

Leica Confocal Software – Specification

Congratulations. This CD contains the newest release of Control Software for Confocal Microscopes by Leica Microsystems, Heidelberg. It offers you the state of the art in confocal microscopy. It specifies as follows. (Please note that these specifications are subject to change without prior notice.)

LCS – Data Acquisition	
Leica Confocal Software <u>Data Acquisition</u> <u>General</u>	Features
	Data Transfer Modes: <ul style="list-style-type: none"> - Continuous Data Transfer and Visualization - Frame Burst Data Transfer and Visualization - Complete Burst – Visualization only after the experiment to speed up measurements.
	Experiment Setup: <ul style="list-style-type: none"> - Dye based parameter pre-sets to control instrument settings. - Scan Parameters attached to image data.
	Scan Types: <ul style="list-style-type: none"> - Continuous Scan (Start/Stop) - Single Image Scan - Series Scan - Interactive Time-lapse Module with parameter change (including ROI Scan, Panning, Zoom In, Bleach Points as possible on the corresponding device) - Progress Bar Visualization of Scan Process
	Safety: All shutters are controlled to maximize laser safety.
<i>The following Data Acquisition specifications are device dependent. Please refer to the system that you have purchased.</i>	

LCS – Data Acquisition – Digitalization							
	ICM 1000:	TCS NT / TCS SP* / MP	TCS SP2 / MP2	TCS SL	TCS SP2 RS	MP RS	
Binary Resolution:	12 bit	8 bit	8/12 bit	8/12 bit	8/12 bit	8/12 bit	
Image Formats:	640x512	64 ² , 128 ² , 256 ² , 512 ² , 1024 ²	64 ² , 128 ² , 256 ² , 512 ² , 1024 ² , 2048 ² , 512x32, 512x64 4096 ² [optional]	64 ² , 128 ² , 256 ² , 512 ² , 1024 ² , 2048 ² , 512x32, 512x64	64 ² - 1024 ²	64 ² - 1024 ²	
Input Channels: (Reflection)	1	-	2 NDD [optional]	-	2 NDD [optional]	2 NDD [optional]	
Input Channels: (Fluorescence)	-	Up to 4	2 to 4	2	2 to 4	-	
Input Channels: (Transmission)	-	-	1 Standard or NDD [optional]	1 [optional]	1 – 2	1 – 2	
Microscope Automation:	-	Dependent on microscope	Dependent on microscope	Dependent on microscope	Dependent on microscope	Dependent on microscope	
Microscope Stands:	- DM LM	- DM IRB - DM IRBE - DM R - DM RE - DM RXE - DM RXA - DM LFS E - DM LFS A	- DM IRB - DM IRBE - DM IRE2 - DM R - DM RE - DM RXE - DM RXA - DM RXA2 - DM LFS E - DM LFS A	- DM IRB - DM IRBE - DM IRE2 - DM R - DM RE - DM RXE - DM RXA - DM RXA2 - DM LFS E - DM LFS A	- DM IRB - DM IRBE - DM IRE2 - DM R - DM RE - DM RXE - DM RXA - DM RXA2 - DM LFS E - DM LFS A	- DM IRB - DM IRBE - DM IRE2 - DM R - DM RE - DM RXE - DM RXA - DM RXA2 - DM LFS E - DM LFS A	
Motorized Microscope Stages:	-	- Märzhäuser with external Controller	- Märzhäuser with external Controller	- Märzhäuser with external Controller	- Märzhäuser with external Controller	- Märzhäuser with external Controller	
Scan Geometries:	XYZ XYT XYZT	XT, XYZ, XYT, XYZT, XZ, XZT XZ-λ (only *) XY-λ (only *)	XT, XYZ, XYT, XYZT, XZ, XZT XZ-λ, XY-λ	XT, XYZ, XYT, XYZT, XZ, XZT XZ-λ, XY-λ	XT, XYZ, XYT, XYZT, XZ, XZT XZ-λ, XY-λ)	XT, XYZ, XYT, XYZT, XZ, XZT XZ-λ, XY-λ)	
Scanner Speed:	- 4 kHz	- 220 Hz - 440 Hz - 900 Hz	- 200 Hz - 400 Hz - 800 Hz - 1 kHz	- 200 Hz - 400 Hz - 800 Hz - 1 kHz	- 4000 Hz (4 KHz)	- 4000 Hz (4 KHz)	
Scan Speed: (Continuous Operation)	Not spec.	-	Up to 20 fps depending on acquisition parameters	Up to 20 fps depending on acquisition parameters	Up to 100 fps depending on acquisition parameters		

LCS – Data Acquisition – Input & Output							
	ICM 1000:	TCS NT / TCS SP* / MP	TCS SP2 / MP2	TCS SL	TCS SP2 RS	MP RS	
Input by Panel box	Only z drive	yes	yes	[optional]	yes	Yes	
Computer Monitors	1	1 or 2	1 or 2	1 or 2	1 or 2	1 or 2	
Output Trigger:	-	Line trigger Frame trigger Software controlled trigger	Line trigger Frame trigger Software controlled trigger	Line trigger Frame trigger Software controlled trigger	Line trigger Frame trigger Software controlled trigger	Line trigger Frame trigger Software controlled trigger	

LCS – Data Acquisition – Optical Properties						
	ICM 1000:	TCS NT / TCS SP* / MP	TCS SP2 / MP2	TCS SL	TCS SP2 RS	MP RS
Leica Confocal Software Data Acquisition Optical Properties	Adjustable Pinhole	-	yes	yes	Yes	yes
	Adjustable Pupil Illumination	-	-	yes	-	yes
	Excitation Control: (Voxel/ROI illumination)	-	-	yes	[optional]	yes
	Scan Field Rotation:	90°	-	90°	-	90°
	Spectral Tuning: (Design a Filter)	-	Only TCS SP	yes	Yes	yes
	Zoom:	1x, 2x, 4x, 8x	1x – 32x (continuous) - Pan - Zoom - Zoom In Function	1x – 32x (continuous) - Pan - Zoom - Zoom In Function	1x – 32x (continuous) - Pan - Zoom - Zoom In Function	1x – 32x (continuous) - Pan in "y" - Zoom - No Zoom In Function

LCS – Data Acquisition – Signal Conditioning						
	ICM 1000:	TCS NT / TCS SP* / MP	TCS SP2 / MP2	TCS SL	TCS SP2 RS	MP RS
Leica Confocal Software Data Acquisition Signal Conditioning	Average:	- Frame based	- Frame based	- Frame based - Line based	- Frame based - Line based	- Frame based - Line based
	Accumulation:	- Frame based	- Frame based	- Frame based	- Frame based	- Frame based
	Extended Dynamics Amplifier:	-	yes	-	-	-
	Excitation Multiplexing:	-	- Volume by Volume - Frame by Frame	- Volume by Volume - Frame by Frame - Line by Line	- Volume by Volume - Frame by Frame - Line by Line [optional]	- Volume by Volume - Frame by Frame - Line by Line

LCS – Data Management	
<i>LCS provides strong data management facilities that fulfill all needs coming with the usage of large, multidimensional data sets.</i>	
Leica Confocal Software Data Management	Features
	Annotation:
	Experiment: (LCS's Document Concept)
	Export:
	Image Data:
Memory Management:	

<u>LCS – Image Processing & Visualization</u>	
<i>LCS provides multidimensional image processing and manipulation features</i>	
<u>Leica Confocal Software</u> <u>Image Processing</u>	<p style="text-align: center;"><u>Features</u></p> <p>3D Projections: Several Projections support the generation of extended focus images.</p> <ul style="list-style-type: none"> - Maximum Intensity Projection (MIP) - Average Intensity Projection (AIP) - Transparent Blend Projection (Alpha Blending) - Stereo Red/Green Anaglyph Images <p>Coloring: more than 20 predefined color tables (LUT)</p> <ul style="list-style-type: none"> - allows user defined color tables by ASCII file definition - Visualization of 12 bit images with optimal coloring schemes - RGB Overlay - True Color Overlays <p>Image Arithmetic: Multidimensional Image Calculator</p> <ul style="list-style-type: none"> - Image by Image Operations - Image by Constant Operations - Arithmetic: Addition, Subtraction, Multiplication, Division - Statistical: Minimum, Maximum, Mean - Logical: AND, OR, XOR - Digital Operation and Scaled Operation (e.g. subtract heights or ion concentrations) - calculations can be performed with up to 12 bit accuracy <p>Image Manipulation: SEPARATION: Multidimensional CROP and Down sampling Editor</p> <ul style="list-style-type: none"> - MERGING: Multidimensional Glue Tool - Conversion of digital resolution <p>Image Presentation: Fixed Projections for extended focus</p> <ul style="list-style-type: none"> - Full Screen and Standard Operation - Gallery / Single / Tiled - Image Information: Coordinates, Grids and Scale bar overlaid in Image Data - Interactive Level Slicing for Interactive Coloring, Interactive Contrast Manipulation, Interactive Segmentation - Interactive LUT Wedge with Amplitude Scaling - Single Step and Movie Play Mode - Orthogonal Sectioning - Overlay (True Color and RGB) - Quick Mode Changes by Pre-Set Buttons - Software Display Zoom - Standard: Print, Snap, Send To <p>Image Processing: (Classical)</p> <ul style="list-style-type: none"> - Contrast & Brightness Transformation - Gamma Transformation - Image Leveling (by linear, bi-linear, quadratic, or cubic polynomials) <p>Image Processing: (Surfaces)</p> <p>To analyze surfaces that are folded in 3D several operations are offered:</p> <ul style="list-style-type: none"> - Interpretation of Intensity images as pseudo surfaces - segmentation of surfaces for reflecting not transparent specimen (Maximum, Center of Intensity) - whole image and region based interactive leveling - 3D Surface Visualization (frequently also referred as 2½D) - OpenGL based Surface, Wire frame and ISO-Line Rendering with Interactive Zooming, Panning, Rotation <p>Quantification:</p> <ul style="list-style-type: none"> - Histograms - Profile (Intensity, Height) - Profile through stack (displays intensity changes in a series of images) - Region statistics (Intensity and Ratio) - Region Geometries: Ruler, Rectangle, Ellipse, Polygon - Region Estimation Wizard

<u>LCS – User Interface</u>	
<u>Leica Confocal Software</u> <u>User Interface</u>	<p style="text-align: center;"><u>Features</u></p> <p>Ergonomics: Easy to use</p> <ul style="list-style-type: none"> - Intuitive and Guided Layout - Full configurable layout - Large user interface elements ideal for low light laboratory conditions - Context sensitive presentation of functional options - Thumbnail visualization and iconic visualization of software tools <p>Help: Context sensitive Help system</p> <ul style="list-style-type: none"> - Tool Tips <p>Process Visualization: Online Visualization of system state, includes:</p> <ul style="list-style-type: none"> - Actual Hardware Parameters (Legend) - Scan Geometry and Scan Plane - Spectral acquisition bands [only SP systems] <p>Multi User Environment: Operator and Administrator configurable User Interface</p> <ul style="list-style-type: none"> - Data Sharing and Data Hiding between Users (needs NT administration) - fully integrated into Windows NT multi user concept - Factory Presets

<u>LCS – Automation</u>	
<u>Leica Confocal Software</u> <u>Automation</u>	<p style="text-align: center;"><u>Features</u></p> <p>Macro</p> <ul style="list-style-type: none"> - Fully Macro compatible - Recording & Playback of Macros - Macro administration

<p>Leica Confocal Software</p> <p>LCS-3D</p>	<p><u>LCS – 3D [Optional]</u></p>
	<p><i>LCS – 3D offers you the state of the art in visualizing multidimensional images, which includes volumes and volumetric time series.</i></p> <p style="text-align: center;"><u>Features</u></p> <p>Animations: Computational Engine to render Movies and Projections under arbitrary viewing conditions from volumetric and higher dimensional images</p> <p>Filter: Multidimensional Separable Filters to filter RAW data or refine rendered scenes.</p> <p>Projections: - Maximum Intensity Projection (MIP), - Average Projection (AIP), - Transparent Blend Projection (alpha Blending) - Simulated Fluorescence Projection (SFP) - Simulated Fluorescence Projection (SFP) with artificial Shadowing</p> <p>Stereo: Projections and animations may create red/green stereo anaglyphs</p>

<p>Leica Confocal Software</p> <p>LCS- Macro</p>	<p><u>LCS – Macro [Optional]</u></p>
	<p><i>LCS – Macro offers automation and programming functions to your LCS installation.</i></p> <p style="text-align: center;"><u>Features</u></p> <p>Commands: - Scanner and Microscope Control - Data and Document Management - Image Processing - Visualizations - View Commands - Option Package functions available when license available</p> <p>Development Environment: - Visual Basic™ based macro engine - VBA IDE integrated - Macro Recording - VB code generation - DCOM interface</p>

<p>Leica Confocal Software</p> <p>LCS-Materials</p>	<p><u>LCS – Materials [Optional]</u></p>
	<p><i>LCS – Materials offers surface analysis functions mainly for material inspection and related sciences. It is part of each ICM1000 installation and optional for all other installations.</i></p> <p style="text-align: center;"><u>Features</u></p> <p>Compliances: DIN ISO 4287 Part I</p> <p>Quantifications: - Primary Profiling of surfaces - Waviness and Roughness Profiling after filtering of surfaces. - Volume over height distributions - Mean Step Height differences between ROIs - Automatic and Interactive Leveled Profiles - Multi Height measurements by Multipoint Memory</p> <p>Filter: Multidimensional Separable Binominal Filters to smooth and sharpen acquired intensities or surfaces. - Low Pass filter for Waviness Separation - High Pass filter for Roughness Separation</p> <p>Visualizations: - Images - Surfaces (OpenGL) - ISO surfaces (OpenGL) - Wire frames (OpenGL) - Geogeographic Coloring</p>

<p>Leica Confocal Software</p> <p>LCS-Multicolor</p>	<p><u>LCS – Multicolor [Optional]</u></p>
	<p><i>LCS – Multicolor offers you functionality for inspection of doubled stained structures. The search for colocalisation is guided by the visualization of the joint frequency distribution of channel intensities (multidimensional histograms).</i></p> <p style="text-align: center;"><u>Features</u></p> <p>Data Selection: - Regular Intensity ranges. - Regular frequency ranges. - Arbitrary regions (ROI) in 2D joint frequency space. - Arbitrary regions (ROI) in original images to restrict evaluations to interesting domains.</p> <p>Visualizations: - one dimensional intensity histogram - two dimensional scatter plot - histograms of 3D vector intensity data - three dimensional scatter plot (OpenGL) - Coloring Schemes: Binary, Frequency based, Intensity based, Frequency and Intensity based - Image Coloring by distribution coloring (Cytofluorogram Overlay) - Special 2D and 3D color tables (LUT) - User define able color tables by ASCII file definition.</p> <p>Quantification: - Co-localized number of pixels, areas in image/ROI. - Area Rate between co-localized and not co-localized specimen compartments. - Intensity Rate between co-localized and not co-localized specimen compartments. - ROI based refinement to interesting structures.</p>

<p><u>Leica Confocal Software</u></p> <p><u>LCS-Physiology</u></p>	<p><u>LCS – Physiology [Optional]</u></p>
	<p><i>LCS – Physiology offers you functionality for inspection of physiological states and especially ions inside of living specimen.</i></p> <p style="text-align: center;"><u>Features</u></p> <p>Experiment: - Dye lists with most common choices - On-Line Visualization of changes in Intensity and Ratio during experiments.</p> <p>Miscellaneous: - Correction of background fluorescence - Ratio metric Ion Calibration after Grynkiewicz - Validation of physiological data</p> <p>Physiological Imaging: Visualization of physiological activity with - Validation by means of online cytofluorogram segmentation - Optimal coloring by means of phase visualization. - Estimation wizard to find model parameters from calibration measurements.</p> <p>Quantification: - Provides Ratios and estimations of Ion Concentration - ROI/Image based quantification - Profile based quantification - Volumetric and time course quantification - Quantification of XT images</p>

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