VISION RESEARCH

PHANTOM

when it's too fast to see, and too important not to.®

PRELIMINARY

DATA SHEET

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Phantom® Miro® M-Series Digital High-Speed Cameras

Advanced features in a compact camera at an affordable price

Miro M310 shown with optional Remote Control Unit (RCU)

Key Benefits:

WHEN IT'S TOO FAST TO SEE, AND TOO IMPORTANT NOT TO®

You will wonder how we packed so much capability in such a small package! The Phantom Miro M-Series cameras contain all the **high-performance** features you've come to expect from Vision Research in a **compact, rugged camera.**

The Miro M110 and M310 are based on a 1 Megapixel (Mpx), 1280 x 800, custom-designed CMOS sensor from Vision Research. The M110 has 1.6 Gigapixel/second (Gpx/s) throughput, yielding over **1600 frames-per-second** (fps) at full resolution. The M310 doubles that for 3.2 Gpx/s throughput and over **3200 fps at full resolution.** With a 20 micron (µm) pixel size and 12-bit depth, these cameras feature **high-light sensitivity** and **great dynamic range.** Maximum frame rates at reduced resolution are 400,000 fps for the M110 and 650,000 for the M310.

Key Features:

1 Megapixel and 2 Megapixel custom-designed CMOS sensors

Up to 3.2 Gigapixels/second throughput

High light sensitivity

Compact, rugged design

Rechargeable battery

Phantom CineFlash™ storage system
- 60GB, 120GB and 240GB CineFlash
- CineFlash Dock
- eSATA Connectivity

AMETEK®
MATERIALS ANALYSIS DIVISION

Miro® M-Series

Miro M120 shown with optional BP-U60 battery

Advanced Features:

CineFlash Storage System

Image-Based Auto-Trigger

Burst Mode

Extreme Dynamic Range

Continuous Recording

Auto-Exposure

Measurements

Multi-cine Acquisition

Internal Mechanical Shutter

AutoSet

Miro M-Series Rear View shown with optional BP-U60 battery

The M120 is based on a >2Mpx sensor and 1.6 Gpx/s throughput. That translates to **730 fps at 1920 x 1200**, or **over 1200 fps at 1152 x 1152. The M320S has 3.2 Gpx/s throughput. That's 1380 fps at 1920 x 1200.** These cameras use microlenses on their custom-designed CMOS sensors with 10 µm pixel pitch to achieve high light sensitivity. With 12-bit pixel depth, they also sport high dynamic range for excellent image quality. Maximum frame rate at reduced resolution is 250,000 for the M120 and 325,000 for the M320S.

Depending on model, the minimum digital exposure time is either 1 µs or 2 µs for **sharp, blur-free images** using a global electronic shutter. Vision Research's unique **Extreme Dynamic Range** (EDR) feature is standard on all models. With EDR enabled, each pixel in a frame will receive one of two exposure times – a short exposure for potentially overexposed pixels and a longer exposure for pixels receiving normal light levels. This dramatically increases dynamic range and gets you results even under the most demanding shooting conditions.

For PIV applications, using the Shutter Off mode allows for a **straddle time of 500 ns** on the M110 and M310 and **1.4 µs** on the M120 and M320S.

An integrated internal mechanical shutter for remote and automatic black references is another unique innovation from Vision Research that comes standard on all models. This means **each shot is properly referenced** for maximum image quality. And, there is no need to manually cap the lens or even touch the camera since the black reference can be done remotely or automatically before each shot.

A **Nikon F-mount is standard on the cameras.** Or, you can choose a C-mount, PL-mount or EOS-mount. The EOS mount enables the use of compatible EF and EF-S lenses. Focus and aperture can be adjusted via our Phantom Remote Control Unit (RCU), Phantom Camera Control software (PCC), or using an adjustment ring on the lens mount. Remote control of focus and aperture is a **huge benefit when cameras are remotely located and/or difficult to reach.**

Each camera model comes in three memory configurations: 3 Gigabytes (GB), 6 GB or 12 GB. The high-speed internal **memory can be segmented** into as many as 16 partitions for cine storage. (A *cine* is Vision Research's raw image format that stores all image data in a compact file.)

At the end of any shot, save your cine to the removable Phantom CineFlash storage media at about 4GB/minute. CineFlash allows you to **save a copy of your cine to non-volatile memory** for later retrieval, and **avoid costly downtime** while you download from camera memory to a computer hard disk. When done with an experiment, just remove the CineFlash from the camera, insert it into its docking station connected to a PC, and drag-and-drop cines from the CineFlash onto your computer disk.

	Phantom Miro M110	Phantom Miro M310	Phantom Miro M120	Phantom Miro M320S
Maximum Resolution	1280 x 800	1280 x 800	1920 x 1200	1920 x 1200
Maximum Frame Rate at Maximum Resolution	1600 fps	3200 fps	730 fps	1380 fps
Throughput (Gpx/s)	1.6 Gpx/s	3.2 Gpx/s	1.6 Gpx/s	3.2 Gpx/s
Sensor Size	25.6mm x 16.0mm	25.6mm x 16.0mm	19.2mm x 12.0mm	19.2mm x 12.0mm
Pixel Pitch	20 µm	20 µm	10µm	10µm
Minimum Exposure	2 µs	1 µs	1 µs	1 µs
ISO (12232 SAT Method)	13,000 T Mono 3900 T Color	13,000 T Mono 3900 T Color	8600 T Mono 1100 T Color	8600 T Mono 1100 T Color

	Phantom Miro M110		Phantom Miro M310		Phantom Miro M120		Phantom Miro M320S	
	FPS	**Secs***	**FPS**	**Secs***	**FPS**	**Secs***	**FPS**	**Secs***
1920 x 1200	N/A	-	N/A	-	730	4.7	1,380	2.5
1920 x 1080	N/A	-	N/A	-	800	4.8	1,540	2.5
1152 x 1152	N/A	-	N/A	-	1,220	4.9	2,250	2.6
1024 x 1024	N/A	-	N/A	-	1,530	4.9	2,780	2.7
1280 x 800	1,630	4.7	3,260	2.3	1,600	4.8	2,960	2.6
1280 x 720	1,810	4.7	3,630	2.3	1,780	4.8	3,280	2.6
896 x 720	2,520	4.9	5,040	2.4	2,450	5.0	4,400	2.8
640 x 480	5,090	5.1	10,100	2.5	4,910	5.3	8,490	3.0
512 x 512	5,790	5.2	11,500	2.6	5,540	5.5	9,330	3.2
384 x 288	12,900	5.6	25,900	2.7	12,200	5.9	19,600	3.6
256 x 256	19,800	6.1	39,700	3.0	18,300	6.6	27,600	4.4
128 x 128	60,400	8.0	120,700	4.0	52,400	9.3	69,000	7.0
128 x 64	113,200	8.6	226,300	4.3	95,300	10.2	121,900	8.0
128 x 8	400,000	19.5	650,000	12.0	250,000	31.0	325,000	25.0

* Record time into maximum memory of 12GB.

PRELIMINARY

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Phantom® Miro® M-Series Digital High-Speed Cameras

Using PCC, you can then **view, edit, enhance and analyze** cine files. Easily extract still shots, or convert cines into web- and presentation-compatible formats for sharing with colleagues and documenting experiments. Use PCC's measurement tools to **determine distances, angles and speed.** Advanced tools let you **crop, scale, rotate and enhance** cine files to get to the information and insight you seek in images that have never before been seen.

Control your camera with an extensive suite of tools in PCC via a Gb Ethernet connection, or use the Phantom RCU and its **easy-to-learn and easy-to-use touchscreen interface.**

Advanced control signals are available including a Trigger input and Frame Synchronization signal (FSYNC) on the camera back panel. Trigger, Ready, IRIG In, Video Out, IRIG Out and an Auxiliary signal connection are all available on the standard capture cable. The Auxiliary signal can be assigned to Event, Strobe or Memgate.

Video Out is either **NTSC or PAL on the M110, M310 and M120. An HD-SDI port is available on the M320S.** And, a live image is always available in PCC. You can adjust the video to fill the available monitor space for framing a shot, and then switch to a 1:1 pixel representation (center-cropped) for focusing.

Applications for the Phantom Miro M-Series cameras are as broad as your imagination. Study flow dynamics in PIV applications; improve micro- and nano-designs through small object imaging; diagnose and troubleshoot problems with high-speed machinery; improve product designs by characterizing materials and products under stress; any application that demands high-speed image capture at one- to two-megapixel resolution with high light sensitivity is a candidate for the Miro M-Series cameras.

AMETEK Vision Research's digital high-speed cameras are subject to the export licensing jurisdiction of the Export Administration Regulations. As a result, the export, transfer, or re-export of these cameras to a country embargoed by the United States is strictly prohibited. Likewise, it is prohibited under the Export Administration Regulations to export, transfer, or re-export AMETEK Vision Research's digital high-speed cameras to certain buyers and/or end users.

Customers are also advised that some models of AMETEK Vision Research's digital high-speed cameras may require a license from the U.S. Department of Commerce to be: (1) exported from the United States; (2) transferred to a foreign person in the United States; or (3) re-exported to a third country. Interested parties should contact the U.S. Department of Commerce to determine if an export or a re-export license is required for their specific transaction.

Additional Features:

Gb Ethernet

Rechargeable Battery (Sony BP-U30 or BP-U60)

Dimensions: 7.5 x 3.5 x 4 inches, 19 x 9 x 10 cm
(L, W, H without handle or lens)

Weight: 3.0 lbs, 1.4 kg (without CineFlash, battery or lens)

Operating Temperature and Humidity: 0° C to 40° C @
8% to 80% relative humidity, non-condensing

Tiered Service Contracts to protect your investment

Miro M310 Side View

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