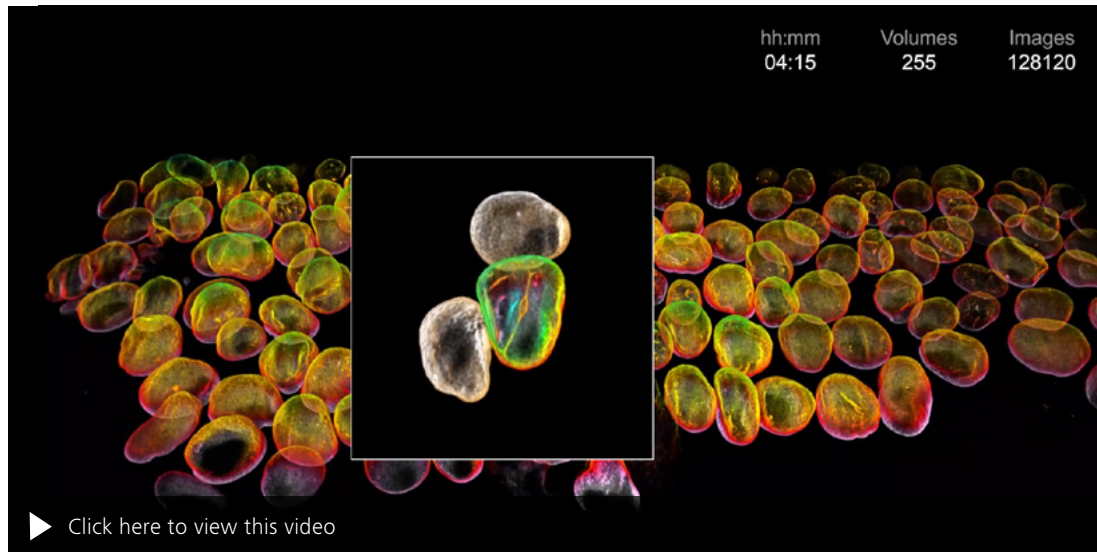
*Long-term phase contrast time lapse of Indian muntjac cells (7 days, 1 image every 6 mins). This slowly growing cell line requires stable conditions over days. Cells show high dynamics – mitotic events were observed after 100 h and 125 h indicating that ideal physiologic conditions of 37 °C, 5% CO<sub>2</sub> and 100% rel. humidity were matched even after days of imaging.*

# Environmental Control for Investigation of Dynamic Processes

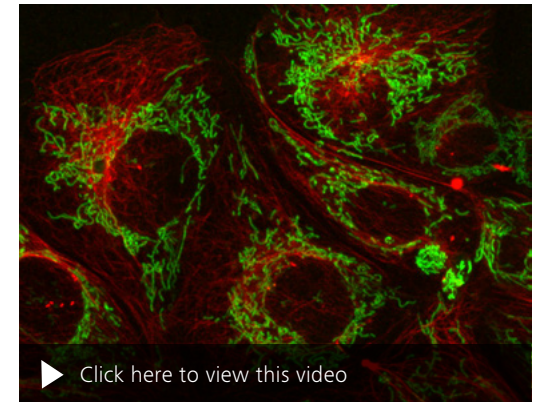
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With functional biology becoming more important, the investigation of highly dynamic processes such as vesicle trafficking or the interaction of different cell organelles has yielded new scientific insights. These applications require not only the highest frame rates and resolution but also gentle imaging conditions over minutes or even hours. Unaltered development of whole organisms in 3D, like *C. elegans* or *Drosophila*, can be observed only by combining the lowest phototoxicity with fast volumetric imaging. Additionally, imaging conditions must be adapted to the natural environment of the specimen. Only when the physiological conditions of the specimen are matched perfectly, highly sensitive processes like mitosis can be observed.

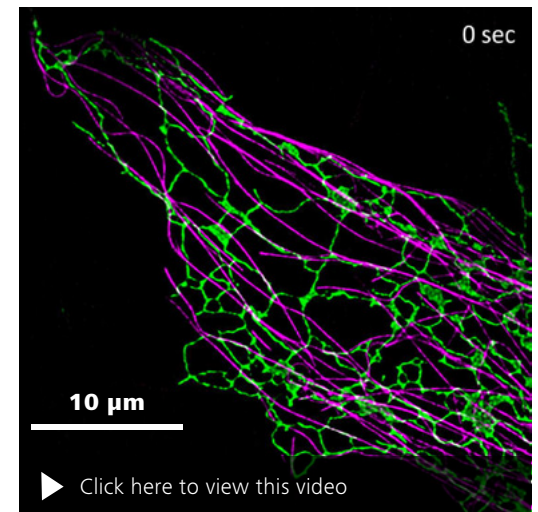
By intentionally changing the environment, the reaction of the organisms to external influences can be monitored. Treatment with chemicals allows the investigation of cell movement or growth rate. Heat shocks and hyper-/hypotonic conditions can alter protein expression and cell shape significantly. Fast, precise, and reproducible control of the environmental conditions is the prerequisite for these experiments.



Human induced pluripotent stem cells which endogenously express mEGFP-tagged lamin B1 (AICS-0013). Images generated using AICS-0013 (LMNB1-mEGFP) from the Allen Institute for Cell Science.



Kidney medulla cells stained with MitoView Green and SiR-tubulin are exposed to chemical stress. The cells recover fully after removing the chemical by washing. Courtesy of Sarita Patnaik, PhD, University of Mainz, Germany.



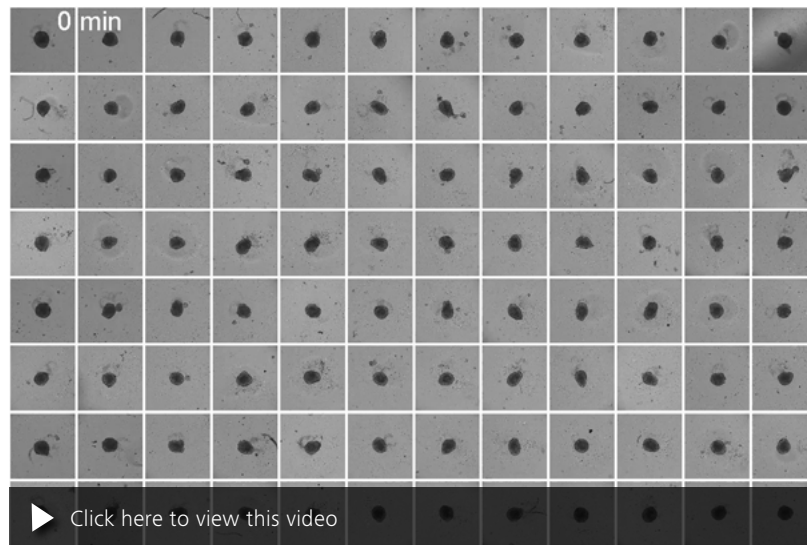
Dynamics of GFP labeled microtubules (magenta) and tdTomato labeled endoplasmic reticulum (blue/green) in a Cos7 cell.

# Environmental Control for High Content Screening Applications

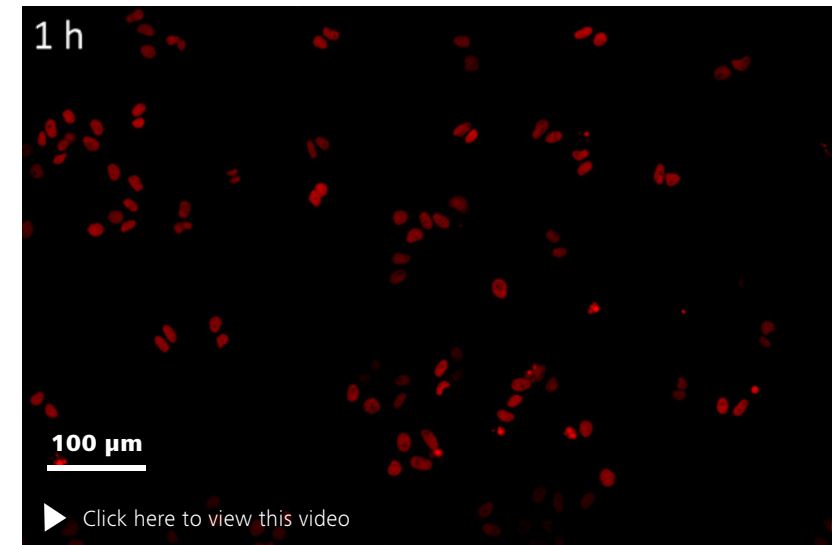
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Throughput is important to obtain meaningful results for complex life cell studies. High content experiments increase statistical evidence by using larger sampling sizes. Therefore, it is necessary that specimens in different vessel containers are treated with identical environmental conditions. For investigation of highly sensitive specimens such as embryotic stem cells, simultaneously maintaining a consistent environment and gentle imaging conditions is essential.

Cell proliferation assays require gentle imaging over many hours or days. The environmental requirement strongly depends on the cell type. Therefore, the temperature within the sample chamber can be set within a broad range. CO<sub>2</sub> and O<sub>2</sub> levels can be controlled to accommodate a vast array of different cell types and organs or even small organisms. With the increasing number of automation features, ZEISS microscopes are an ideal platform for high-throughput automated live cell imaging.



*Mouse embryonic stem cells: High content screening of growing organoids.*  
Sample courtesy of S. Reither, Advanced Light Microscopy Facility, EMBL, Heidelberg, Germany.



*HeLa Kyoto cells expressing H2B-mCherry in a 48h cell proliferation assay.*  
Sample courtesy of S. Reither, Advanced Light Microscopy Facility, EMBL, Heidelberg, Germany.

# Your Flexible Choice of Components

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### Microscopes

- Axio Vert.A1
- Axio Observer 3, 5

### Microscope Stages

- Mechanical stage 130x85 R/L with short coaxial drive
- Mechanical stage 130x85 R/L

### Microscope Condensers for Axio Vert.A1

- LD condenser 0.3 for slider
- LD condenser 0.4 for slider
- LD condenser 0.4 for H Ph PlasDIC DIC iHMC
- LD condenser 0.55 for H Ph PlasDIC DIC

### Microscope Condensers for Axio Observer

- LD condenser 0.35
- LD condensers 0.55, manual

### Environmental Control

- Mounting Frame K Thermo Plate with Controller or
- Temperature Controller with Heated Plate K, ibidi and Glass Lid CO<sub>2</sub>/O<sub>2</sub> heated, ibidi and
- Gas Mixer System CO<sub>2</sub>, ibidi or Gas Mixer System CO<sub>2</sub>/O<sub>2</sub>, ibidi

### Software

- ibidi IncuControl for ibidi controllers via USB control

### Micromanipulation

- Only possible in combination with Mounting Frame K Thermo Plate

### Objectives

- Objectives (A-Plan/Plan-Neofluar) recommended for Mounting Frame K Thermo Plate:
  - Objective 2.5x
  - Objective 5x
  - Objective 10x/LD 10x
  - Objective LD 20x
  - Objective LD iHMC 63x

### High magnification objectives for for Mounting Frame K Thermo Plate:

- Objective LD A-Plan 40x/0.55 for Thermo Plate M27
- Objective LD A-Plan 40x/0.55 Ph1 for Thermo Plate M27
- Objective LD A-Plan 40x/0.55 iHMC for Thermo Plate M27
- Objective LD Plan-Neofluar 40x/0.4 for Thermo Plate M27
- Objective LD A-Plan 63x/0.65 for Thermo Plate M27

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### Microscope

- Axio Observer 7

### Microscope Stages

- All manual and motorized ZEISS stages with K-frame opening
- Stage attachment Z PIEZO WSB 500

### Microscope Condensers

- LD condenser 0.35
- LD condensers 0.55, manual and motorized
- LD condenser 0.55 mot.;
- AI Sample Finder (recommended)

### Components for environmental control / incubation

- Heated stage inserts for various sample holders
- Heated lids with gas inlets for temperature control and CO<sub>2</sub>/O<sub>2</sub> gasing
- Heated gas humidification
- Objective heaters
- Temperature sensors for temperature control at the sample

### System Control

- TFT Axio Observer
- ZEN (blue edition)

### Compatibility

- LSM 900 / 980, Elyra 7
- Recommended cameras: scientific class Axiocams
- Recommended light source: Colibri 7

### Recommended Objectives

- LD LCI Plan-Apochromat 25x Imm (with objective heater)
- LCI Plan-Neofluar 25x Imm (with objective heater)
- LD C-Apochromat 40x W, 63x W (with objective heater)
- C-Apochromat, 40x W, 63x W (with objective heater)
- LD Plan-Neofluar 20x, 40x, 63x



# Your Flexible Choice of Components

## XL Incubation for Inverted Research Microscopes

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### Microscope

- Axio Observer 7

### Options for XL enclosure

- Slide-In module standard
- Slide-In module camera
- Standard or premium internal illumination

### Compatibility

- Stage-top incubation
- LSM 900 / 980
- Apotome 3
- Scientific class Axiocams
- Colibri 7, X-Cite Xylis, HXP 120 V
- Definite Focus 3

### With Slide-In Module Camera

- Double camera adapter Duolink
- All Axiocams
- Third party camera models

### Microscope Stages

- All manual, motorized and scanning ZEISS stages
- Stage attachment Z PIEZO WSB 500

### Microscope Condensers

- LD condenser 0.35
- LD condensers 0.55, manual and motorized
- LD condenser 0.55 mot.;
- AI Sample Finder (recommended)

### Recommended Objectives

- LD LCI Plan-Apochromat 25x Imm, 40x Imm, 63x Imm
- LD C-Apochromat 40x W, 63x W
- C-Apochromat 10x W, 40x W, 63x W, 100x W
- LCI Plan-Neofluar 25x Imm
- LD Plan-Neofluar 20x, 40x, 63x

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### Options for XL temperature control

- TempModule S1 or Temperature Controller, ibidi

### XL temperature regulation with (heated) stage-top incubation

#### Option 1

- Heating Insert P S1  
(or other PeCon heating insert)
- CO<sub>2</sub>-Cover
- Control Sensor T S1
- TempModule S1  
and
- CO<sub>2</sub> Module S1 with Heating Device Humidity
- Optional: O<sub>2</sub>-Module S1

#### Option 2

- Temperature Controller, ibidi
- Heated Plate K, ibidi
- Glass Lid CO<sub>2</sub>/O<sub>2</sub> unheated, ibidi  
and
- Gas Mixer System CO<sub>2</sub>, ibidi  
or
- Gas Mixer System CO<sub>2</sub>/O<sub>2</sub>, ibidi

### System Control

- TFT of Axio Observer
- Software: ZEN (blue edition)

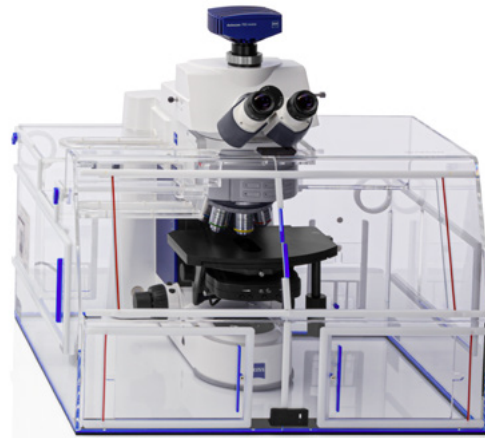
### Incubation of multi-well plates

- Universal mounting frame K-M with  
CO<sub>2</sub>-Cover  
or
- Mounting frame K for multi-well plates, ibidi  
with Glass Lid CO<sub>2</sub>/O<sub>2</sub> unheated, ibidi

# Your Flexible Choice of Components

## Incubation for Axio Imager

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- › Technology and Details
- › Service



### **XL enclosure for Axio Imager**

- Temperature regulation
- TempModule S1

### **Compatibility**

- LSM 900 / 980
- Apotome 3
- Scientific Class Axiocams
- Other "scientific/ third party" camera models
- Colibri 7, X-Cite Xylis, HXP 120 V
- Docking Station for TFT-Display required

### **Microscope Stages**

- All manual, motorized and scanning ZEISS stages

### **System control**

- TFT of Axio Imager
- Software: ZEN (blue edition)

### **Recommended objectives**

- LD LCI Plan-Apochromat 25x Imm, 40x Imm, 63x Imm
- LCI Plan-Neofluar 25x Imm
- W Plan-Apochromat 20x/1.0, 40x, 63x

### **Heating for Axio Imager**

- Heatable universal mounting frame A-H S1 for manual stage KT 75x50
- TempController 2000-2

### **Microscope condensers for heating**

- Only condensers 0.8 can be used with A-H S1 (see price list for details)

# Your Flexible Choice of Components

## Fully Integrated Incubation for Automated Box Microscopes

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### **Microscope**

- Celldiscoverer 7

### **Microscope Stage:**

- Build-in motorized xy scanning stage and z-drive for Celldiscoverer 7 with adaptive lens guard for collision protection of the objectives with any hardware or sample vessels

### **Incubation:**

- TempModule S1 for Celldiscoverer 7
- CO<sub>2</sub> Module S1 for Celldiscoverer 7
- O<sub>2</sub> Module S1 for Celldiscoverer 7
- Humidifier unit for Celldiscoverer 7 with automatic display of liquid level
- Refrigerated circulator Corio CP-200F for air objectives

### **System Control:**

- TFT of Celldiscoverer 7
- Software: ZEN (blue edition)

### **Sample mounting:**

- Compatible with all Celldiscoverer 7 insert plates and sample carriers
- Insert plate for 1 Petri dish 35/60
- Insert plate for 6 Petri dishes 35
- Insert plates for 2 or 3 slides 76×26 mm
- Insert plate for 2 slides / Lab-Tek™ chambers 57×26 mm
- Insert plate for perfusion with POC-R2

### **Dispensing unit:**

- For semi-automated pipetting of multi-positions without disturbing environmental conditions. Software control via ZEN (blue edition)

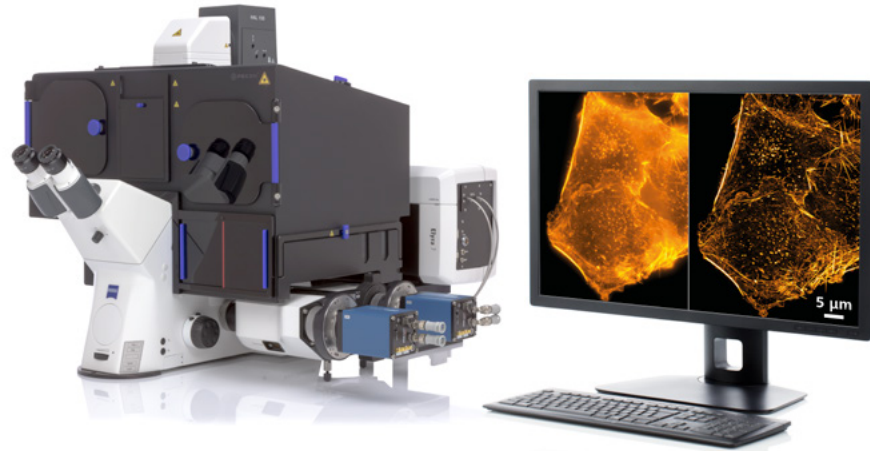
### **Objectives:**

- Compatible with all Celldiscoverer 7 objectives from 2.5× up to 100× magnifications. All objectives are equipped with heating elements for automatic temperature control.
- Objective Plan-Apochromat 5×/0.35
- Objective Plan-Apochromat 20×/0.7 autocorr
- Objective Plan-Apochromat 20×/0.95 autocorr
- Objective Plan-Apochromat 50×/1.2 W autocorr with autoimmersion

# Your Flexible Choice of Components

Fully Integrated Incubation for Fast and Gentle 3D Superresolution Microscopy

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## Microscope

- Elyra 7

## Microscope Stage:

- Motorized XY Piezo scanning stage with a range of 130 mm × 100 mm and max. speed of 100 mm/s.
- Z-Piezo stage insert with the smallest Z step size of 5 nm

## Incubation:

- Large chamber incubation with Incubator for superresolution microscopy, also prevents exposure to ambient light
- Stage-top incubation including temperature and CO<sub>2</sub> control possible with z-piezo stage insert

## System Control:

- TFT
- ZEN (black edition)

## Sample mounting:

- Sample holders available for standard 3" × 1" slides, LabTek™ chambers, multiwell plates and 36 mm round glass-bottom dishes
- Level-adjustable and universal stage insert available for standard slides, glass-bottom dishes and LabTek™ chambers

## Objectives:

- C-Apochromat 63×/1.2 W Corr (DIC)
- Plan-Apochromat 63×/1.4 Oil (DIC)
- alpha Plan-Apochromat 100×/1.46 Oil DIC
- alpha Plan-Apochromat 100×/1.57 Oil HI Corr (DIC)
- alpha Plan-Apochromat 63×/1.46 Oil Corr
- C-Apochromat 40×/1.2 W
- Plan-Apochromat 40×/1.4 Oil (DIC)
- LD LCI Plan-Apochromat 25×/0.8 Imm Corr
- Plan-Apochromat 20×/0.8
- EC Plan-Neofluar 10×/0.3



# Your Flexible Choice of Components

## Fully Integrated Incubation for Lightsheet Microscopy

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### Microscope

- Lightsheet 7

### Microscope Stage:

- Motorized 4 axis stage with a range of 10 mm (X) × 50 mm (Y) × 10 mm (Z) × 360°C (α); speed of 200 mm/s.
- Smallest step size X-Y-Z of 50 nm – 1000 nm – -50 nm

### Incubation:

- Chamber Temperature control via Peltier element
- CO<sub>2</sub>-Module Lightsheet
- Heating Device Humidity S1

### System Control:

- ZEN (black edition)

### Sample mounting:

- Sample holder for capillaries
- Sample holder for syringes
- Universal sample holder for capillaries and pedestals
- Smart sample holder for various pedestals and outside sample loading

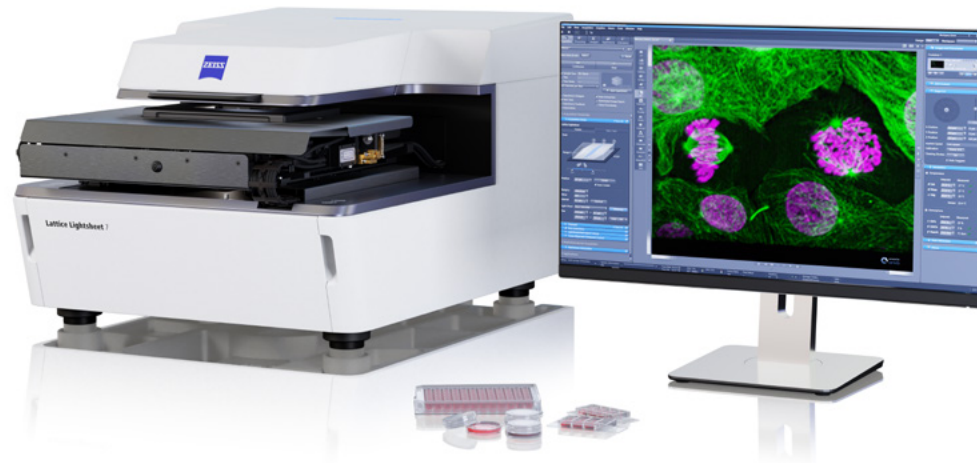
### Objectives:

- Fluar 2.5×/0.12
- EC Plan-Neofluar 5×/0.16
- Plan Apochromat 10×/0.5
- W Plan-Apochromat 20×/1.0
- W Plan-Apochromat 40×/1.0
- W Plan-Apochromat 63×/1.0
  
- EC Plan-Neofluar 5×/0.16
- EC Plan-Neofluar 5×/0.16
- Clr Plan-Apochromat 10×/0.5
- Plan-Apochromat 20×/1.0
- Plan-Neofluar 20×/1.0
- Plan-Neofluar 20×/1.0

# Your Flexible Choice of Components

## Fully Integrated Incubation for Lattice Lightsheet Microscopy

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### Microscope

- Lattice Lightsheet 7

### Microscope Stage:

- Motorized 5 axis multi-coordinate with Piezo motors with a range of  $\pm 36$  mm (X)  $\times$   $\pm 54$  mm (Y)  $\times$   $\pm 0.5$  mm (Z)  $\times$   $\pm 0.5^\circ$  (TiltX)  $\times$   $\pm 0.5^\circ$  (TiltY)
- Smallest step size X-Y-Z-TiltX-TiltY of 200 nm – 200 nm – 100 nm –  $0.1^\circ$  –  $0.1^\circ$

### Incubation:

- Stage Top incubation
- Temperature control
- Gas concentration ( $\text{CO}_2$  and  $\text{O}_2$ ) control
- Humidity control
- Perfusion prepared

### System Control:

- ZEN (blue edition)

### Sample mounting:

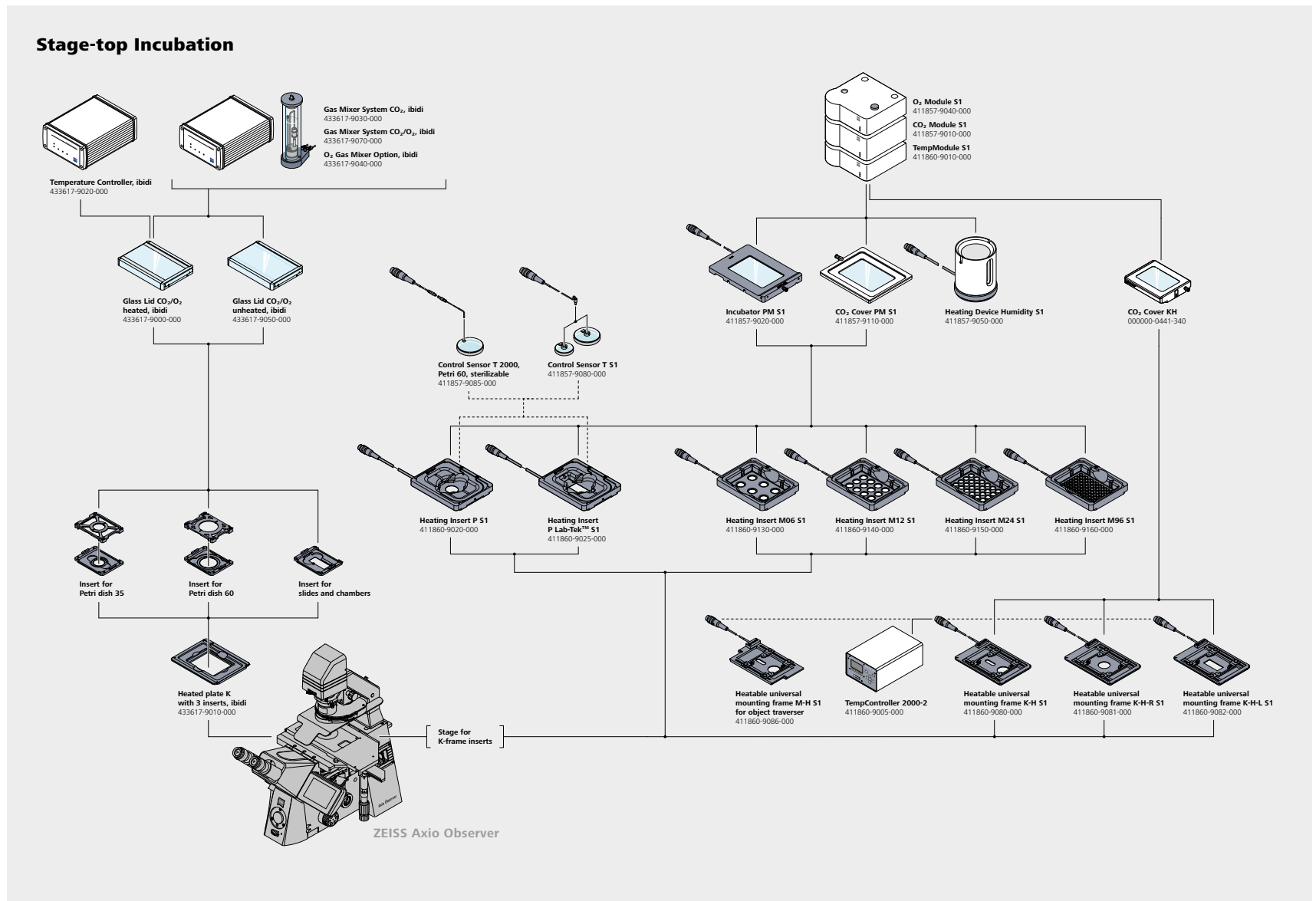
- 35 mm cell culture dishes (glass bottom)
- Slides with coverslip
- Multi-well plates with glass bottom
- Multi-well chamber slides with glass bottom

### Objectives:

- $\mu$ SPIM optics 48 $\times$ / 1.0 NA (effective)

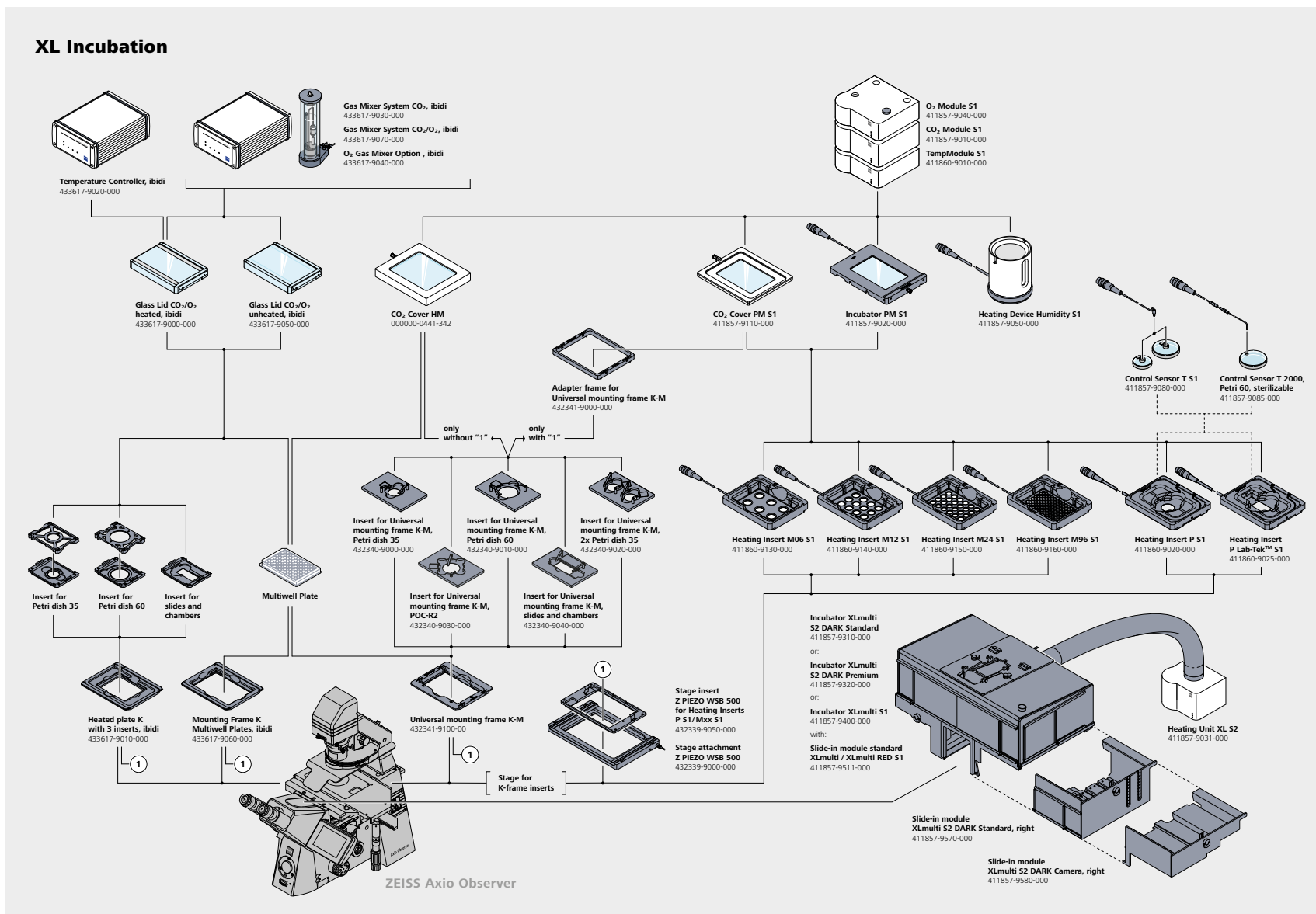
# System Overview

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# System Overview

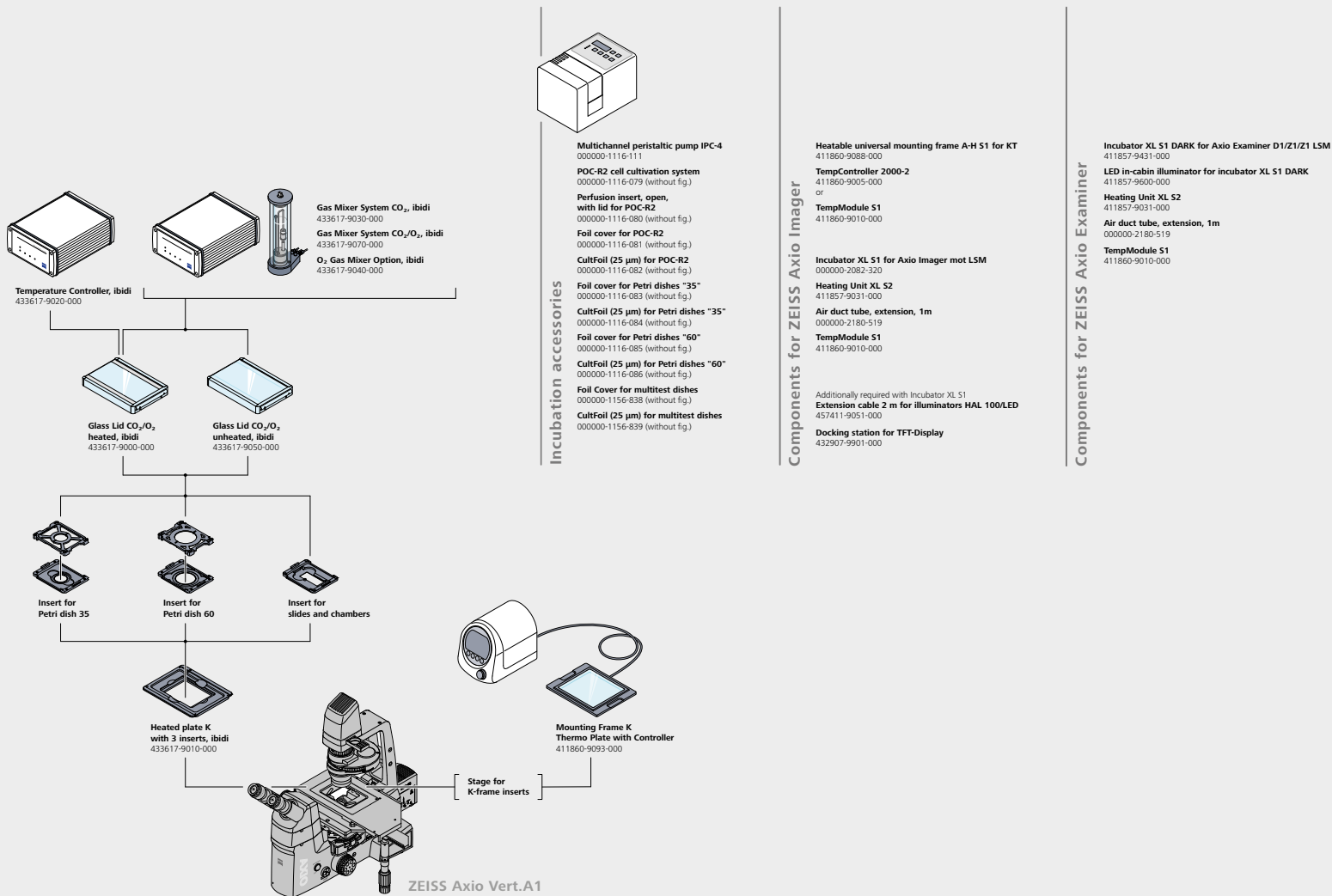
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# System Overview

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## ZEISS Axio Vert.A1 and accessories



# Technical Specifications – PeCon

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System requirements	
Microscope + Software	Axio Observer Z.1, 7 with CAN-Port and TFT Microscope stage with K-frame opening Settings controlled via TFT or ZEN through CAN-Connection
Environmental Operating Conditions	Temperature: 5°C – 40°C Rel. Humidity: < 80% Altitude: < 2000 m

TempModule S1	
AC operating voltage	AC 100–240 V, 50–60 Hz
Power consumption	460 VA max.
Output Voltage	DC 24 V; max 4 A per channel, max. 14 A total power
Temperature resolution	0.1°C
Dimensions (W × H × D)	313 mm × 85.5 mm × 301 mm
Weight	5.4 kg

CO <sub>2</sub> Module S1	
AC operating voltage	via TempModule S1 – no stand-alone unit
Operating voltage	24 V DC
Power consumption	max. 610 mA
CO <sub>2</sub> supply	1 bar (14,5 psi), max 2 bar (29 psi)
CO <sub>2</sub> display range	0.0 – 10.0 Vol %
Resolution	0.1 Vol %
Dimensions (W × H × D)	313 mm × 128 mm × 301 mm
Weight	5.7 kg

O <sub>2</sub> Module S1	
AC operating voltage	via TempModule S1 – no stand-alone unit
Operating voltage	24 V DC
Power consumption	max. 370 mA
N <sub>2</sub> supply	1 bar (14.5 psi), max. 2 bar (29 psi)
O <sub>2</sub> display range	0.0 – 25.0 Vol %
Resolution	0.1 Vol %
Dimensions (W × H × D)	313 mm × 85.5 mm × 301 mm
Weight	4.2 kg

Heating Device Humidity S1	
DC operating voltage	24 V DC
Power consumption	< 2.1 A
Heating range	Ambient temperature up to 60°C
Dimensions (D × H)	104 mm × 124 mm
Weight	1.5 kg

Heating Insert P S1	
DC operating voltage	24V DC
Power consumption	< 1.7 A
Heating range	Ambient temperature up to 60°C
Observation area	32 × 30 mm (oval)
Dimension (W × H × D)	160 mm × 135 mm × 22 mm
Weight	800 g

Heating Insert P Lab-Tek S1	
DC operating voltage	24V DC
Power consumption	< 1.7 A
Heating range	Ambient temperature up to 60°C
Observation area	48.9 × 25.5 mm
Dimension (W × H × D)	160 mm × 135 mm × 22 mm
Weight	800 g

Heating Insert Mxx S1	
DC operating voltage	24V DC
Power consumption	< 0.4 A
Heating range	Up to 30°C above ambient
Dimension (W × H × D)	160 mm × 135 mm × 25 mm
Weight	400 g

Incubator PM S1	
DC operating voltage	24V DC
Power consumption	< 1.1 A
Heating range	Up to 30°C above ambient temperature
Observation area (W x D)	118 mm × 75.2 mm
Dimension (W × H × D)	136 mm × 13.4 mm × 189 mm
Weight	235 g



# Technical Specifications – PeCon

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CO <sub>2</sub> Cover PM S1	
Observation area (W × L)	81.5 mm × 114.5 mm
Dimensions (W × H × D)	147.5 mm × 9.0 mm × 170.5 mm
Weight	150 g

Heating Unit XL S2	
AC operating voltage	AC 100 ... 115/230V – autorange, 50–60 Hz
Power consumption	615 VA max.
Operating Voltage (from TempModule S1)	DC 24V
Power consumption (from TempModule S1)	250 mA max
Dimension (W × H × D)	206 mm × 154 mm × 210 mm
Weight	3.7 kg

For Axio Imager

TempController 2000-2	
AC operating voltage	AC 90–260 V, 50–60 Hz
Power consumption	200 W max
Output Voltage	DC 24 V; max 4 A per channel, max. 4.2 A total power
Temperature resolution	0.1°C
Dimension (W × H × D)	190 mm × 130 mm × 255 mm
Weight	4.25 kg

Heatable universal mounting frame A-H S1 for KT 75 × 50	
DC operating voltage	24 V DC
Power consumption	< 0.5 A
Heating range	Up to 30 °C above ambient temperature
Clamping range	max. 128.0 mm; min. 27.0 mm
Specimen size	max. 68.0 mm
Observation Area	circular 30.0 mm; slotted 30.0 mm × 10.0 mm
Dimensions (WxHxD)	153 mm × 110 mm × 8 mm
Weight	250 g

# Technical Specifications – ibidi stage top

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System requirements		
Microscope + Software	Axio Observer D.1, Z.1, 5, 7 Firmware 02.695 or higher (for CAN control)	
	ZEN 2.3 SP1 (blue edition) Hotfix 9 or higher	
	Axio Vert.A1 with K-Frame stage and computer with USB	
Environmental Operating Conditions	Temperature: 18–30 °C/64–86 °F	
	Rel. Humidity: < 80%	
	Altitude: < 2000 m (atmospheric pressure 800–1060 hPa/ 11.6–15.4 psi)	
Storage conditions	–5–50 °C/23–122 °F, < 60% RH	
Temperature Controller, ibidi		
AC operating voltage	AC 100 To 240 V, 50–60 Hz	
Output Voltage	Glas Lid CO <sub>2</sub> /O <sub>2</sub> heated, ibidi: DC 10 V, 5 A	
	Heated Plate K with 3 inserts, ibidi: DC 24 V, 5 A	
	Objective heater: DC 24 V, approx. 300 mA	
	XL-Inc: DC 24 V, approx. 300 mA	
Temperature control range	Glas Lid CO <sub>2</sub> /O <sub>2</sub> heated (Channel 1)	ambient (min. 18 °C) – 46 °C
	Heated Plate K with 3 inserts (Channel 2)	ambient (min. 18 °C) – 45 °C
	Objective heater (Channel 3)	ambient (min. 18 °C) – 40 °C
	XL-Inc (Channel 4)	ambient (min. 18 °C) – 40 °C
Dimensions Temperature Controller (W × H × D)	170 mm × 90 mm × 230 mm	
Dimensions of Heated Plate K with Glas Lid CO <sub>2</sub> /O <sub>2</sub> (W × H × D)	160 mm × 30 mm × 130 mm	
Weight	350 g	
Connections	USB for computer control via IncuControl software (ibidi)	
	CANbus for connection to Axio Observer or CAN-Hub for control via TFT and ZEN (blue edition)	
	4 control channels (see above)	
	Thermocouple Type K	
	External power supply	

# Technical Specifications – ibidi stage top

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Gas Mixer System	
AC operating voltage	AC 100 To 240V, 50–60 Hz
Output Voltage	DC 24 V
Entry Voltage	DC 24 V, 5 A, 120 W
Dimensions Gas Mixer (W × H × D)	170 mm × 90 mm × 230 mm
Weight	2.2 kg
CO <sub>2</sub> -Control	Control range: 0–15 % Accuracy: ± 0.35 % at 5 % CO <sub>2</sub> Resolution: 0.1 % Self-calibrating
O <sub>2</sub> -Control	Control range: 1–21 % Accuracy: ± 0.2 % typical / ± 0.5 % maximal Resolution: 0.1 %
Humidity control	Control range: 20–99 % (lower limit depending on environmental conditions) Accuracy: 2.5 % Resolution: 1 %
Gas supply (CO <sub>2</sub> , Air, N <sub>2</sub> )	1 bar / 14.5 psi optimum (0.8–1.2 bar / 11.6–17.4 psi)
Gas flow rate	10 l/h
Connections	USB for computer control via IncuControl software (ibidi) CANbus for connection to Axio Observer or CAN-Hub for control via TFT and ZEN (blue edition) 3 Push-in fittings for CO <sub>2</sub> , Air, N <sub>2</sub> input (Tubing ID 4 mm, OD 6 mm) 2 Push-in fittings for mixed gas outputs (Tubing ID 2.5 mm, OD 4 mm) Heater of humidifying column Humidity sensor External power supply

# Technical Specifications – Tokai Hit

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Mounting Frame K Thermo Plate with Controller		
System requirements	Manual control via control pad	
	Microscope stage with K-frame opening	
Environmental operating conditions	Temperature 25 °C ± 2 °C	
	Rel Humidity: 5–70 %	
	Altitude: < 2000 m	
Storage Conditions	Temperature: –10–50 °C, RH 5–70 %	
	AC operating voltage	AC 100–240 V
	Temperature Control Range	Ambient +5 °C – 60 °C
	Temperature Accuracy	0.1 °C
	Increments	0.1 °C
	Maximum Power Consumption	50W
Dimensions of Mounting Frame K Thermo Plate	160 mm × 110 mm	

# Technical Specifications

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		Incubator XLmulti S1/S2 configurations		
		Incubator XLmulti S1 (411857-9400-000) with:	Incubator XLmulti S2 DARK (411857-9310-000/411857-9320-000) with:	
		Slide-in module standard S1 (411857-9511-000)	Slide-in module S2 DARK Standard, right (411857-9570-000)	Slide-in module S2 DARK Camera, right (411857-9580-000)
<b>Compatible with:</b>				
424533-9110-000 *	Definite Focus	●	●	●
424533-9120-000 *				
<b>Double Adapter Duolink 60N – 2x 60N man. (426143-9000-000) at sideport left:</b>				
	Axiocam, e.g. 503 / 506 / 512 / 702 / 705 / 712 (Axiocam 202 / 208 <b>NOT</b> compatible)	●	●	●
000000-1964-944	EMCCD Camera evolve 512	●	●	●
000000-2034-186	EMCCD Camera evolve 512 delta	●	●	●
	Hamamatsu Image EM / Orca R2 / Flash 4.0 / Andor iXon3	●	●	●
<b>Double Adapter Duolink 60N – 2x 60N man. (426143-9000-000) at sideport right:</b>				
	Axiocam, e.g. 503 / 506 / 512 / 702 / 705 / 712 (Axiocam 202 / 208 <b>NOT</b> compatible)	–	–	●
000000-1964-944	EMCCD Camera evolve 512	–	–	●
000000-2034-186	EMCCD Camera evolve 512 delta	–	–	●
	Hamamatsu Image EM / Orca R2 / Flash 4.0 / Andor iXon3	–	–	●
<b>Camera with camera adapter 1.0x or 0.63x at sideport left:</b>				
	Axiocam, e.g. 503 / 506 / 512 / 702 / 705 / 712	●	●	●
	Axiocam 202 / 208 (only with camera adapter 1x)	●	●	●
000000-1964-944	EMCCD Camera evolve 512	●	●	●
000000-2034-186	EMCCD Camera evolve 512 delta	●	●	●
	Hamamatsu Image EM / Orca R2 / Flash 4.0	●	●	●
<b>Camera with camera adapter 1.0x or 0.63x at sideport right:</b>				
	Axiocam, e.g. 503 / 506 / 512 / 702 / 705 / 712 (Axiocam 202 / 208 <b>NOT</b> compatible)	●*	●	●
000000-1964-944	EMCCD Camera evolve 512	–	–	●
000000-2034-186	EMCCD Camera evolve 512 delta	–	–	●
	Hamamatsu Image EM / Orca R2 / Flash 4.0	–	–	●
<b>Other accessories:</b>				
425535-0000-000	Binocular ergotube 25°/23	–	–	–
432047-9902-000 *	Mechanical stage 130 x 85 R/L, short drive	–	–	–
432017-9901-000	Specimen stage 250 x 230	●	●	●
000000-1005-833	Object guide 130 x 85 mm right	●	●	●
428400-9000-000	LD condenser 0.55 mot.; AI Sample Finder	●	●	●
428400-9900-000				
452358-9011-000 *	Dual filter wheel mot. for beam splitting and emission; CAN	●	●	–
all versions	Slider systems ApoTome / ApoTome.2 / Apotome 3	●	●	●

● = compatible    – = incompatible    \* = incl. predecessors    ●\* = compatible if Axiocam is mounted horizontally

## ZEISS Service – Your Partner at All Times

Your microscope system from ZEISS is one of your most important tools. For over 170 years, the ZEISS brand and our experience have stood for reliable equipment with a long life in the field of microscopy. You can count on superior service and support - before and after installation. Our skilled ZEISS service team makes sure that your microscope is always ready for use.

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### Procurement

- Lab Planning & Construction Site Management
- Site Inspection & Environmental Analysis
- GMP-Qualification IQ/OQ
- Installation & Handover
- IT Integration Support
- Startup Training

### Operation

- Predictive Service Remote Monitoring
- Inspection & Preventive Maintenance
  - Software Maintenance Agreements
    - Operation & Application Training
    - Expert Phone & Remote Support
  - Protect Service Agreements
    - Metrological Calibration
      - Instrument Relocation
        - Consumables
        - Repairs

### New Investment

- Decommissioning
- Trade In

### Retrofit

- Customized Engineering
  - Upgrades & Modernization
- Customized Workflows via APEER



Please note: Availability of services depends on product line and location

>> [www.zeiss.com/microservice](http://www.zeiss.com/microservice)





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