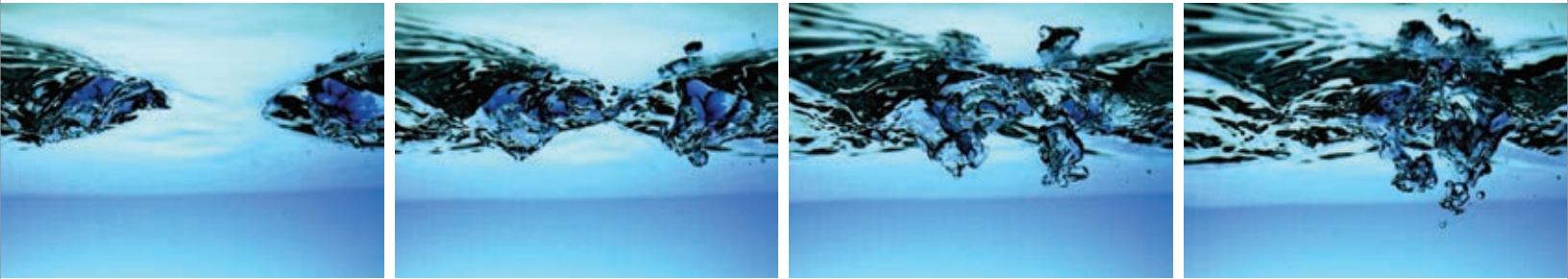# FASTCAM SA-X2
HIGH PERFORMANCE HIGH-SPEED CAMERA SYSTEM

To meet the requirements of the most demanding high-speed imaging applications, a balance of high frame rate, image resolution, dynamic range and light sensitivity is required. The FASTCAM SA-X2 high-speed camera system provides an optimal combination of these critical parameters, with sufficient performance to capture high quality 12-bit megapixel images at up to 13,500 frames per second (fps).

Taking advantage of the very latest CMOS sensor technology, the FASTCAM SA-X2 utilizes large 20 μm square pixels to capture more light than any other high-speed camera. It is rated to ISO 25,000 (against the accredited ISO 12232 Ssat measurement standard) for monochrome 12-bit cameras and ISO 10,000 for 36-bit color (Bayer system, single sensor) cameras. Higher light sensitivity means less additional lighting is required, or higher framing rates or faster shutter speeds can be used with existing lighting conditiors.

The FASTCAM SA-X2 is controlled remotely through Photron's FASTCAM Viewer (PFV) software over a high-speed Gigabit Ethernet network, or locally via an optional handheld keypad. If a PC connection is available, then images can be downloaded via dual industry standard Gig-E ports. Alternatively, two SD card slots allow for the download of recorded image data from the camera without the need for a PC connection.

As with other FASTCAM SA series cameras, the SA-X2 includes both a C-mount and a Nikon G type compatible F-mount, as well as optional support for Canon EF lenses with remote control of aperture and focus, through our PFV software. Wrappers for both LabVIEW™ and MATLAB™ are available with PFV, as is our new automated motion analysis plug-in software — Photron FASTCAM Analysis (PFA).

Target applications include:

- Materials Science
- Combustion Research
- Fluid dynamics (PIV)
- Defense and aerospace research
- Ballistic Imaging
- Shock Waves and Detonations

Benefits

- Frame Rate Performance examples:
    - 12,500 fps at 1024x1024 pixel resolution
    - 13,500 fps at 1024x1000 pixel resolution
    - 40,000 fps at 640x488 pixel resolution
    - 100,000 fps at 384x264 pixel resolution
    - 1,000,000 fps at 128x8 pixel resolution (Model 1000K only)

- Market leading light sensitivity (ISO Ssat 12232 standard) ISO 25,000 monochrome / ISO 10,000 color

- High Speed Dual Gigabit Ethernet interface provides reliable system communication and image download rates

- Two SD card slots allow fast image transfer without a PC connection

- Flexible frame synchronization permits synchronization to devices with non-stable external frequencies

- Four Internal Memory Configurations are available to support all application requirements: 8GB, 16GB, 32GB, 64GB

- Integrated mechanical calibration shutter, Nikon F-mount (compatible with Nikon G type lenses), and optional Canon EF mount

- Optional Range Version provides sealed enclosure for electronics, thereby preventing contamination from dust and other materials

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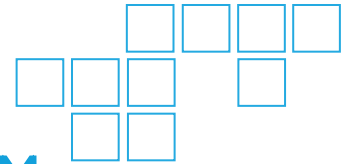
Specifications: Partial Frame Rate / Recording Duration Table

FRAME RATE (fps)*	MAXIMUM RESOLUTION Horizontal	Vertical	RECORD DURATION (12-BIT) TIME (Sec.) 8GB	16GB	32GB	64GB	FRAMES 8GB	16GB	32GB	64GB
Model 480K										
1,000	1,024	1,024	5.45	10.91	21.83	43.68	5,455	10,916	21,839	43,684
2,000	1,024	1,024	2.72	5.45	10.91	21.84	5,455	10,916	21,839	43,684
5,000	1,024	1,024	1.09	2.18	4.36	8.73	5,455	10,916	21,839	43,684
10,000	1,024	1,024	0.54	1.09	2.18	4.36	5,455	10,916	21,839	43,684
12,500	1,024	1,024	0.43	0.87	1.74	3.49	5,455	10,916	21,839	43,684
13,500	1,024	1,000	0.41	0.82	1.65	3.31	5,586	11,178	22,363	44,733
18,000	896	848	0.41	0.83	1.67	3.34	7,529	15,066	30,140	60,287
22,500	768	768	0.43	0.86	1.72	3.45	9,699	19,408	38,827	77,663
40,000	640	488	0.45	0.91	1.83	3.66	18,320	36,656	73,327	146,670
45,000	512	512	0.48	0.97	1.94	3.88	21,827	43,672	87,363	174,744
50,000	640	384	0.46	0.93	1.86	3.72	23,282	46,584	93,187	186,394
75,000	512	296	0.50	1.00	2.01	4.03	37,756	75,543	151,116	302,262
100,000	384	264	0.56	1.12	2.25	4.51	56,445	112,934	225,912	451,868
200,000	256	152	0.73	1.47	2.94	5.88	147,058	294,227	588,564	1,177,238
400,000	256	48	1.16	2.32	4.65	9.31	465,690	931,724	1,863,791	3,727,926
480,000	384	24	1.29	2.58	5.17	10.35	62,091	1,242,299	2,485,056	4,970,569
Model 1000K										
720,000	256	8	3.88	7.76	15.53	31.06	2,794,152	5,590,355	11,182,760	22,367,571
900,000	128	8	6.20	12.42	24.85	49.70	5,588,307	11,180,712	22,365,523	44,735,144
1,000,000	128	8	5.58	11.18	22.36	44.73	5,588,307	11,180,712	22,365,523	44,735,144

*FPS = Frame Per Second

OPTION SUBJECT TO EXPORT LICENSE CONTROL RESTRICTIONS WHERE APPLICABLE
Frequency settings above 900,000 fps require external synchronization
Model 1000K providing frame rates above 480,000 fps subject to export licence control

Sensor	20 μm pixel size, 12-bit ADC (Bayer system color, single sensor)
Shutter	Global electronic shutter from 1ms to 1μs independent of frame rate (293ns shutter available subject to export license control)
Lens Mount	Interchangeable Nikon F-mount (compatible with Nikon G type lenses), C-mount using supplied adapters. Optional Canon EF remote control mount
Extended Dynamic Range	Selectable in twenty steps (0 to 95% in 5% increments) to prevent pixel over-exposure
Memory	8GB (standard: 5,455 frames @ maximum resolution) 16GB (option: 10,916 frames @ maximum resolution) 32GB (option: 21,839 frames @ maximum resolution) 64GB (option: 43,684 frames @ maximum resolution)
Recording bit depth	Selectable 8-bit or 12-bit recording
Video Output	Live and playback video through Two HD-SDI or Dual RS-170 (NTSC/PAL) outputs
Nonvolatile Data Storage	Two SD card slots
Camera Control	Remote computer control via high-speed dual port Gigabit Ethernet or optional local control via handheld keypad with LCD monitor
User Preset Switches	Four user selectable camera function controls mounted on the camera's rear panel
Low Light Mode	Low light mode drops the frame rate and shutter time to their maximum values, while maintaining other set parameters, to enable users to position and focus the camera
Triggering	Selectable positive or negative TTL 5Vp-p or switch closure

Trigger Delay	Programmable delay on selected input and output triggers, 100ns resolution
Timing	Internal clock or external source
Phase Lock	Enables cameras to synchronize precisely to a master camera or external signal source, such as IRIG/GPS time code
Event Markers	Ten user specified event markers indicate specific events within an image sequence in real time. Immediately accessible through software
Trigger Modes	Start, End, Center, Manual, Random, Random Reset, Random Center, Random Manual, Image Trigger
Saved Image Formats	JPEG, AVI, TIFF, BMP, RAW, RAWW, MRAW PNG, MOV and FTIF. Images can be saved with or without image or comment data
Data Display	Frame Rate, Shutter Speed, Trigger Mode, Date or Time, Status (Playback/Record), Real Time, Frame Count, Resolution and IRIG time stamp
Partitioning	Up to 64 memory segments for capturing multiple recordings into camera memory
Data Acquisition	Supports Photron and National Instruments™ DAQ options
Operating Temperature	0 - 40 degrees (32 - 104 degree F)
Mounting	1 x 1/4 - 20 UNC, 1 x 3/8 - 16 UNC, 6 x M5
Dimensions	177.7mm (7.0")H × 160mm (6.3")W × 350mm (13.78")D *excluding protrusions
Weight	9.9 kg (21.3 lbs)
Power Requirements	100V-240V AC 50-60Hz DC operation 18-36 VDC, 210VA

Specifications subject to change without notice

ROCKY MOUNTAIN HIGH SPEED, LLC
TEL: 406-599-5577
EMAIL: INFO@RM-HS.COM
WWW.RM-HS.COM

Photron
SLOW MOTION IMAGING SOLUTIONS
WWW.PHOTRON.COM