

## DATA SHEET



### v12.1

High-Definition

1280 x 800

1 million fps

sub- $\mu$ s shutter

Phantom CineMag® compatible

#### Key Benefits:

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

**One million fps** is the new benchmark in high-speed imaging. Introducing the Phantom v12.1 – a megapixel camera capable of taking 1,000,000 pictures-per-second.

With the Phantom v12 camera, Vision Research broke the high-speed digital imaging speed barrier. With the v12.1, the fastest camera now adds remote/automatic black referencing, versatile dual HD-SDI outputs, a component viewfinder port, high-speed synchronization and range data input.

**Take the wide view** with our custom-designed 1280 x 800 CMOS sensor. The wide aspect ratio of the v12.1 allows you to see more of the event you are recording with a “widescreen” view. The v12.1’s widescreen aspect ratio also provides the unique ability to shoot 1280 x 720 HD with a one megapixel camera.

Get 6,242 frames-per-second (fps) at full resolution. At lower resolutions, you will get even higher frame rates, up to 1,000,000 fps (optional).

With an active pixel size of 20 microns and improved quantum efficiency, the Phantom v12.1 camera has **sensitivity** superior to our acclaimed v7.3. So, even if you are using our sub-microsecond shuttering, you’ll get the highest sensitivity with the lowest noise possible.

#### Key Features:

Up to 6242 frames-per-second (fps) at full resolution.  
Maximum fps: 680,000 standard, 1,000,000 optional

1280 x 800 CMOS sensor

Exposure Time (shutter speed): 1  $\mu$ s standard  
Sub-microsecond shuttering: 300 ns, programmable in 18 ns increments (optional)

High-resolution timing system: Better than 20 ns resolution

Extreme Dynamic Range (EDR): Two different exposures within a single frame

Internal Shutter: Hands-free/remote current session reference (CSR)

Memory Segmentation: Up to 63 segments

Non-volatile, hot-swappable Phantom CineMag memory magazines (128 GiB, 256 GiB & 512 GiB)

CineMag to CineStation®

Range Data input

Built-in Memory: 8 GiB, 16 GiB, 32 GiB

ISO (ISO-12232 SAT): 7000 Mono, 2100 Color

Pixel Bit-depth: 8- and 12-bit

Gb Ethernet

View recordings immediately via video-out port

Versatile Dual HD-SDI ports configured to meet your needs

Phantom v12.1  
a megapixel  
camera  
capable  
of taking  
1,000,000  
pictures-  
per-  
second...

That's right. You can eliminate blur and see the most minute detail by using our optional **sub-microsecond shuttering**. Down to 300 nanoseconds, programmable in 18 ns increments.

Each camera supports **8- and 12-bit pixel depth**. Smaller bit-depth gives you more recording time and smaller files. Greater bit-depth gives you more gray levels and finer detail. With the greater latitude of 12-bits, you can pull more detail out of the image.

The v12.1's **high-resolution timing** system yields a timing resolution of better than 20 ns. Frame rate, frame synchronization and exposure accuracy are all improved over previous generations of high-speed cameras. And, a frame synchronization signal is now available via a dedicated BNC for easier cabling and increased signal integrity. This makes the camera perfect for **PIV applications** with a 500 nanosecond straddle time and no image lag.

Of course, the v12.1 offers our unique **Extreme Dynamic Range (EDR)** feature giving you the ability to get two different exposures within a single frame. And, with **auto exposure**, the camera adjusts to changing lighting conditions automatically.

There is an optional **internal shutter** for shading the sensor when doing a session-specific black reference (CSR). Whenever you do a CSR from the Phantom Software, the shutter closes automatically. You no longer have to manually shade the sensor with a lens cap!

The v12.1 comes with 8 GiB of high-speed dynamic RAM standard, but you can order 16 GiB or 32 GiB versions. Our **segmented memory** allows you to divide this into up to 63 segments so you can take multiple shots back-to-back without the need to download data from the camera.

Or, record directly to our **Phantom CineMag** non-volatile, hot-swappable memory magazines. They mount on the CineMag compatible version of the camera. Continuously record full resolution cines into non-volatile memory at up to 800 fps. That's just over 2 minutes into the 128 GiB CineMag, 4.25 minutes into the 256 GiB CineMag, or 8.5 minutes into the 512 GiB CineMag. Or, record at even higher speeds into camera RAM, then manually or automatically move your cine to the CineMag. With CineMag storage you get maximum data protection and an ideal storage medium for secure environments.

Move the CineMag from the camera to a **CineStation** connected to a PC and view, edit, and save your cines using the Phantom Software supplied with the camera.

Keep them in their original cine raw format, or convert them to TIFF, QuickTime, AVI, or a number of other formats. Move the files from the CineStation to a disk or tape deck via Gb Ethernet, dual HD-SDI, or Component Video outputs. (A 10Gb Ethernet interface is available.)

When used on a tracking mount, elevation and azimuth data can be transferred to the camera and associated with image frames through our unique **Range Data** input.

**View your recording immediately** in a variety of formats. Our Versatile **Dual HD-SDI** ports can be configured to meet your monitoring and playback needs. Use them together for 4:4:4 video out; or, use them independently – one for playback while the other is always live. A component video viewfinder port has been added so any viewfinder compatible with our Phantom HD camera can now be used with the v12.1.

The v12.1 is controlled by the feature-rich Phantom Software. If you've used any Phantom camera before, you will know how to run the v12.1. And, we'll ship you a trial version of Image System's TEMA Starter for Phantom for motion analysis applications.

The v12.1 comes in two base models, either with or without a CineMag interface. The base models operate at up to 680,000 fps and 1µs exposure. An option is available to enable 1,000,000 fps and 300 ns exposure. All models come in either color or monochrome configurations.

*\* Assumes optional 1,000,000 fps, 300nsec upgrade is installed.*

	128	256	512	768	1024	1280
8	1,000,000	980,392	763,941	632,511	534,759	463,177
16	852,514	683,994	490,196	381,970	312,891	264,970
32	560,224	423,190	284,171	214,684	172,503	143,472
64	330,469	240,096	155,207	114,220	90,637	74,934
96	236,239	168,067	106,371	77,911	61,402	50,709
128	183,250	128,998	81,024	59,059	46,464	38,296
256	96,749	66,997	41,483	30,042	23,548	19,362
512	49,724	34,140	20,978	15,156	11,854	9,735
768	33,479	22,906	14,042	10,134	7,921	6,501
800	32,161	22,006	13,485	9,730	7,605	6,242

H	V	FPS*
1280	800	6,242
1280	720	6,933
1024	768	7,921
1024	512	11,854
800	600	11,364
720	576	13,485
640	480	18,769
512	512	20,978
512	384	27,865
512	256	41,483
512	128	81,024
512	64	155,207
512	32	284,171
320	240	54,516
256	256	66,997
256	128	128,998
256	64	240,096
256	32	423,190
256	16	683,994
256	8	980,392
128	128	183,250
128	96	236,239
128	64	330,469
128	32	560,224
128	16	852,514
128	8	1,000,000

*\*Typical results; frame rates > 680,000 assume the FAST option is installed.*

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### Additional Features:

Analog Viewfinder Out: PAL, NTSC & HD Component (720p)

Lensing: F-mount, C-mount, PL-mount

Size (without lens): 12.25 x 5.5 x 5.0 in. (L,W,H)  
31.1 x 14 x 12.7 cm

Weight (without lens): 12 lbs (5.4 Kg)

Power: 90 Watts @ 24 VDC, without CineMag

Operating Temperature: 0°C to 40°C @ 8% to 80% RH

Storage Temperature: -10°C to 55°C

Non-operational Shock: 33G, half sine wave, 11ms,  
all axes without lens

Operational Shock: 30G, half sine wave, 11ms, 10 times all  
axes (without CineMag or lens) to  
Mil-Std-810 G

Operational Vibration: 0.25G, 5-500 Hz, all axes

### 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.



An **AMETEK**<sup>®</sup> Company

100 Dey Road  
Wayne, NJ 07470 USA  
+1.973.696.4500  
phantom@visionresearch.com

[www.visionresearch.com](http://www.visionresearch.com)

All specifications are subject to change without notice. Rev Dec 2009

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.