LAUDA Scientific Surface Analyser – Technical Data

LAUDA Scientific Surface Analyser – All specifications at one glance

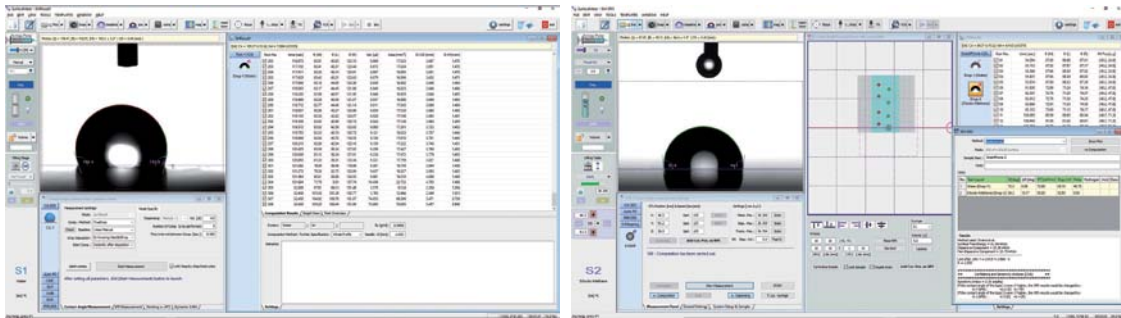| Product	LSA 60	LSA 100	LSA 200
Lens	‖ 6 x zoom lens ‖ Optical distortion: < 0.05 % ‖ Monochrome LED backlit ‖ Image brightness adjustable via software	‖ 8.7 x zoom lens ‖ Field of view: 1.33 x 1.07 mm ... 11.67 x 9.39 mm ‖ Optical distortion: < 0.05 % ‖ Monochrome LED backlit ‖ Image brightness adjustable via software	
Image processing system	‖ USB3 camera LCA-3 ‖ Max. resolution: 1280 x 1024 px, 60 fps	‖ USB3 camera LCA-1 ‖ Max. resolution: 1280 x 1024 px, 225 fps ‖ Support binning, subsampling and AOI ‖ Max. frame rate: 640 x 480 px, 836 fps	‖ USB3 camera LCA-2 ‖ Max. resolution: 1920 x 1200 px, 170 fps ‖ Support binning, subsampling and AOI ‖ Max. frame rate: 640 x 480 px, 1020 fps
Focus	‖ 12 mm fine focus ‖ Focus assistant support	‖ 12 mm fine focus ‖ 100 mm super-precise focus adjustment platform, with built-in dust protection cover ‖ Focus assistant support	
Max. sample dimensions	‖ ∞ × 290 × 76 mm (L×W×H)	‖ ∞ × 290 × 76 mm (L×W×H)	‖ ∞ × 350 × 76 mm (L×W×H)
Sample table dimensions	‖ 100 x 100 mm (L×W)		
Levelness adjustment	‖ Available: 4x feet + 1x: optic module		
Sample stage rotation	‖ Optional available ‖ Automatic Tilting Stage (ATS): 0 - 360°		
Travel distance of sample table in X/Y/Z direction	‖ Y: 100 mm, with built-in dust protection cover ‖ Z: 50 mm	‖ X: 100 mm, with built-in dust protection cover ‖ Y: 100 mm, with built-in dust protection cover ‖ Z: 50 mm	‖ X: 100 mm, with built-in dust protection cover ‖ Y: 100 mm, with built-in dust protection cover ‖ Z: 50 mm ‖ Optional motorized
Measuring range for contact angles	‖ 0 to 180 deg ‖ Resolution: 0.01° ‖ Precision: 0.1 deg		
Measuring range for surface and interfacial tensions	‖ 0.001 ... 2000 mN/m ‖ Resolution: ± 0.001 mN/m or 0.01 % ‖ Precision: 0.1 % ‖ Modes: • Support for analysis of drops with NO Apex • Support of drop quality index	‖ 0.001 ... 2000 mN/m ‖ Resolution: ± 0.001 mN/m or 0.01 % ‖ Precision: 0.1 % ‖ Modes: • Fully automatic-pendant drop (faPDA) measurement support • Fully automatic drop size/volume control • Measurement by keeping drop from dripping • Constant drop volume or drop surface area • Support for analysis of drops with NO Apex • Support of drop quality index	
Max. sample weight	‖ 15 kg (self-locking without clamping)		
Manual dispensing system	‖ Micrometer-driven manual dispensing unit ‖ Resolution 0.001 mm (or 0.017 µl with a 1 ml syringe)		
Motorized dispensing system (option)	‖ Volume resolution 0.4 nl with a 1 ml syringe ‖ Dispensing rate: 1 - 5000 ul/min ‖ Optional support for disposable syringes, disposable dispensing tips and non-contact dispensing		

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Dispensing modes with motorized dispensing systems	‖ (1) Manual dosing ‖ (2) Continuous dosing ‖ (3) (fixed) Volume ‖ Computation or video recording may be triggered at any stage, inclusive time delay support	‖ (1) Manual dosing ‖ (2) Continuous dosing ‖ (3) (fixed) Volume ‖ (4) Volume scope ‖ (5) Volume cycle ‖ (6) Volume oscillation ‖ (7) Constant drop volume: volume lock ‖ (8) Constant drop surface area: surface area lock ‖ (9) Drop lock ‖ (10) Automatic formation of pendant drop for IFT measurement ‖ Computation or video recording may be triggered at any stage of the first 6 dispensing modes, inclusive time delay support	
Dispensing unit positioning	‖ Y/Z-2-axial precise control ‖ Ranges: 76/60 mm (Y/Z)	‖ X/Y/Z-3-axial precise control ‖ Ranges: 85/76/60 mm (X/Y/Z)	
Dimensions (L x W x H)	‖ 600 × 160 × 533 mm	‖ 600 × 160 × 543 mm	‖ 650 × 190 × 543 mm
System weight	‖ ca. 18 kg	‖ ca. 19 kg	‖ ca. 22 kg
Power supply	‖ 100 / 240 V AC; 50 / 60 Hz		
Warranty	‖ Standard: 1 year		

Accessories

Accessories	LSA 60	LSA 100	LSA 200
Accessories	‖ Full set of syringe & needle options are available ‖ Automatic Tilting Stage: 0 - 360° for studying advanced/receding contact angle, sliding/roll-off angle, sliding speed etc. ‖ Lamella/liquid bridge module for determination of IFT and contact angles for filaments and sheet samples ‖ Environmental/temperature chambers for various temperature ranges	‖ Drop volume tensiometer module for surface/interfacial tension measurement based on drop volume determination ‖ CMC module for fully automatic determination of both equilibrium and dynamic critical micelle concentration (CMC) of surfactants based on pendant drop method ‖ Surface/interfacial rheology module based on Oscillating/Expanding Drop (OED) method ‖ Fully automatic process IFT monitoring system ‖ Top-View drop analysis module, for determination of contact angle based on Top-View method, or with both Top-View and Side-View methods simultaneously ‖ Full set of syringe & needle options are available ‖ Automatic Tilting Stage: 0 - 360° for studying advanced/receding contact angle, sliding/roll-off angle, sliding speed etc. ‖ Rotating Force Balance (RFB) for studying retention force up to 40 g ‖ Module for working with powder/porous samples: wettability, adsorption and contact angle measurement of powder/porous samples ‖ Lamella/liquid bridge module for determination of IFT and contact angles for filaments and sheet samples ‖ Environmental/temperature chambers of various temperature ranges	

Camera

Module	LSA 60	LSA 100	LSA 200
Module	‖ LCA-3	‖ LCA-1	‖ LCA-2
Max. resolution	‖ 1280 x 1024 px	‖ 1280 x 1024 px	‖ 1920 x 1200 px
Camera speed	‖ 60 fps at 1280 x 1024 px	‖ 169 fps at 1280 x 1024 px ‖ 212 fps at 1280 x 800 px ‖ 224 fps at 1200 x 800 px ‖ 460 fps at 1200 x 350 px ‖ 714 fps at 1200 x 200 px ‖ 1460 fps at 1280 x 60 px ‖ 557 fps at 640 x 480 px ‖ 975 fps at 640 x 240 px ‖ 2189 fps at 640 x 60 px ‖ 2360 fps at 680 x 50 px ‖ 421 fps at 768 x 576 px ‖ 525 fps at 640 x 512 px	‖ 181 fps at 1920 x 1200 px ‖ 392 fps at 1920 x 544 px ‖ 298 fps at 1280 x 1024 px ‖ 379 fps at 1280 x 800 px ‖ 400 fps at 1200 x 800 px ‖ 868 fps at 1200 x 350 px ‖ 1421 fps at 1200 x 200 px ‖ 3223 fps at 1200 x 60 px ‖ 1018 fps at 640 x 480 px ‖ 1830 fps at 640 x 240 px ‖ 3250 fps at 640 x 60 px ‖ 761 fps at 768 x 576 px ‖ 3232 fps at 784 x 72 px
Sensor area	‖ 6,784 x 5,427 mm	‖ 6,144 x 4,915 mm	‖ 9,216 x 5,760 mm
Dark noise	‖ 24 e/s, LSB_{10}/s	‖ 5 e/s, LSB_{10}/s	‖ 9,3 e/s, LSB_{10}/s
Dynamic range	‖ > 62 dB	‖ > 60 dB	‖ > 60 dB

Software specifications

	LSA 60	LSA 100	LSA 200

Contact angle	‖ Measurement methods supported: sessile drop, captive bubble, pendant drop ‖ Range: 0° < θ < 180° ‖ Resolution: 0.1° ‖ Precision: better than 0.15° (for ideal drops based on Laplace-Young eq.) ‖ Computation methods implemented: • Young-Laplace equation • Conic • iTangent • TrueDrop™ • Circle • Height/width • Manual ‖ All methods (except manual) run automatically, no user interventions are required ‖ Automatic detection of drop deposition & automatic invoking of measurement ‖ Automatic baseline detection: before and after drop deposition, with stabilizing capability ‖ Curved baseline support for all methods, automatic correction of contact angles due to surface curvature ‖ Drop volume determination (before deposition): live tracking ‖ Live image computation: single or batch ‖ Adjustable frequency and duration for batch computation ‖ Video recording support (see below) ‖ Computation on image/video files: fully automatically (but allows user interventions if required) ‖ Measurement of static, dynamic and equilibrium contact angles ‖ Image caching for all calculated live images: they can be reviewed subsequently and recalculated or kept as files if necessary ‖ Accurate determination of extreme low contact angle measurement (down to ca. 1°) ‖ Measurement template for automatic determination of dynamic contact angles (CAH) ‖ Besides contact angle values (left/right/mean) computation results include drop geometrical parameters like volume, surface area, contact diameter and height, drop contact points coordinates, work of adhesion, spreading coefficient, sample tilting angle, etc., depending on computation method applied

| Surface tension / Interfacial tension | ‖ Measurement methods supported: pendant/rising drop/bubble (incl. drop/bubble images with NO Apex), sessile drop (incl. constrained sessile drop)
‖ Range: ca. 0.001 ~ 2000 mN/m
‖ Resolution : ± 0.01 mN/m or 0.01 % (pendant/rising drop method)
‖ Precision: 0.1 %
‖ Incl. (but not limited to) features:
• Fully automatic formation of drops (when an automatic dosing unit is used)
• Fully automatic IFT-measurement (faPDA)
• Drop-/Volume-/-Area locking capability (when an automatic dosing unit is used)
• Dynamic IFT-measurement (from ca. 0.1 s)
• Enhanced Precision modes (EPM)
• Fast computing mode
• Surface/Interface relaxation measurement
• Automatic determination of liquid/fluid/solid-contact baseline and drop analyzing area
• Calculation of drop images with NO Apex eliminating restriction of FOV
• Image caching for all calculated live images: they can be reviewed subsequently and recalculated or kept as files if necessary
• Support pendant drop quality index
‖ Evaluation is based on full-automatic analysis of whole drop profiles in real time. Besides IFT values computation results include drop geometrical parameters like volume, surface area, maximum diameter, height, contact angle, drop quality index etc. |

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Surface Free Energy calculation (Option for LSA 60 and LSA 100 Basic)	‖ SFE models supported: • Zisman Plot (critical wetting tension) • Fowkes • Owens-Wendt-Rabel-Kaelble (OWRK) • Extended Fowkes • Wu harmonic mean / Wu geometric mean • Equation-of-State • Lewis acid/base theory • Schultz-1/-2 ‖ SFE measurement template ‖ Computation can be invoked directly after measurement; no extra input of data is necessary; after computation wetting behavior analysis (WBA™) for the studied surface can be launched straightforwardly. Built-in support for the determination of unknown liquid SFE properties ‖ Incl. reporting
Wetting Behavior Analysis (WBA™) (Option for LSA 60 and LSA 100 Basic)	‖ Based on the chosen SFE-model and measurement/computation results, wetting behavior, or adhesion of various liquids (work of adhesion) on a studied solid surface can be modelled and predicated. Different SFE-models and full contact angle range ($0° < θ < 180°$) are supported. Analysis results may be exported in Excel-format
Video recording and computing	‖ Recording speed: adjustable, max. speed camera- & system-dependent ‖ Recording time: pre-definable or manually controllable; max. time: NO limitation ‖ Recording start: manual or via triggering events ‖ Triggering support: leave/enter (adjustable) triggering zone, triggering events ‖ Time stamp: with a resolution of 0.1 ms ‖ Parameter stamp: dispensing volume, tilting angle etc., device-configuration-dependent ‖ Video editing: supported ‖ Recording directly to file: supported ‖ Video instant playback (fileless): supported ‖ Video computation: play & computation, whole video or multiple sections; fully automatic (but allowing user-intervention if desired) ‖ Video file format: AVI (lossless compression)
Substance database	‖ More than 150 common liquids/solids included with about 200 records; editable and extensible
Data center	‖ Data display and management: • Organized by measurement task • Drop-based results-data collection and management • Drop-based statistical analysis and data filtering based on robust statistics • Plot with two Y-axes (drop-based settings) ‖ Data exportable by clipboard, in Excel/text/bitmap (for plot)-format; single drop-based or whole task-based

Information and Contact

LAUDA Scientific GmbH
Pfarrstraße 41/43
97922 Lauda-Königshofen
Germany

Phone +49 (0)9343 503-340
Fax +49 (0)9343 503-222
E-Mail: info@lauda-scientific.de

Further information: www.lauda-scientific.de