

PHANTOM[®] Miro Family

All specifications subject to change Rev October 2008



VISION RESEARCH

Key Features:

Resolution (Pixels): 640x480, 800x600¹

Maximum full-resolution frame rates of 500fps to 1200fps. (Maximum frame rates at reduced resolutions are as high as 111,000fps)

CMOS active-pixel sensor

Exposure time (shutter speed) as low as 2 microseconds (1/500,000 second)

Built-in LCD touch screen display (on most models)

ISO (ISO-12232 standard): 4800 Mono, 1200 Color

10/100 Ethernet

¹ Very short focal-length lenses may exhibit some vignetting in the extreme corners at maximum resolution.

Compact, lightweight, untethered. The world's first "point and shoot" high-speed cameras.

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

Compact. Lightweight. Rugged. The perfect balance of resolution, speed, and light-sensitivity. A built-in touch screen display. Battery powered. Flexible triggering. PC connectivity. Removable CompactFlash memory. Everything you need in a high-speed digital imaging system. Whether for product drop testing, biometrics research, automotive crash testing, airborne applications, manufacturing line troubleshooting, or scientific experimentation, our new line of cameras has a model just for you.

Every member of the Phantom Miro family is compact, lightweight, and rugged. Each accepts any standard 1" C-mount lens. Each is packed with the technology and innovation you've come to expect from Vision Research.

With a variety of image sizes (640x480, 800x600) and maximum full-resolution frame rates of **500fps to 1200fps**, you will find a model that matches your need. (Maximum frame rates at reduced resolutions are as high as 111,000fps!)

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On most Phantom cameras, as you decrease the resolution in increments defined by the Continuously Adjustable Resolution (CAR) specification, you will see an increase in the maximum frame rate that is available to you. This is true on the Phantom Miro cameras with the exception of the Miro 1. The Miro 1 has a fixed resolution of 640x480 pixels and a maximum frame rate of 500 fps. Here are some example frame rates for the rest of the Miro line.

| Resolution | Miro 2 |
|------------|--------|
| 640 x 480 | 1258 |
| 512 x 480 | 1558 |
| 512 x 384 | 1941 |
| 512 x 256 | 2892 |
| 512 x 128 | 5665 |
| 512 x 64 | 10869 |
| 320 x 240 | 4756 |
| 256 x 480 | 2969 |
| 256 x 256 | 5471 |
| 256 x 192 | 7194 |
| 256 x 128 | 10526 |
| 256 x 64 | 19607 |
| 128 x 128 | 18433 |
| 128 x 64 | 32520 |
| 64 x 64 | 48192 |
| 32 x 32 | 86956 |
| 32 x 16 | 105263 |

| Resolution | Miro 3 & 4 |
|------------|------------|
| 800 x 600 | 1265 |
| 640 x 480 | 1949 |
| 512 x 512 | 2252 |
| 512 x 384 | 2985 |
| 512 x 256 | 4429 |
| 512 x 128 | 8583 |
| 512 x 64 | 16194 |
| 320 x 240 | 7155 |
| 256 x 512 | 4192 |
| 256 x 256 | 8146 |
| 256 x 128 | 15325 |
| 256 x 64 | 27586 |
| 128 x 128 | 25477 |
| 128 x 64 | 43010 |
| 64 x 64 | 58823 |
| 32 x 32 | 95238 |
| 32 x 16 | 111111 |

The Phantom Miro's custom-designed CMOS active-pixel sensors have an ISO rating of 4800 (monochrome) ensuring the **light-sensitivity** required in high-speed imaging applications, come in color or monochrome versions.

With shutter speeds as low as 2 microseconds (1/500,000 second), you can **freeze objects in motion**, eliminate blur, and bring out the detail you need for successful motion analysis.

A built-in LCD touch screen display (on most models) allows you to program the camera easily, frame your shot perfectly, and gives you **immediate feedback** on the results of your test or experiment. You can play and rewind in normal or fast mode or step through your movie one frame at a time. Trimming the movie is as easy as setting in-points and out-points prior to saving.

Connect your Phantom Miro camera to a PC using 10/100 Ethernet for camera programming and control, and to retrieve your test images in our efficient cine format for later analysis and processing using the bundled TEMA Starter for Phantom motion analysis software.

Using the Phantom Software you can also **save movies in popular formats** such as Quicktime or AVI, or you can save frames as JPEG or TIFF images. Easily email movies or frames to colleagues.

Take advantage of our **flexible triggering**. When you power-up the camera, it begins taking images at the programmed settings and stores them in a circular buffer in internal memory. Change a setting, and see the impact of the change on the built-in LCD or external monitor immediately. Set up the camera so that a trigger (from external hardware, an on-camera trigger button or software on a connected PC) starts your recording, stops your recording, or records a selectable number of frames before and after the trigger.

Apply the bundled TEMA Starter for Phantom software from Image Systems AB, and you get a **quantitative analysis** as well as a qualitative view of your test results.

All models can be connected to a standard analog video monitor (PAL or NTSC) for real-time monitoring of the camera image or for playback of images stored in the camera's memory.

Use any 1" C-mount lens, or attach your Phantom Miro camera to a microscope or borescope.

Battery power allows you to take shots completely **untethered** from a power source. Field use for animal studies, for example, is now practical. Carry multiple batteries with you for field replacement.

Store images onto removable non-volatile CompactFlash memory (not removable on the Miro 3).

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Mounting plates on two sides of the camera give you plenty of options whether using a tripod, boom, or custom mount. There are standard 1/4-20 mounting holes.

The **Hi-G model** (Miro 3) ensures the camera will get great pictures, even when subjected to 100Gs of acceleration.

| KEY SPECIFICATIONS | Miro 1.0 | Miro 2.0 | Miro 3.0 | Miro 4.0 |
|---|--|--|--|--|
| Resolution (pixels) | 640 x 480 | 640 x 480 | 800 x 600 ¹ | 800 x 600 ¹ |
| Continuously Adjustable Resolution (CAR) | No | Yes (32 x 8) | Yes (32 x 8) | Yes (32 x 8) |
| Frames-per-second at full resolution | 50, 60, 100, 120, 240, 250, 480, 500 | 10-1200 | 10-1200 (2252 fps at 512 x 512) | 10-1200 (2252 fps at 512 x 512) |
| Maximum Frame Rate | 500 fps | 105,200 fps at 32 x 15 | 111,110 fps at 32 x 16 | 111,110 fps at 32 x 16 |
| Exposure Time (Shutter Speed) | 10%, 25%, 50%, or 100% of maximum (1/frame-rate) | 5 µs to 1/frame-rate | 2 µs to 1/frame-rate | 2 µs to 1/frame-rate |
| Built-in Memory | 512 MB | 1 GB or 2 GB | 1 GB or 2 GB | 1 GB, 2 GB, or 4 GB |
| LCD Touchscreen Interface | Yes, 3-1/2" 640 x 480 | Yes, 3-1/2" 640 x 480 | No | Yes, 3-1/2" 640 x 480 with 800 x 600 zoom |
| ISO (ISO-12232 Standard) | 4800 Mono, 1200 Color | 4800 Mono, 1200 Color | 4800 Mono, 1200 Color | 4800 Mono, 1200 Color |
| Hi-G Rated | No | No | Yes to 100Gs for 13 ms on all axis | No |
| Non-volatile memory | Type 1 CompactFlash | Type 1 CompactFlash | 2 GB Internal flash standard, not removable, 4 GB option | Type 1 CompactFlash |
| Memory Segmentation | No | 1-4 | 1-4 | 1-4 |
| Pixel bit-depth | 8-bits | 8-bits 10-bit option | 8-bits 12-bit option | 8-bits 12-bit option |
| Camera trigger and signals | <ul style="list-style-type: none"> • Trigger • Video out | <ul style="list-style-type: none"> • Trigger • Strobe (Aux) • Video out | <ul style="list-style-type: none"> • Trigger • Aux (IRIG-out or Strobe) • Ready • FSync • IRIG-in • Video | <ul style="list-style-type: none"> • Trigger • Aux (IRIG-out or Strobe) • Ready • FSync • IRIG-in • Video |
| 10/100 Ethernet | Yes | Yes | Yes | Yes |
| Analog Video Out | PAL & NTSC | PAL & NTSC | PAL & NTSC | PAL & NTSC |
| Lensing | 1-inch C-mount | 1-inch C-mount | 1-inch C-mount, C- to F-mount adapter included | 1-inch C-mount, C- to F-mount adapter included |
| Size (without lens) | 11.2 x 8 x 7.9 cm (WxDxH) 4.4 x 3.4 x 3.1 in | 11.2 x 8 x 7.9 cm (WxDxH) 4.4 x 3.4 x 3.1 in | 11 x 6.5 x 8 cm (WxDxH) 4.3 x 2.56 x 3.15 in | 11.2 x 8 x 7.9 cm (WxDxH) 4.4 x 3.4 x 3.1 in |
| Weight | 2.5 lbs / 1.1 kg | 2.5 lbs / 1.1 kg | 2 lbs / 0.9 kg | 2.5 lbs / 1.1 kg |
| Standard Accessories | <ul style="list-style-type: none"> • Rechargeable, removable LI-ion battery • AC power supply with power cord • Trigger cable - 18" • Ethernet cable - 5m • Single-user software license • Software CD • 2 GB CF card • USB CF card reader | <ul style="list-style-type: none"> • Rechargeable, removable LI-ion battery • AC power supply with power cord • Capture cable with 2 BNCs - 18" • Ethernet cable - 5m • Single-user software license • Software CD • 2 GB CF card • USB CF card reader | <ul style="list-style-type: none"> • AC power supply with power cord • Capture cable with 5 BNCs - 18" • Ethernet cable - 5m • Single-user software license • Software CD | <ul style="list-style-type: none"> • Rechargeable, removable LI-ion battery • AC power supply with power cord • Capture cable with 5 BNCs - 18" • Ethernet cable - 5m • Single-user software license • Software CD • 8 GB CF card • USB CF card reader |

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| ADDITIONAL SPECIFICATIONS | Miro 1.0 | Miro 2.0 | Miro 3.0 | Miro 4.0 |
|--|---|---|----------------------------|---|
| External Power | 12 - 30 VDC 12W | 12 - 30 VDC 12W | 15 - 30 VDC 12W | 12 - 30 VDC 12W |
| Operating Temperature | 10°C to 40°C | 10°C to 40°C | 0°C to 50°C | 10°C to 40°C |
| Storage Temperature | -20°C to 35°C with battery -25°C to 80°C without battery | -20°C to 35°C with battery -25°C to 80°C without battery | -20°C to 35°C | -20°C to 35°C with battery -25°C to 80°C without battery |
| Battery | Removable, replaceable LI-ion 7.4V BP-511 | Removable, replaceable LI-ion 7.4V BP-511 | Internal Li-polymer, 11.1V | Removable, replaceable LI-ion 7.4V BP-511 |
| Typical battery use time between charges | 30 minutes ² | 30 minutes ² | 45 minutes ² | 30 minutes ² |
| Recording time at full resolution, 500 fps, maximum built-in memory and 8-bit depth | 3.4 seconds | 13.9 seconds | 8.9 seconds | 17.8 seconds |

MIRO

² Highly dependent upon frame-rate, idle time, installed memory and battery AH rating.



Focused

Since 1950, Vision Research has been shooting, designing, and manufacturing **high-speed cameras**. Our single focus is to invent, build, and support the most advanced cameras possible.

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RESEARCH

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