



# Phantom Miro Family

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 1000fps, you will find a model that matches your need. (Maximum frame rates at reduced resolutions are as high as 95,000fps!)

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, 3-1/2" 640 x 480 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).

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 HYGE model (Miro 3) ensures the camera will get great pictures, even when subjected to 100Gs of acceleration.



# MIRO.

# Key specifications:



	MIRO 1	MIRO 2	MIRO 3	MIRO 4
<b>RESOLUTION (PIXELS)</b>	640x480	640x480	800x600 <sup>1</sup>	800x600 <sup>1</sup>
<b>CONTINUOUSLY ADJUSTABLE RESOLUTION (CAR)</b>	No	Yes (32x8)	Yes (32x8)	Yes (32x8)
<b>FRAMES-PER-SECOND AT FULL RESOLUTION</b>	50, 60, 100, 120, 240, 250, 480, 500	10 - 1000	10 - 1000 (2252 at 512x512)	10 - 1000 (2252 at 512x512)
<b>MAXIMUM FRAME RATE</b>	500 fps	105,200 fps at 32x16	111,110 fps at 32x16	111,110 fps at 32x16
<b>EXPOSURE TIME (SHUTTER SPEED)</b>	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
<b>BUILT-IN MEMORY</b>	512MB	1GB or 2GB	1GB or 2GB	1GB or 2GB
<b>LCD TOUCHSCREEN INTERFACE</b>	Yes, 3-½” 640 x 480	Yes, 3-½” 640 x 480	No	Yes, 3-½” 640 x 480
<b>ISO (ISO-12232 STANDARD)</b>	4800 Mono 1200 Color	4800 Mono 1200 Color	4800 Mono 1200 Color	4800 Mono 1200 Color
<b>HYGE RATED</b>	No	No	Yes to 100Gs for 13 ms on all axis	No
<b>NON-VOLATILE MEMORY</b>	Type 1 CompactFlash	Type 1 CompactFlash	2GB internal flash standard, not removable, 4GB option	Type 1 CompactFlash
<b>MEMORY SEGMENTATION</b>	No	1 to 4	1 to 4	1 to 4
<b>PIXEL BIT-DEPTH</b>	8 bits	8 bits 10 bit option	8 bits 12 bit option	8 bits 12 bit option
<b>CAMERA TRIGGER AND SIGNALS</b>	<ul style="list-style-type: none"> <li>• Trigger</li> <li>• Video out</li> </ul>	<ul style="list-style-type: none"> <li>• Trigger</li> <li>• Strobe (Aux)</li> <li>• Video out</li> </ul>	<ul style="list-style-type: none"> <li>• Trigger</li> <li>• Aux (IRIG-out or Strobe )</li> <li>• Ready</li> <li>• FSync</li> <li>• IRIG-in</li> <li>• Video</li> </ul>	<ul style="list-style-type: none"> <li>• Trigger</li> <li>• Aux (IRIG-out or Strobe )</li> <li>• Ready</li> <li>• FSync</li> <li>• IRIG-in</li> <li>• Video</li> </ul>
<b>10/100 ETHERNET</b>	Yes	Yes	Yes	Yes

<sup>1</sup> Very short focal-length lenses may exhibit some vignetting in the extreme corners at maximum resolution. An F-mount adapter is included to be used in these situations.

	MIRO 1	MIRO 2	MIRO 3	MIRO 4
<b>ANALOG VIDEO OUT</b>	PAL & NTSC	PAL & NTSC	PAL & NTSC	PAL & NTSC
<b>LENSING</b>	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
<b>SIZE</b>	11.2cm x 8. cm x 7.9cm (W x D x H) 4.4in x 3.4in x 3.1in without lens	11.2cm x 8. cm x 7.9cm (W x D x H) 4.4in x 3.4in x 3.1in without lens	11cm x 6.5cm x 8cm (W x D x H) 4.3in x 2.56in x 3.15in without lens	11.2cm x 8. cm x 7.9cm (W x D x H) 4.4in x 3.4in x 3.1in without lens
<b>WEIGHT</b>	2.5 lbs / 1.1 kg	2.5 lbs / 1.1 kg	2 lbs / 0.9 kg	2.5 lbs / 1.1 kg
<b>STANDARD ACCESSORIES</b>	<ul style="list-style-type: none"> <li>• Rechargeable, removable LI-ion battery</li> <li>• AC power supply with power cord</li> <li>• Trigger cable - 18"</li> <li>• Ethernet cable - 5m</li> <li>• Single-user software license</li> <li>• Software CD</li> <li>• 2GB CF card</li> <li>• USB CF card reader</li> </ul>	<ul style="list-style-type: none"> <li>• Rechargeable, removable LI-ion battery</li> <li>• AC power supply with power cord</li> <li>• Capture cable with 2 BNCs - 18"</li> <li>• Ethernet cable - 5m</li> <li>• Single-user software license</li> <li>• Software CD</li> <li>• 2GB CF card</li> <li>• USB CF card reader</li> </ul>	<ul style="list-style-type: none"> <li>• AC power supply with power cord</li> <li>• Capture cable with 5 BNCs - 18"</li> <li>• Ethernet cable - 5m</li> <li>• Single-user software license</li> <li>• Software CD</li> </ul>	<ul style="list-style-type: none"> <li>• Rechargeable, removable LI-ion battery</li> <li>• AC power supply with power cord</li> <li>• Capture cable with 5 BNCs - 18"</li> <li>• Ethernet cable - 5m</li> <li>• Single-user software license</li> <li>• Software CD</li> <li>• 4GB CF card</li> <li>• USB CF card reader</li> </ul>
<b>EXTERNAL POWER</b>	12 - 30 VDC 12W	12 - 30 VDC 12W	15 - 30 VDC 12W	12 - 30 VDC 12W
<b>OPERATING TEMPERATURE</b>	10°C to 40°C	10°C to 40°C	0°C to 50°C	10°C to 40°C
<b>STORAGE TEMPERATURE</b>	-20°C to 35°C w/battery -25°C to 80°C without battery	-20°C to 35°C w/battery -25°C to 80°C without battery	-20°C to 35°C	-20°C to 35°C w/battery -25°C to 80°C without battery
<b>BATTERY</b>	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
<b>TYPICAL BATTERY USE TIME BETWEEN CHARGES</b>	30 minutes <sup>2</sup>	30 minutes <sup>2</sup>	45 minutes <sup>2</sup>	30 minutes <sup>2</sup>
<b>RECORDING TIME AT FULL RESOLUTION, 500 FPS, MAXIMUM BUILT-IN MEMORY AND 8-BIT DEPTH</b>	3.4 seconds	13.9 seconds	8.9 seconds	8.9 seconds

<sup>2</sup> Highly dependent upon frame-rate, idle time and battery AH rating.



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



All specifications are subject to change. (Jan 14, 2008)

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