



PHANTOM
VEO 1310
VEO 1010
VEO 610

HIGH-SPEED CAMERAS

1.2 Megapixels, 1280 x 960
Up-to 10,860 fps (1310);
8,420 (1010); 5,610 (610)
L and S body styles

FEATURES & BENEFITS

PHANTOM VEO PRODUCT FAMILY

Designed to perform in a wide array of scientific and industrial applications, Phantom VEO high-speed cameras provide valuable insight into events that are otherwise too fast to be seen.

VEO 1310, 1010 and 610 models incorporate recent advancements in sensor technology to deliver exceptional image quality with **2.5X greater light sensitivity** and the **highest frame rates** available in the VEO platform. Binned mode boosts throughput and sensitivity at 640 x 480 and below.

EXTREME CONFIGURABILITY

VEO cameras are available in color or monochrome, up to 72GB RAM, with a variety of lens mounts and two body styles to allow users to **choose the best configuration** in terms of features and budget:

- **L-model** is for basic, software based imaging in a lab or office environment
- **S-model** provides additional signals, on-camera controls for untethered and remote recording, ruggedized connectors and compatibility with removable CFast 2.0 storage media.

| FRAME RATES & EXPOSURE | | | |
|---------------------------|--|---------------------------------------|--------------|
| Top FPS at Max Resolution | 1310: 10,860 | 1010: 8,420 | 610: 5,610 |
| 1 Megapixel FPS | 1310: 12,900 | 1010: 10,010 | 610: 6,670 |
| Maximum FPS* | 1310: 423,350 | 1010: 328,460 | 610: 218,970 |
| Minimum FPS | 50 | | |
| CAR Increments | 640 x 12 | | |
| Minimum Exposure | 1 μ s Standard | 709 ns with Fast Option**, all models | |
| Electronic Shutter | Global | | |
| PIV Features | Shutter-off mode with a straddle time of 726 ns, Supports Burst Mode | | |
| Exposure Features | Auto-Exposure, Overexposure Indication over video and in PCC | | |

| IMAGING | | |
|--------------------------|---|---|
| Sensor Type | CMOS with Correlated Double Sampling | |
| Maximum Resolution | 1280 x 960 | |
| Bit Depth | 12-bit | |
| Pixel Size | 18 μ m | |
| Sensor Size | 23 x 17.2; 28.7 mm diagonal | |
| ISO Daylight (12232 STD) | Standard: Mono 25,000; Color 6,400 | Binned: Mono 50,000; Color 8,000 |
| ISO Tungsten (12232 STD) | Standard: Mono 80,000; Color 8,000 | Binned: Mono 125,000; Color 10,000 |
| Exposure Index | Standard: Mono 25,000 - 125,000; Color 6,400 - 32,000 | Binned: Mono 50,000 - 250,000; Color 8,000 - 40,000 |
| Dynamic Range | Standard: 60.3 dB | Binned: 59.4 dB |
| Readout Noise | Standard: 10 e- | Binned: 24 e- |

FRAME RATE CHART

Table provides examples of common resolutions and frame rates. The record times shown are for 72GB RAM at the frame rate shown. Duration will be 1/2 the time for 36GB and 1/4 the time for 18GB RAM.

| Maximum Frame Rate - FPS; (72GB Record time - Sec) | | | | | | |
|--|----------------|----------------|----------------|----------------|--------------|--------------|
| Resolution (H x V) | VEO 1310 | | VEO 1010 | | VEO 610 | |
| | Standard | Binned | Standard | Binned | Standard | Binned |
| 1280 x 960 | 10,860 (3.6) | - | 8,420 (4.4) | - | 5,610 (7.1) | - |
| 1280 x 804 | 12,900 (3.6) | - | 10,010 (4.4) | - | 6,670 (7.1) | - |
| 1280 x 720 | 14,350 (3.6) | - | 11,140 (4.4) | - | 7,420 (7.1) | - |
| 1280 x 240 | 40,300 (3.9) | - | 31,270 (4.8) | - | 20,840 (7.6) | - |
| 960 x 960 | 13,330 (3.9) | - | 10,340 (4.8) | - | 6,890 (7.6) | - |
| 640 x 480 | 30,030 (5.1) | 40,300 (3.9) | 23,300 (6.4) | 31,270 (4.8) | 15,530 (10) | 20,840 (7.5) |
| 640 x 240 | 57,360 (5.3) | 73,510 (4.2) | 44,510 (6.8) | 57,030 (5.2) | 29,670 (10) | 38,020 (8) |
| 640 x 120 | 105,260 (5.7) | 125,000 (4.9) | 81,660 (7.2) | 96,980 (6.4) | 54,440 (11) | 64,650 (9.4) |
| 640 x 96 | 126,360 (5.9) | 145,360 (5.2) | 98,030 (7.6) | 112,780 (6.8) | 65,350 (11) | 75,180 (10) |
| 640 x 72 | 158,030 (6.3) | 173,650 (5.8) | 122,610 (8.0) | 134,730 (7.2) | 81,740 (11) | 89,820 (10) |
| 640 x 48 | 210,900 (6.9) | 215,610 (6.9) | 163,630 (8.8) | 167,280 (8.8) | 109,090 (12) | 111,520 (10) |
| 320 x 240 | 57,360 (10.3) | 105,260 (5.7) | 44,510 (13.2) | 81,660 (7.2) | 29,670 (20) | 54,440 (10) |
| 320 x 72 | 158,030 (11.9) | 253,270 (7.6) | 122,610 (15.2) | 196,500 (9.6) | 81,740 (23) | 131,000 (14) |
| 320 x 24 | 316,930 (15.3) | 423,350 (11.9) | 245,900 (19.6) | 328,460 (15.2) | 163,930 (29) | 218,970 (22) |

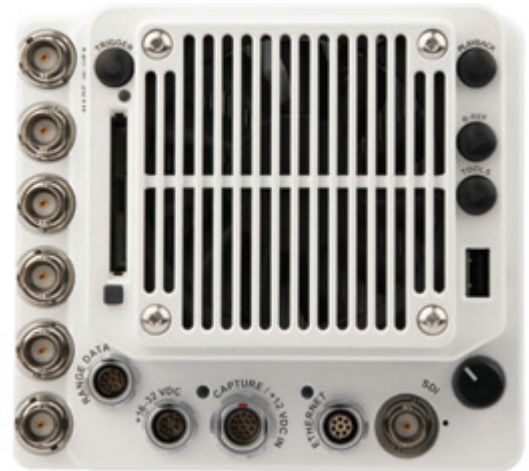
* Higher frame rates are available with shutter-off mode and FAST option at 640x12 and 320x24 resolution: 604,000 fps (1310); 468,000 fps (1010); 312,000 fps (610)

**Certain Phantom cameras are held to export licensing standards. Details available at: www.phantomhighspeed.com/export



CONNECTIVITY & SIGNALS

| | | | |
|--------------------|--|------------------------------|-----------------------|
| Ethernet | Gigabit Standard, 10Gb Optional | | |
| Timecode | IRIG-B Modulated and Un-modulated | | |
| Port Descriptions | | S-model | L-model |
| | Ethernet | Fischer 8-pin | RJ45 |
| | Power | Fischer 6-pin | Fischer 6-pin |
| | Range Data | Fischer 8-pin | N/A |
| | USB | Yes for WiFi dongle | N/A |
| | Video output | 3G-SDI (2 ports), HDMI | 3G-SDI (1 port), HDMI |
| | Dedicated BNC | Trigger, Timecode-in, 3G-SDI | Trigger, Timecode-in |
| | Programmable I/O BNC | 4 ports | 2 ports |
| I/O Signals | Programmable I/O for Fsync, Strobe, Ready, Timecode-out, Event, Memgate, Pretrigger. Assign and define signals in PCC | | |
| Hardware Trigger | Dedicated BNC | | |
| Software Trigger | Trigger button (S-model); via Ethernet; via Image-based auto trigger (IBAT) | | |
| Synchronization | External Sync via FSync or IRIG Timecode | | |
| Recording Features | Burst mode; Image-based auto trigger, Continuous recording & AutoSave to CFAST (S-model) | | |
| Video Output | 3G-SDI via BNC (rear-S-model only), Din and Micro HDMI type D port (front). <i>Cameras prior to 2021 had HDMI type A port.</i> | | |
| Accessory Power | 4-pin Hirose (front) for 12V monitors up to 1 Amp | | |



VEO S-model (Top),
L-model (Bottom)

CONTROL

| | |
|-----------------------------|--|
| Software & OS | Phantom PCC (Windows); SDK also available with MatLab and LabView drivers |
| On-camera Controls | S-models only. Access menu system with encoder, viewed on video monitor. Buttons for trigger, play and save – Color indicates current camera state |
| Primary File Format | Phantom Cine RAW (.cine) |
| Alternative File Formats | Easily convert to formats including .mp4, Apple ProRes .mov, .avi, Tiff, JPG, DNG and many more using PCC. Cine files are directly compatible with many major video editing and motion analysis programs |
| Software Feature Highlights | Continuous Recording for automated workflows, Integrated Data Acquisition (NI-DAQ), support for DIC Calibration with Sync-Snapshot menu, advanced Image Tools including Crop & Resample, Tone Curves, Filters and more |

MEMORY & STORAGE

| | |
|--------------------|--|
| RAM Buffer | 18GB, 36GB, 72GB RAM options |
| Multi-Cine | Up-to 64 Partitions |
| Non-Volatile Media | VEO S-model supports CFAST 2.0 (NTFS format) 80 MB/s Cine Raw file transfer rate from RAM |

MECHANICAL

| | |
|------------------|---|
| Housing Variants | L-model and S-model variants |
| Size | L-model: 5 x 5 x 5" (12.7 x 12.7 x 12.7 cm); S-model: 5 x 5.5 x 5" (12.7 x 14 x 12.7 cm) |
| Weight | L-model: 5.0 lbs (2.3 kg); S-model: 5.6 lbs (2.5 kg) |
| Lens Mounts | Choose lens mount at time of purchase: F-mount (with aperture support for Nikon G-style lenses), Canon EF mount (with electronic focus and iris control), PL, C-mount |
| Mounting Points | Standard 1/4 x 20" mounting points on bottom. Top, bottom and side are compatible with Cameo cheese plate for added mounting points, riser, and custom handle |
| Internal Shutter | Standard, for remote black references |
| Cooling | Active cooling. Quiet mode disables fans during capture |

GLOBAL SUPPORT NETWORK

The Phantom VEO product line is supported by Vision Research's Global Service and Support network, offering PhantomCare Performance Services from multiple sites around the globe. Maximize the value of your Phantom camera with a selection of professional services from which to choose.

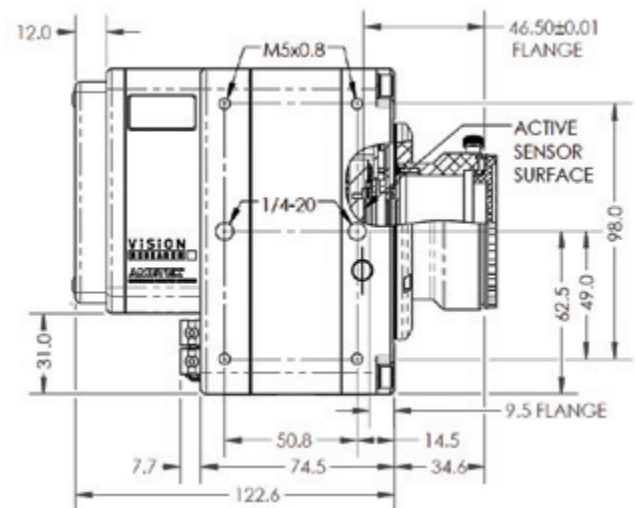
Learn more about our service offering at www.phantomhighspeed.com/Service-Support

POWER

| | |
|-------------------|---|
| AC Power | 100-240 VAC, 80W power supply included |
| Voltage Range | 16-32VDC Primary; Secondary Power down to 12VDC via 12-pin capture port (S-models only) |
| Power Consumption | 65W typical |
| Battery Options | S-model includes 12V input for compatibility with common 14.4V batteries. V-Lock and Gold-mount VEO side-mounts are available for VEO-S cameras |

ENVIRONMENTAL

| | |
|-----------------------|--|
| Operating Temperature | -10 to +50°C |
| Storage Temperature | -20 to +70°C |
| Operational Shock | MIL-STD-202G Method 213-B. Rated 30G with shutter; 100G without; sawtooth wave, 11ms, +/- 10 pulses all axes |
| Operational Vibration | MIL-STD-202G Method 214-A. Rated 12Grms; Figure 2A-1, Test Condition D, 15 min per axis |
| Relative Humidity | ≤85% non condensing |
| Regulatory | CE Emissions – CE Compliant EN 61326-1 CE Immunity – CE Compliant EN 61326-1 FCC – CFR 47, Part 15, Subpart B & ICES-0003, Class A |



ABOUT VISION RESEARCH

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

AMETEK[®]
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