

Specifications

LSM 5 LIVE and LSM 5 LIVE DuoScan

Microscopes

Models	Upright: Axio Imager.Z1, Axioskop 2 FS MOT. Inverted: Axio Observer.Z1 RP (Rear Port) or SP (Side Port)
Z drive	DC motor with optoelectronic coding, smallest increment 25 or 50 nm
Fine focusing	Accessory piezoelectric drive acting on stage or objective; total travel approx. 250 μm , smallest increment < 10 nm
XY stage (option)	Motor-driven XY scanning stage with Mark&Find (xyz) and Tile Scan (Mosaic Scan) functions; smallest increment 1 μm
Accessories	AxioCam Digital Microscope Camera, incubation chambers, micromanipulators, etc.

Scanning Modules LSM 5 LIVE

Models	Choice of one or two genuinely confocal channels
Scanner	One galvanometric scanning mirror for ultrafast image scanning; optional second scanning mirror for positioning the zoom region
Scan resolution	Up to 1536x1536 pixels, also for several channels, continuously variable
Scanning speed	Variable up to 120 frames/s with 512x512 pixels; faster modes with smaller frames (e.g. 505 frames/s with 512x100 pixels, 1010 frames/s with 512x50 pixels); ultrafast line scan mode with >60,000 lines/s
Scan zoom	0.5x to 2.0x, digital, free XY offset (depending on configuration)
Scan field	Maximum field diagonal 18 mm in the intermediate image plane, homogeneous illumination
Pinholes	Individually variable confocal pinholes for each detection channel
Detection	Up to two confocal channels for fluorescence, equipped with highly sensitive Detectors (QE 70% or better). Bright-field transmitted-light mode possible.
Data depth	Selectable: 8 bits or 12 bits

Laser Module LSM 5 LIVE

VIS Laser Module	Polarization-preserving single-mode fiber, temperature-stabilized VIS-AOTF for simultaneous intensity control; switching time < 5 μs
Lasers	All lasers of maintenance-free diode or solid-state type without significant heat dissipation. 405nm laser diode, 50 mW, alternatively 440 nm, 16 mW; 488nm laser diode, 100 mW; diode-pumped solid-state laser 532nm, 75 mW; laser diode 561 nm, 40 mW; laser diode 635nm, 35 mW

Scanning Module LSM DuoScan

Scanner	Two independent galvanometric scanning mirrors, real-time controlled, with ultrashort line and frame flyback
Scanning speed	13 x 2 speed stages; up to 5 regions/s with 512x512 pixels (max. 77 regions/s with 512x32 pixels), 0.38 ms for a line of 512 pixels
Scan zoom	0.7x to 40x, digitally variable in steps of 0.1
Scan rotation	Free 360° rotation in steps of 1°, free X/Y offset
Scan field	18 mm field diagonal (max.) in the intermediate image plane, homogeneous field illumination

Laser Modules LSM DuoScan

Variable beam splitting	Additional outlet from existing LIVE Laser Module with polarization-preserving single-mode fiber; splitting proportion between the outlets freely variable through the software; for 405, 488 or 532nm laser lines
UV Laser Module	Polarization-preserving single-mode fiber, temperature-stabilized UV-AOTF for simultaneous intensity control of two ultraviolet laser lines, switching time < 5 μ s; Ar laser (351, 364 nm), 80 mW

Electronics Module

LSM 5 LIVE Control	Controls the microscope, the laser modules, the scanning module and other accessories. Controls and synchronizes data acquisition through real-time computer; data exchange with user PC through Gigabit Ethernet Interface
Computer I	Standard PC with main and hard disk memory space appropriate to practical requirements; ergonomic high-resolution flat-panel displays of 19" (4:3) or 24" (16:10), many accessories; Windows XP multi-user operating system
Computer II	High-end PC with abundant main memory space and ultrafast RAID 0 hard disk system; ergonomic high-resolution flat-panel displays of 19" (4:3) or 24" (16:10), many accessories; Windows XP multi-user operating system

Standard Software

System configuration	Convenient control and configuration of all motor-driven microscope functions and of the laser and scanning modules; saving and restoration of application-specific configurations
ReUse function	Restoration of acquisition parameters with a mouse click
Acquisition modes	Line, Frame, Z-stack, time-lapse series and combinations: xy, xyz, xyt, xyzt, xz, xt, xzt; on-line computation and visualization of ratio images. Averaging and summation.
Auto-Z function	On-line adaptation of acquisition parameters for Z-stacks for uniform brightness distribution
Zoom Crop function	Convenient selection of scanning areas (Zoom, Crop, Offset)
ROI Bleach	Localized photobleaching in up to 99 bleaching ROIs for such applications as FRAP (Fluorescence Recovery After Photobleaching) or Uncaging; up to 99 ROIs (Regions of Interest) of any shape, and laser blanking with single-pixel accuracy
Multitracking	Acquisition of multiple fluorescence signals by fast change of the excitation lines
Visualization	Orthogonal view (xy, xz, yz in one display), cut view (3D section at freely definable solid angles), 2.5D view for time-lapse series of line scans, projections (stereo, maximum, transparency projection) for single images and series (animations), depth coding (false-color view of height information). Brightness and contrast adjustment; off-line interpolation for Z-stacks, selection and modification of color look-up tables (LUTs), drawing functions for documentation
Image analysis	Modern tools for colocalization and histogram analysis with various parameters and options, profile measurement along straight lines and curves of any kind, measurement of lengths, angles, areas, intensities, etc.
Image operations	Addition, subtraction, multiplication, division, ratio, shift, filters (low-pass, median, high pass, etc; user-definable)
Image archiving, export, import	LSM image database with convenient functions for managing the images and the associated acquisition parameters; Multipart function for compiling assembled image and data views; more than 20 file formats (TIF, BMP, JPG, PSD, PCX, GIF, AVI, Quicktime ...) for compatibility with all common image processing programs.
Image Browser	Free software package for visualization, processing, sorting, printing and export/import of LSM 5 images

Software Options for all Systems

Image VisArt plus	Fast 3D and 4D reconstruction and animation (various modes: Shadow projection, transparency projection, surface rendering)
Multiple Time Series	Multiple time series with varied application configurations, autofocus and bleaching functions
Physiology	Comprehensive analysis software for time-lapse series, graphical Mean-of-ROI analyses, on-line and off-line calibration of ion concentrations
FRET plus	Analysis of experiments with the Sensitized Emission or Acceptor Photobleaching methods
FRAP	User guiding for, and analysis of FRAP and FLIP experiments, with calculation of the quantitative parameters
VBA Macro Editor	Recording and editing of routines for the automation of scanning and analysis functions
Visual Macro Editor	Graphical compilation of routines for scanning and analysis functions
3D for LSM	3D visualization and 3D measurement of volume data records

System Overview

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