

IACS eXplorer *Specification*

IMAGING

Description	High-performance camera sensor with integrated analysis and feature extraction.
Frame rate	210 fps @ 1280×1024 px; up to 10000 fps @ 400×32 px
Type	Monochrome; 10bit color depth; 1/2" active area
Sensitivity	Wavelength range 300-1000nm; 58% QE @ 550nm peak ; 62% QE @ 630nm; global shutter
Pixel size	4.8µm
Latency	Image capturing to analysis result <200µs; control precision <10 ns
Outputs	6 flash outputs for light control; 2 trigger for sorting / device control (3.3V TTL)
Interfacing	Ethernet; DVI-D; USB-2.0; 9 Pin multi-purpose connector
Fluorescence compatibility	Yes, up to 4 channels (on request), e.g. 405nm, 488nm, 532nm, 561nm, 638nm

ILLUMINATION UNIT

Description	Compact light-engine with super high intensity LED Green: 530 nm, collimated optical output
Colors	Other colors available on request: red, amber, lime, blue
Flash length	0.1µs – 5µs (pulse operation mode, frequency range >10kHz)

FLOW CONTROL

Pressure channels	4
Pressure range	up to 2000 mbar
Pressure stability	< 0.1% CV (measured)
Pressure resolution	0.03% of full scale

HV GENERATOR AND AMPLIFIER

Max. voltage	up to +- 1800 V
Max. current	20 mA
Function shape	Sine (others on request), AC coupled
Frequency range	10 kHz to 100 kHz
Min. pulse length	One full pattern /wavelength
Max. pulse length	Infinite
Other features	Safety interlock Software interlock Gateable with Software Configurable with Software

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SAMPLE STAGE UNIT

Sample holder	Easy-access sample holder stage for Sensific sample holders or chips and open compatibility. Accommodates up to six microfluidic reservoirs (1.5 mL, 2 mL or 15 mL). Other sample holders on request.
Microscope	Fully corrected and automatized Köhler optics, fully automatized microscope (XYZ stage). Wide field microscope with motorized four-position objective turret with three built-in high quality Olympus objectives (5x NA 0.15, 10x NA 0.3, 20x NA 0.4) and one open slot for customization (e.g. 40x).

SOFTWARE

Description	User-friendly and feature-rich graphical user-interface for observation, analysis, and control.
Readout regions	2 freely selectable, simultaneous readout regions, e.g. for two stage processes, immediate quality control or parallelization
Analysis	Real-time analysis of various detection parameters (see Experimental Features).
Plotting engine	Comprehensive plotting features for easy visualization of data in scatter or line plots; direct access to image data, cross channel and intra channel visualization and gating; gate combining; arbitrary polygon gating
Storage format	RAW; AVI uncompressed; MJPEG; MP4; XLS; XLSX; CSV (infinite recording); supports USB-mass storages (ext3/4, exFAT, NTFS)
Triggers	Freely programmable and independent triggers; latency down to 200µs (frame rate dependent)
Gating	Freely configurable gating; graphical marking in scatter plot; arbitrary points polygon selection
Multi-Color Mode	Up to 4 simultaneous imaging settings by time multiplexing (e.g. bright field and three different fluorescent colors)
Smart Imaging Mode	Yes (all images; only particles; one per particle; partial imaged particle removal). The intelligent imaging system captures only frames of specific relevant content and takes a picture of each object as a standard, ensuring efficiency and accuracy to optimize data quality and analysis accuracy.
Smart Droplet Control Mode	Pump closed loop feedback control on image analysis result.
Remote control	HTTP; ZMQ
Other features	Automatic background subtraction Parameter logging

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250 GB storage space for recordings Sensor control via FullHD monitor (DVI/HDMI) and USB mouse/keyboard

CASING

Laser safety	Laser proof casing with interlock for Class 1 laser safety rating and electric shock hazard mitigation.
Size (L*W*H/mm)	690 x 400 x 530 (compatible with most laminar flow systems)

CONNECTORS

Power supply	IEC C14 connector for 120 V, 230 V 50/60 Hz power supply. IEC power cable with type B plug.
Pressure	6 mm pressure quick connect IQS standard connector. Up to 2.5 Bar, clean and inert gases for pressure controller input.
Display	HDMI output (DVI signaling) for Full HD display
Ethernet	Ethernet connector (1GBASE-T)
USB	USB-A 2.0 for external storage and mouse/keyboard interface

EXPERIMENTAL FEATURES

Sorting Method	Active Dielectrophoretic
Sorting Efficiency	Up to 99 % demonstrated
Sorting Selectivity	Up to 99 % demonstrated
Sorting Purity	Up to 99 % demonstrated
Droplet Sizes	Analysis: 10 µm to 1 mm diameter Sorting: 10 µm to 150 µm diameter
Detection Methods	Bright field image Phase contrast image Fluorescence 408 nm image Fluorescence 488 nm image Fluorescence 532 nm image Fluorescence 561 nm image Fluorescence 638 nm image
Detection Parameters	Brightness/intensity; brightness contrast; circumference; area; surface roughness; colocalization; fluorescence colocalization; particle count; area contrast; fill factor; elongation; circularity; size; velocity; position; granularity; removal of small dirt particles; area of no contrast; contrast within particles; particles touching walls; particles touching image boundaries; particle position; particle velocity;

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Integration Options	Adaptable microfluidic chips (no vendor lock) Adaptable lasers Adaptable sample stages Adaptable fluorescence filter sets Inline droplet generation or reinjection Sterilization
Quality Control	In-line, multispectral image per particle pre & post sorting; all droplets recorded
Sample Viability	Further downstream usage of the sample; maximized cell viability
Assay-based Sorting	Yes