Phantom v2512 and v1612

Key Benefits:

The **Phantom Ultra High-Speed UHS-12 camera line** offers ultra high throughputs, superb sensitivity, and special attention to data management.

◔ **Ultra-high throughputs:** At full megapixel resolution of 1280 x 800, these cameras achieve, in frames per second (fps):

Phantom v2512: Over 25,000 fps   Phantom v1612: Over 16,000 fps
Phantom v2012: Over 20,000 fps   Phantom v1212: Over 12,000 fps

◔ **Superb sensitivity** for better picture quality and more lighting flexibility. Using the ISO 12232 SAT method, all models are measured at:

Monochrome	Color
ISO 100,000T, 32,000*D	10,000T*, 6,400D*
Adjustable E.I. 32,000D-160,000D	Adjustable E.I. 6,400D-32,000D

◔ The **Exposure Index (E.I.)**, with eight selections, brightens the image by increasing the camera's effective ISO - it's like adding light to the subject. E.I. adjusts the image tone curves in software without affecting the native data.
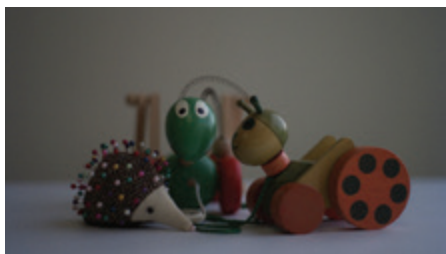
E.I. 8000 applied

E.I. 40,000 applied

Image captured in indoor light at 25,000 fps

DATA SHEET

Phantom® v2512
Phantom® v2012
Phantom® v1612
Phantom® v1212

The world's fastest 1 Mpx high-speed digital camera line also comes with great sensitivity and features.

Key Features:

1 Megapixel sensor (1280 x 800)

25 Gpx/s throughput (v2512)
22 Gpx/s throughput (v2012)
16 Gpx/s throughput (v1612)
12 Gpx/s throughput (v1212)

ISO (ISO 12232 SAT method):
   Mono: 32,000D; 100,000T*
   Color: 6,400D*; 10,000T*

   * Measured according to ISO 12232:2006 method

1μs minimum exposure standard

Camera	Minimum exposure with FAST option
v2512	265 ns
v2012	290 ns
v1612	500 ns
v1212	500 ns

The FAST option is an export controlled feature

Up to 288GB memory

Phantom CineMag® IV 1TB and 2TB compatible

Sturdy, metal body construction

Made in USA

AMETEK®
MATERIALS ANALYSIS DIVISION

⬤ ᴘʜᴀɴᴛᴏᴍ®

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

v2512, v2012 v1612 & v1212

The standard Capture Cable, which attaches to the Capture Port, provides the following signals:

- Ready, which can be combined with other cameras to provide a "system ready" signal
- Strobe
- Auto-Trigger (a hardware trigger signal supplied by Image-Based Auto-Trigger)
- Pre-trigger/Memgate (a falling edge causes the camera to start acquiring pre-trigger frames and wait for a trigger or in Memgate mode, frames acquired while low are discarded and not saved to memory allowing for selective recording)
- Video Out (NTSC or PAL composite video signal)

The optional Break-out-Box (BoB) connected to the Capture Port provides the following signals:

IRIG-In	Strobe
IRIG-Out	Auto-Trigger
Video Out	Pre-trigger/Memgate
Trigger	Ready
Event	

Phantom v1212 with CineMag®

⬤ **Data Storage and Management Focus:**

Memory: The cameras can be equipped with **72GB, 144GB, or 288GB** of memory. A camera with 288GB of memory, recording at 10,000 fps at 1280 x 800 can record a single high-speed cine for up to **almost 20 seconds,** and over 7.6 seconds of recording time for a v2512 capturing images at 25Gpx/s. The memory can be segmented into 63 partitions for multiple, shorter cines.

Non-volatile memory: The cameras can securely save data into a 1TB or 2TB Phantom CineMag IV. Save speed is 1GB/s, and 288GB of data can be saved in under 5 minutes. Data on a CineMag can be downloaded via a CineStation or the camera, using 1Gb or 10Gb Ethernet.

10Gb Ethernet: 1Gb and 10Gb Ethernet are standard on the Ultrahigh-speed cameras. The 10Gb Ethernet transfers data at up to 600 MB/second on optimized systems.

Sensor Specifications:

Phantom ultra high-speed cameras are based on a Vision Research designed **custom CMOS sensor with a global electronic shutter,** available in **color or monochrome.** Sensor specifications include:

Parameter	Specification	Benefit
Sensor Resolution	1 Mpx: 1280 x 800	Widescreen format keeps object in the frame longer
Sensor Size	35.8mm x 22.4mm	Compatible with F-Mount and EOS lenses at full resolution
Pixel Size	28 Micron	High light sensitivity
Bit Depth	12 bits	4,096 gray levels for optimal image quality
Minimum Exposure	1 µs standard, up to 265 ns with FAST option	Helps eliminate motion blur

Camera Control:

Phantom Camera Control (PCC) software: Used for complete setup, control, image processing and download, and includes tracking and motion analysis tools. An SDK that supports Labview and Matlab is also available for integration.

On-Camera Controls: On-camera controls are standard. Connect a video monitor to the camera and use the intuitive user interface to control most common camera settings.

Connectivity:

The Phantom v2512, v2012, v1612 & v1212 are **our most "connected" cameras ever!** On the back panel of the camera you will find: The two HD-SDI ports can act as identical 4:2:2 HD-SDI ports with one port set up to provide an (optional) on-screen display to monitor the on-camera controls and camera operation. Or, they can be configured as a "single" 4:4:4 Dual-Link HD-SDI port.

Phantom v2512, v2012 v1612, and v1212 - Back Panel

BNC Connectors		9	Power Switch
1	**Trigger**	**10**	**Range Data** (input azimuth and elevation data from a tracker)
2	**Time Code In** (IRIG, SMPTE)	**11**	**GPS** (input time, location from an external GPS receiver)
3	**I/O 1: Ready**	**12**	**Remote Control Port**
4	**I/O 2: F-SYNC**	**13**	**1 Gb Ethernet**
5	**I/O 3: Time Code Out** (IRIG, SMPTE)	**14**	**10 Gb Ethernet** (copper interface, RJ45 connector)
6	**I/O 4: Strobe**	**15**	**Primary DC Input** (20-28VDC)
7	**HD-SDI 2**	**16**	**Backup DC Power**
8	**HD-SDI 1**	**17**	**Capture Port**

Advanced Features:

- **Image-Based Auto-Trigger:** Trigger the camera (or a number of connected cameras) from motion detected within the live image. This makes it possible to catch unpredictable events without manually triggering the camera.

- **Internal Mechanical Shutter:** A black reference is obtained by sampling a perfectly black image. No physical access to the camera is needed.

- **Multi-Cine:** Partition internal memory into segments and make shorter recordings back-to-back without missing any action.

- **Continuous Recording:** Automatically saves a recorded cine to a disk drive on a connected PC immediately after it is recorded then re-arms the camera and waiting for the next cine. A recording can be triggered manually, from an event detection system, or by Image-Based Auto-Trigger. The number of recordings is limited only by the amount of available disk storage.

- **SYNC-to-Trigger:** Attaches the F-SYNC pulse to the trigger frame, for accurate frame comparisons among multiple repeated tests.

Environmental Specs:

Power:	100 - 240 VAC, 280 Watt power supply included
Weight (without lens):	17 lbs, 8 oz. (8.1 Kg)
Operating Temperature:	-10 to +50 C
10Gb Ethernet operation:	+5 to +50 C
Storage temperature:	-20 to + 70 C
Humidity:	95% non-condensing
Regulatory:	EMI/EMC/ESD
Emissions Tests	EN 61326-1/FCC part 15
Immunity Tests	EN 61326-1
Random Vibration:	
Operational	7.5 Grms, 3 axes, IAW MIL-STD-202G
Shock:	
Operational	5.5G, 11mSec sawtooth, 3 axes, 60 pulses total.
Non-Operational	30G, 11mSec, sawtooth, 3 axes, 60 pulses total
Safety:	IEC 60950

Phantom® v2512
Phantom® v2012
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Phantom® v1212

- **PIV features:** Particle Image Velocimetry and similar measurement techniques like Particle Tracking Velocimetry (PTV), Laser Induced Florescence (LIF), and Digital Image Correlation (DIC) require extremely accurate timing and the ability to take images in a very stable and predictable way. The straddle time on the v2512 is 375ns, on the v2012 is 400ns, on the v1612 is 425ns, and on the v1212 is 550ns.

- **Burst Mode:** Many experiments require taking images at precisely the same time during the experiment. Burst mode triggers the camera then takes a burst of images at precise time delays.

- **Quiet Fans:** Turns the fans off to eliminate vibration.

v1612 with 2TB CineMag

Vision Research Global Support – for wherever you are

Our ultra high-speed camera line is supported by Vision Research's Global Service and Support network offering AMECare Performance Services from multiple sites around the globe. Maximize the value of your Phantom camera with a full menu of professional support services.

Learn more about our service and support options at www.phantomhighspeed.com/Support

Phantom v2512, v2012, v1612 & v1212

RESOLUTION					
		v2512	v2012	v1612	v1212
H	V	Max FPS	Max FPS	Max FPS	Max FPS
1280	800	25,700	22,600	16,600	12,600
1280	720	28,500	25,100	18,400	14,000
1024	800	30,500	26,900	19,700	15,000
1024	512	47,400	41,800	30,700	23,400
896	800	33,700	29,800	21,800	16,600
768	768	39,100	34,750	25,300	19,300
640	480	70,100	62,500	45,500	34,700
512	512	75,600	67,800	49,100	37,500
512	384	99,800	89,550	65,000	49,600
384	256	171,650	115,100	112,300	85,700
256	256	206,300	188,500	135,400	103,500
256	128	380,100	347,800	253,000	193,900
128	64	663,250	651,150	538,400	415,500
128	32	663,250	651,150	626,850	551,700
128	16	663,250	651,150	626,850	551,700

With the FAST Option (FAST Option is an export controlled feature)

H	V	v2512	v2012	v1612	v1212
128	64	783,100	727,200		
256	32	1,000,000	949,400	724,100	
768	16	1,000,000	965,500	750,000	581,800
384	16	1,000,000	1,000,000	954,500	744,100
128	32	1,000,000	1,000,000	840,000	653,000
128	16	1,000,000	1,000,000	1,000,000	820,500

Focused

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

VISION RESEARCH

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