Key Benefits:

The Phantom ultrahigh-speed digital camera line offers ultra high throughputs with improved sensitivity.

- The Phantom line’s new member, the Phantom v2511, achieves over 25 Gpx/s and more than 25,000 frames-per-second (fps) at its full megapixel resolution of 1280 x 800.
- The Phantom v2011 performs at over 22 Gpx/s and greater than 22,000 fps at full resolution
- The Phantom v1611 offers 16 Gpx/s throughput and 16,000 fps at full resolution
- The Phantom v1211 can capture 12,000 fps at full resolution

The entire line has improved sensitivity, providing better picture quality and more lighting flexibility. Using the ISO 12232 SAT method, these cameras are measured at:

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<th>v2511 - v2011 - v1611 - v1211 ISO</th>
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And, these cameras are built on the proven Phantom v2010/v1610/v1210 Ultrahigh-speed Camera Platform, with the full array of unique features that let you take full advantage of their speed and flexibility. The cameras are supported by Vision Research’s Global service and support network, offering a full menu of professional support services so that you can maximize your Phantom camera experience.
Image Storage:
At ultrahigh-speeds, memory can become a limitation to recording duration. The cameras can be equipped with 24GB, 48GB or 96GB of high-speed memory. A camera with 96GB of memory, recording at 10,000 fps at 1280 x 800 can record a single high-speed shot (called a cine) for up to 6.2 seconds. Or, segment memory into up to 63 segments and record shorter cines into each segment.

Minimize cine save times with the Phantom CineMag feature that is standard on all ultrahigh-speed models. With the ability to save 1GB/s of data to an attached CineMag, a 96GB shot can be saved in about 1.5 minutes. The resulting cine is securely stored in non-volatile memory.

The contents of a CineMag can later be viewed on a PC, trimmed, played to video, and saved either by placing the CineMag back on the camera, or using our offline Phantom CineStation® — a simple CineMag reader that connects to your PC with Gb or 10Gb Ethernet.

Sensor Characteristics:
Phantom UltraHigh-Speed Cameras are based on a Vision Research designed custom CMOS sensor. The 28 micron pixel size means high light sensitivity and Vision Research’s innovative design increases the sensitivity even more. Each pixel has a bit depth of 12 bits yielding 4,096 gray levels with high dynamic range. Each camera comes in monochrome and color versions.

Sensor resolution is 1280 x 800 “widescreen” format. The rectangular shape of the 1 Mpx sensor allows the user to keep moving objects in the frame longer and is compatible in aspect ratio with modern display technology. The physical size of the sensor is 35.8mm x 22.4mm.

These cameras have a global electronic shutter capable of exposures as fast as 1 µs on a standard camera, or, 500 ns with the export controlled FAST option, to truly “freeze motion” and eliminate motion blur in the most demanding of applications.

Connectivity:
The Phantom v2511, v2011, v1611 & v1211 are our most “connected” cameras ever!

On the back panel of the camera you will find:

1. Trigger BNC
   (trigger the camera on either a rising or falling TTL signal)

2. F-SYNC BNC
   (as an output, this provides a frame sync signal to slave cameras, as an input, the camera is slaved to an external frame sync signal)
The two HD-SDI ports can be configured in several ways. The two ports can act as identical 4:2:2 HD-SDI ports where one port can be set up to provide an (optional) on-screen display for monitoring the on-camera controls and camera operation. Or, they can be configured as a “single” 4:4:4 Dual-Link HD-SDI port.

Command & Control:

You can set up and control your Phantom camera using several different tools. A convenient way to use your Phantom ultrahigh-speed camera is with the standard **on-camera controls**. Simply connect a video monitor to the camera and use the intuitive user interface to control most common camera settings.

Our **Phantom Camera Control (PCC)** software is full-featured and easy to use. Set up and control one or many cameras from a single interface with easy access to even the most complex camera features. PCC even has a basic motion analysis and measurements package built-in.

PCC also connects to our Phantom CineStation for offline work with our popular CineMag storage devices. View, trim, and save slow-motion movies based on Phantom cine raw files into a variety of formats.

The **Phantom Remote Control Unit** (RCU) is a small full-featured camera controller that connects to the Remote port on the camera (or connects via Bluetooth to using a Bluetooth adapter on the camera for wireless control). The bright LCD touchscreen gives you access to all popular camera features with the tap of a finger. Connect the RCU to one of the HD-SDI video ports and use it as a monitor, too!

LabView and Matlab development environments are also available.

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**Environmental Specs:**

- **Operating Temperature:** -10 to +50 C
- **Storage temperature:** -20 to + 70 C
- **Humidity:** 95% non-condensing
- **Altitude:**
  - **Operational:** 0 to 10 k feet above sea level
  - **Non-Operational:** -500 to 50 k feet above sea level
- **Magnetic Field Immunity:** 500 amp-meter
- **EMI/RFI Emissions**
  - **Conducted:** EN 55022
  - **Immunity:** EN 55024
- **ESD:** IEC 61000-4-2
- **Random Vibration:**
  - **Operational:** 0.25G, 5 – 500 – 5Hz, 1.0 Octave/min 10 Sweeps (5 Cycles).
  - **Non-Operational:** 1.2G, 5 – 500Hz, 1.0 Octave/min 10 Sweeps
- **Shock:**
  - **Operational:** 5.5G, 11mSec half-sine with 10 shocks in all axis.
  - **Non-Operational:** 33G, 11mSec half-sine with 10 shocks in all axis
- **Natural Frequency:** Operational 5-200 Hz
- **Safety:** IEC 60950

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Advanced Features:

- **Image-Based Auto-Trigger:** trigger the camera (or even a number of connected cameras) from motion detected within the live image. This makes it easier to catch events that are not predictable and may occur infrequently.

- **Internal Mechanical Shutter:** all digital high-speed cameras require an occasional black reference if they are to provide the highest quality images. A black reference is obtained by sampling a perfectly black image. With an internal mechanical shutter, the black frame can be obtained by simply closing the shutter. 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:** Do you need to record many occurrences of an event, especially an event that happens rarely or is unpredictable? Continuous recording is a mode that automatically saves a recorded cine to a disk drive on a connected PC immediately after it is recorded then re-arms the camera and waits for the next cine to be recorded. A recording can be triggered manually, electronically from an event detection system, or even by our Image-Based Auto-Trigger. The number of recordings is limited only by the amount of disk storage you have available.

- **PIV features:** Particle Image Velocimetry and similar measurement techniques like Particle Tracking Velocimetry (PTV), Laser Induced Fluorescence (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 v2511 and v2011 is 500 ns, on the v1611 is 525 ns, and on the v1211 is 725 ns.

- **Burst Mode:** Many experiments require taking images at precisely the same time during the experiment. For example, combustion studies may require images at each 1° turn in a crankshaft. Our unique burst mode allows you to trigger the camera at 0° and then take a burst of images at precise time delays.

- **Quiet Fans:** During recording, turns the fans off to eliminate vibration which might interfere with some applications, especially when image magnification is required.

**Vision Research Global Support - for wherever you are**

Our ultrahigh-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 by learning more about our service and support options at www.visionresearch.com/PhantomZone

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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.