PRODUCT DATASHEET

# FASTCAM MINI W5 / W2

FASTCAM series by Photron

Canadian Distributor:
High Speed Imaging Inc.
12-255 Dundas St E, Suite 331
Waterdown ON L8B 0E5
Phone: (905) 649-5445
E-mail: info@hsi.ca Web: www.hsi.ca

FASTCAM MINI W5 / W2

**2.4-megapixel CMOS Image Sensor:**
2048 x 1152 pixels at 5,000fps (MINI W5)
2048 x 1152 pixels at 2,000fps (MINI W2)
1920 x 1080 pixels (FHD) at 5,280fps (MINI W5)
1920 x 1080 pixels (FHD) at 2,750fps (MINI W2)

**Maximum Frame Rate:**
200,000fps (MINI W5)
150,000fps (MINI W2)

**Class Leading Light Sensitivity:**
ISO 10,000 monochrome
ISO 2,000 color

**Global Electronic Shutter:**
2µs independent of frame rate

**Dynamic Range (ADC):**
12-bit monochrome
36-bit color

**Compact and Lightweight:**
120mm (H) x 120mm (W) x 94.4mm (D)
4.72″ (H) x 4.72″ (W) x 3.71″ (D)
Weight: 2.1kg (4.63lbs.)

**Internal Recording Memory:**
16GB, 32GB, 64GB

**Fast 1/10-Gigabit Ethernet Interface:**
Provides camera control and high-speed image download to standard PC

**Fan Stop Function:**
Remotely switch off cooling fans to eliminate vibration when recording at high magnifications

**High-G Rated:**
Suitable for application in high-G environments. Operation tested to 100G, 10ms, 6-axes

## HIGH-RESOLUTION, HIGH-SPEED IMAGING FOR RESEARCH AND INDUSTRY

The Photron FASTCAM Mini W5 and Mini W2 are compact, high-performance high-speed cameras designed to deliver exceptional image quality, light sensitivity, and versatility in demanding research and industrial environments.

With resolutions up to 2,048 × 1,152 pixels, the FASTCAM Mini W5 captures images at 5,000 frames per second (fps), while the FASTCAM Mini W2 achieves 2,000 fps at the same resolution. For ultra-high-speed applications, these models can reach maximum frame rates of 200,000 fps (Mini W5) and 150,000 fps (Mini W2) at reduced resolutions. Full HD (1920 x 1080 pixels) performance is 5,280fps for the Mini W5 and 2,750fps W2 respectively.

Engineered for clarity in low-light conditions, these cameras offer outstanding light sensitivity—ISO 10,000 (monochrome) and ISO 2,000 (color)—ensuring sharp, detailed images even in challenging environments. With 12-bit image recording, users benefit from superior dynamic range and precise image data ideal for accurate analysis and post-processing.

Compact yet powerful, the FASTCAM Mini W series is ideal for a wide range of applications, including: Scientific and academic research, Automotive safety testing and airbag deployment, Aerospace and Defense Research, Materials and Component Testing, Fluid Dynamics, and Bio Mechanics and Sports Technology.

Key features of the FASTCAM MINI W series include an internal mechanical shutter that allows for remote system calibration, a high-performance 10-Gigabit Ethernet interface for seamless camera control and fast image download, memory segmentation that enables recording into one memory partition while downloading from another, and compatibility with various industry-standard lens formats such as Nikon G-Type, C-mount, and Canon EF lenses. Support for the latest generation Canon RF format adds direct lens control of aperture and remote operation of not just focus and aperture but also zoom*.

*Supported lenses - requires optional Canon 'Power Zoom' adapter.

Additionally, the design of the FASTCAM MINI W boasts a "sealed body" construction to safeguard sensitive electronics against dust and corrosive particles. This ensures optimal performance and longevity for the camera.

Intuitive and feature rich Photron FASTCAM Viewer (PFV) software is included with each FASTCAM MINI W camera. Also included is a Photron Device Control SDK that allows integration of the camera with user-specific software, and libraries for controlling the camera within a MATLAB® or LabView environment.

**Light Sensitivity:**

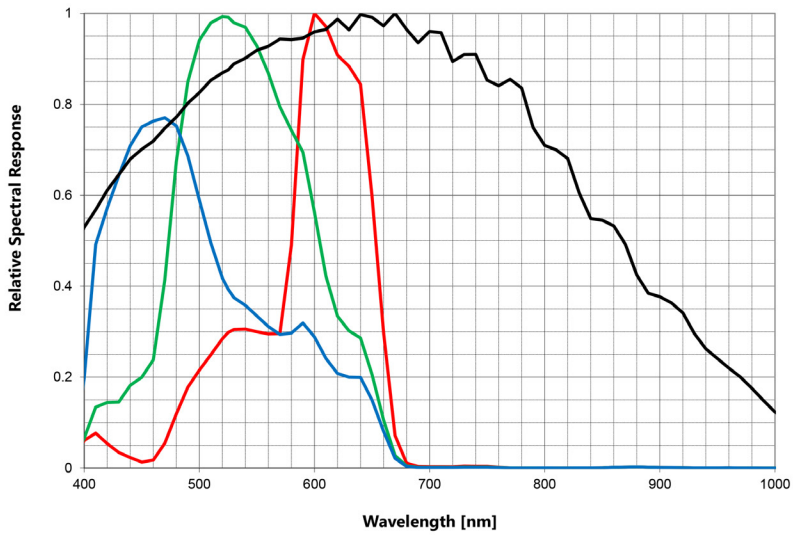
| FASTCAM MINI W SERIES | |
|---|---|
| Monochrome models | ISO 10,000 |
| Color models | ISO 2,000 |

Image Sensor:
The FASTCAM MINI W5 / W2 cameras use an advanced CMOS image sensor optimized for light sensitivity and high image quality that is unique to Photron.

A 13-micron pixel pitch gives a sensor size at full image resolution of 26.62 x 14.98mm (diagonal 30.55mm).

| | |
|---|---|
| Sensor Type | Proprietary Design Advanced CMOS |
| Maximum Resolution (pixels) | 2048 x 1152 pixels |
| Sensor Size / Diagonal | 26.62 x 14.98mm / 30.55mm |
| Pixel Size (microns) | 13µm x 13µm |
| Mircolens Array | Yes |
| Quantum Efficiency | TBD |
| Fill Factor | TBD |
| Color Matrix | Bayer CFA (single sensor) |
| Light Sensitivity | ISO 10,000 monochrome<br>ISO 2,000 color |
| Shutter | Global Electronic Shutter 2.0µs<br>independent of frame rate |

**FASTCAM MINI W5 / W2 Relative Spectral Response Curves - Monochrome and color**



**Camera Performance Specifications**

| Model | FASTCAM MINI W5 | FASTCAM MINI W2 |
|---|---|---|
| Full Frame Performance | 5,000fps<br>2048 x 1152 pixels | 2,000fps<br>2048 x 1152 pixels |
| High Quality (HQ) Mode | 2,000fps<br>2048 x 1152 pixels | NA |
| Maximum Frame Rate | 200,000fps (2048 x 8 pixels) | 150,000fps (2048 x 8 pixels) |
| Minimum Exposure Time | Global electronic shutter to 2.0µs selectable independent of frame rate | |
| Ruggedized Mechanical Calibration Shutter | Standard feature | |
| Dynamic Range (ADC) | 12-bit monochrome / 36-bit color | |
| Memory Capacity Options | 16GB, 32GB, 64GB | |
| Memory Partitions | Up to 64 memory segments | |
| Region of Interest | Selectable in steps of 128 pixels (horizontal) x 128 pixels (vertical) | |
| Trigger Inputs | Selectable +/- TTL 5V and switch input (may be configured NO or NC) | |
| Trigger Delay | Programmable on selected input / output triggers: 100ns resolution | |
| Input / Output | Input: Trigger (TTL/Switch), sync, ready, event, IRIG<br>Output: Trigger, sync, ready, rec, exposure | |
| Trigger Modes | Manual, random reset, random manual, start, center, end | |
| Time Code Input | IRIG-B (selectable at beginning or end of frame exposure) | |
| External Sync | +/- TTL 5Vp-p Variable frequency sync | |
| Camera Control Interface | High-speed 1/10 Gigabit Ethernet | |
| Image Data Display | Frame rate, shutter speed, trigger mode, date/time, status, real time / IRIG time, frame count, resolution | |
| Saved Image Formats | BMP, TIFF, JPEG, PNG, RAWW, MRAW, GRAW, AVI, MOV | |
| Supported OS | Microsoft Windows operating system including: 8.1, 10, 11 (32/64-bit) | |

**High-Speed Gigabit Ethernet Interface:**
The FASTCAM MINI W5 / W2 cameras include a high-speed 1/10-Gigabit Ethernet Interface to provide reliable camera control and fast download of image data.

**Dedicated I/O:**
A dedicated BNC connection for a contact closure hardware trigger input supporting NO, NC opertion is provided. In addition, two programmable inputs and two programmable output channels provide direct connection for common tasks such as synchronization of multiple cameras and operation in conjunction with Data Acquisition (DAQ) hardware.

**Ruggedized Mechanical Calibration Shutter:**
The ruggedized mechanical shutter is fitted as standard on all FASTCAM MINI W5 / W2 cameras, allowing sensor black balance calibration to be carried out remotely from the system control software.

**Optional Canon Lens Mounts:**
In addition to the standard Nikon G type and C-mount lens adapters, all FASTCAM MINI W5 / W2 cameras include support for an optional Canon lens adapter, controlled remotely. The EF lens adapter, through Photron FASTCAM Viewer (PFV), not only enables remote operation of lens focus and aperture but also adds Auto-Focus capability.

Support for the latest generation Canon RF lenses adds direct lens control of aperture and also remote operation of zoom* in addition to focus and aperture, essential for when the camera is to be located where access is limited.

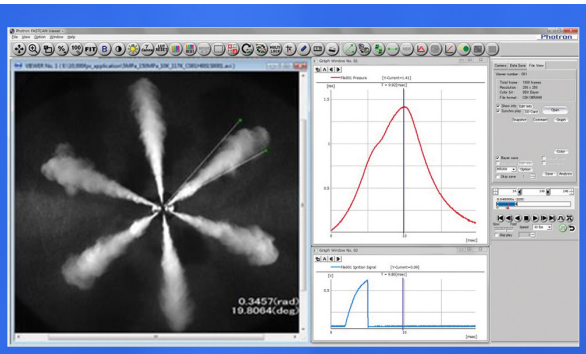
*Supported lenses only, requires optional Canon Power Zoom Adapter

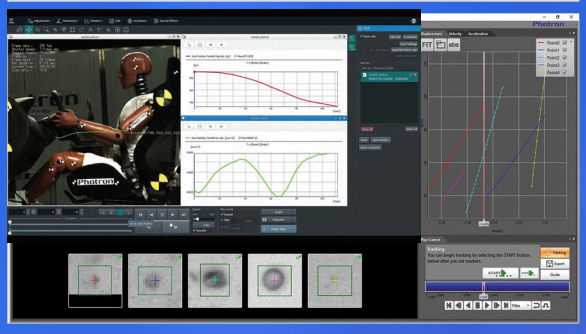
**Camera Operation Features**

| | |
|---|---|
| Frame Synchronization | Accurate frame synchronization with other cameras and with external and unstable frequencies. |
| Memory Partitions | Up to 128 memory segments. |
| Low Light Mode | Operation at minimum frame rate with separately adjustable shutter time to allow easy camera set-up and focus in ambient lighting. |
| IRIG Phase Lock | Enables multiple cameras to be synchronized together with other instrumentation equipment or to a master external time source. |
| Internal Time Delay Generator | Allows programmable delays to be set on input and output triggers; 100ns resolution. |
| Event Markers | Up to ten user-entered event markers to define specific events within the recorded image sequence . |
| Download While Recording | FASTCAM MINI W5 / W2 cameras support Partition Recording Mode, allowing image data captured in one memory partition to be downloaded while at the same time recording into another partition. |
| Automatic Download | The system can be set to automatically download image data to the control PC and, when download is complete to re-arm in readiness for the next trigger with automatically incremented file names. |
| Software Binning | Virtual pixel binning (2x2, 4x4 etc.) allows increased light sensitivity with reduced image resolution without changing camera field of view. |

**Operation Software Features**

| | |
|---|---|
| Image Calibration | 2D image calibration allows the measurement of distance and angle from the image. A calibration grid overlay can be superimposed on the image. |
| Image Overlay | A stored reference image may be overlaid on the live image to allow accurate camera positioning to achieve the same view as a previous test. |
| Import of Multiple Image Sequences | Multiple image sequences can be loaded and simultaneously replayed. Timing of image sequences can be adjusted to create a common time reference. Time based synchronization allows images captured at different frame rates to be synchronized. |
| High Dynamic Range Mode | Making use of the full sensor dynamic range, HDR mode allows enhanced detail in both light and dark areas of an image to be displayed simultaneously. |
| Background Subtraction | In order to highlight subtle changes in an image, Background Subtraction allows a reference image to be subtracted from a recorded sequence. Details including propagation of shock waves and surface changes during impact can be visualized using the feature. |
| Line Profile | A line profile representing grey levels along a line drawn across any region of the image is displayed. In live mode the Line Profile can be used to ensure optimum image focus is achieved. |
| Histogram | A histogram displaying grey levels within a user-defined image area is displayed. In live mode the Histogram can be used to ensure that optimum exposure levels are set for the scene being recorded. |





**Photron FASTCAM Viewer:**
Photron FASTCAM Viewer software (PFV) has been designed to provide an intuitive and feature rich user interface for the control of Photron high-speed cameras, data saving, image replay and simple motion analysis. Operation menus provide access to features for advanced camera operation and image enhancement. Tools are provided to allow image calibration and easy measurement of angles and distances from image data. Also included are a C++ SDK and wrappers for LabView and MATLAB ®.

An optional software plug-in module provides synchronization between Photron high-speed cameras and data acquired through National Instruments data acquisition systems. Synchronized data captured by the DAQ system provides waveform information which can be viewed alongside high-speed camera images.

**Photron FASTCAM Analysis 2 (PFA2):**
Available as an option, the second generation of Photron FASTCAM Analysis (PFA2) autmated 2D tracking, permits the user to obtain quantitative data for displacement, velocity and acceleration from acquired high speed images. Its supports tracking of up to 30 user defined points with a choice of 4 tracking algorithms, static and dynamic coordinate systems, image pre and post processing and powerful graphing tools.

# Frame Rate / Image Resolution

| FASTCAM MINI W5 | | | | | | | |
|---|---|---|---|---|---|---|---|
| Resolution | Maximum Frame Rate | Recording Duration | | | Frame Count | | |
| (h x v pixels) | MINI W5 | 64GB | 32GB | 16GB | 64GB | 32GB | 16GB |
| 2048 x 1152 | 5,000 | 3.879 | 1.937 | 0.966 | 19,394 | 9,685 | 4,830 |
| 1920 x 1080 | 5,280 | 4.179 | 2.087 | 1.041 | 22,065 | 11,018 | 5,495 |
| 2048 x 1024 | 5,500 | 3.967 | 1.981 | 0.988 | 21,818 | 10,895 | 5,434 |
| 2048 x 704 | 8,000 | 3.967 | 1.981 | 0.988 | 31,735 | 15,848 | 7,904 |
| 1280 x 720 | 8,000 | 6.206 | 3.099 | 1.546 | 49,647 | 24,792 | 12,365 |
| 2048 x 576 | 10,000 | 3.879 | 1.937 | 0.966 | 38,788 | 19,370 | 9,661 |
| 640 x 480 | 12,500 | 11.916 | 5.950 | 2.968 | 148,945 | 74,380 | 37,097 |
| 2048 x 256 | 20,000 | 4.364 | 2.179 | 1.087 | 87,273 | 43,582 | 21,737 |
| 2048 x 128 | 40,000 | 4.364 | 2.179 | 1.087 | 174,546 | 87,165 | 43,474 |
| 2048 x 96 | 50,000 | 4.655 | 2.324 | 1.159 | 232,728 | 116,220 | 57,966 |
| 2048 x 64 | 72,000 | 4.849 | 2.421 | 1.208 | 349,093 | 174,330 | 86,949 |
| 2048 x 32 | 112,500 | 6.206 | 3.099 | 1.546 | 698,186 | 348,661 | 173,898 |
| 2048 x 16 | 165,000 | 8.463 | 4.226 | 2.108 | 1,396,373 | 697,322 | 347,797 |
| 2048 x 8 | 200,000 | 13.964 | 6.973 | 3.478 | 2,792,746 | 1,394,645 | 695,594 |

| FASTCAM MINI W2 | | | | | | | |
|---|---|---|---|---|---|---|---|
| Resolution | Maximum Frame Rate | Recording Duration | | | Frame Count | | |
| (h x v pixels) | MINI W2 | 64GB | 32GB | 16GB | 64GB | 32GB | 16GB |
| 2048 x 1152 | 2,000 | 9.697 | 4.843 | 2.415 | 19,394 | 9,685 | 4,830 |
| 2048 x 1024 | 2,000 | 10.909 | 5.448 | 2.717 | 21,818 | 10,895 | 5,434 |
| 1920 x 1080 | 2,750 | 8.024 | 4.007 | 1.998 | 22,065 | 11,018 | 5,495 |
| 2048 x 704 | 4,000 | 7.934 | 3.962 | 1.976 | 31,735 | 15,848 | 7,904 |
| 2048 x 576 | 5,000 | 7.758 | 3.874 | 1.932 | 38,788 | 19,370 | 9,661 |
| 640 x 480 | 6,000 | 24.824 | 12.397 | 6.183 | 148,945 | 74,380 | 37,097 |
| 2048 x 256 | 10,000 | 8.727 | 4.358 | 2.174 | 87,273 | 43,582 | 21,737 |
| 2048 x 128 | 20,000 | 8.727 | 4.358 | 2.174 | 174,546 | 87,165 | 43,474 |
| 2048 x 96 | 25,000 | 9.309 | 4.649 | 2.319 | 232,728 | 116,220 | 57,966 |
| 2048 x 64 | 40,000 | 8.727 | 4.358 | 2.174 | 349,093 | 174,330 | 86,949 |
| 2048 x 32 | 72,000 | 9.697 | 4.843 | 2.415 | 698,186 | 348,661 | 173,898 |
| 2048 x 16 | 120,000 | 11.636 | 5.811 | 2.898 | 1,396,373 | 697,322 | 347,797 |
| 2048 x 8 | 150,000 | 18.618 | 9.298 | 4.637 | 2,792,746 | 1,394,645 | 695,594 |

* Specifications subject to change without notice.

**Variable Region of Interest:**
Region of Interest (ROI) or sub-windowing allows a user-specified portion of the sensor to be defined to capture images. By using a reduced portion of the image area, the frame rate at which images are recorded can be increased. The FASTCAM MINI W5 / W2 cameras allow the ROI to be set in increments of 128 pixels horizontal and 128 pixels vertical.

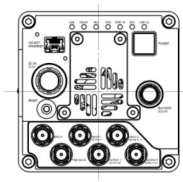
**External Frame Synchronization:**
The FASTCAM MINI W5 / W2 cameras can be fully synchronized with an external source to allow the timing of when each individual image is captured to be precisely referenced. The camera can be accurately synchronized to unstable frequencies allowing complex events such as combustion in rapidly accelerating or decelerating engines to be recorded and studied.

**Record During Download Operation:**
The FASTCAM MINI W5 / W2 cameras' recording memory can be divided into multiple active sections. The user can record an on-going event in one memory partition while at the same time download a previously recorded image sequence in order to improve workflow and optimize camera operation.

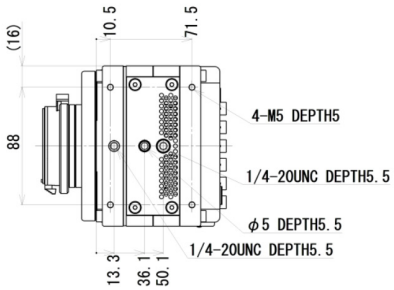
**Mechanical and Environmental Specifications**

| | |
|---|---|
| **Mechanical** | |
| Lens Mount | F-mount (G-type lens compatible)<br>Optional lens mounts include C-mount, Canon EF, Canon RF, and M42 adapter |
| Camera Mountings | 2x 1/4 - 20 UNC & 4x M5 (top, base, and RH side) |
| **External Dimensions** | |
| Camera Body<br>(excluding protrusions) | 120mm (H) x 120mm (W) x 93mm (D)<br>4.72" (H) x 4.72" (W) x 3.66" (D) |
| **Weight** | |
| Camera Body | 2.1kg (4.63lbs) |
| **Environmental** | |
| Operating Temperature | -10 to 40C, 14˚ to 104˚F |
| Storage Temperature | -20 to 60C, -4˚ to 140˚F |
| Humidity | 85% or less (non-condensing) |
| Cooling | Internal fan cooling (fan-off mode supported) |
| Operational Shock | 100G, 11ms, 6-axes 1000 times/axis |
| **Power** | |
| AC Power (with supplied adapter) | 100 to 240V, 50 to 60Hz |
| DC Power (primary input) | 22 to 32V, 70VA |
| DC Power (battery input) | 22 to 32V, 70VA |

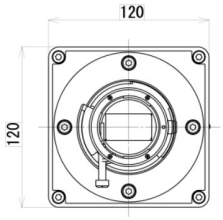
(Rear View)



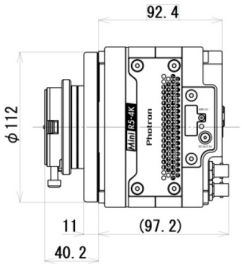
(Top




(Front View)




(Left Side View)




(Right Side View)

(Bottom View)

**Nikon G-Type Compatible Lens Mount:**
FASTCAM MINI W5 / W2 cameras are equipped with an objective lens mount compatible with readily available Nikon G-type lenses. Controls provided within the lens mount allow the adjustment of lens aperture on lenses without external iris control.

**Optional Canon Lens Mounts:**
In addition to the standard Nikon G type and C-mount lens adapters, all FASTCAM MINI W5 / W2 cameras include support for an optional Canon lens adapter. The EF lens adapter, through Photron FASTCAM Viewer (PFV), not only enables remote operation of lens focus and aperture but also adds Auto-Focus capability.

Support for the latest generation Canon RF lenses adds direct lens control of aperture and also remote operation of zoom* in addition to focus and aperture, essential for when the camera is to be located where access is limited.

*Supported lenses only, requires optional Canon Power Zoom Adapter

**Operation Environments:**
The 'sealed body' design of the FASTCAM MINI W5 / W2 cameras ensure optimum air flow and prevents dust and corrosive particles from being ingested within the internal camera body where they can damage sensitive electronics. The fans may be disabled during recording for any vibration sensitive measurements.

The FASTCAM MINI W5 / W2 cameras have been extensively tested to ensure operation for extended periods in ambient temperatures up to 40C.

PHOTRON USA, INC.
9520 Padgett Street, Suite 110
San Diego, CA 92126
USA

Tel: 858.684.3555 or 800.585.2129
Fax: 858.684.3558
Email: image@photron.com
www.photron.com

PHOTRON EUROPE LIMITED
The Barn, Bottom Road
West Wycombe
Bucks. HP14 4BS
United Kingdom

Tel: +44 (0) 1494 481011
Fax: +44 (0) 1494 487011
Email: image@photron.com
www.photron.com

PHOTRON (Shanghai)
Room 20C, Zhao-Feng
World Trade Building
No. 369, JiangSu Road
Chang Ning District
Shanghai, 200050 China
Tel: +86 (21) 5268-3700
Fax: +86 (21) 5268-3702
Email: info@photron.cn.com
www.photron.cn.com

PHOTRON LIMITED
21F, Jinbocho Mitsui Bldg.
1-105 Kanda Jimbocho
Chiyoda-ku, Tokyo 101-0051
Japan

Tel: +81 (3) 3518-6271
Fax: +81 (3) 3 3518-6279
Email: image@photron.co.jp
www.photron.co.jp

REV# 25.11.24