PHANTOM
VEO-SERIES

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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 response** 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.

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IMAGE & SENSITIVITY

Sensor Type	CMOS with Correlated Double Sampling and Global Shutter	
Maximum Resolution	1280 X 960	Binned
CAR Increments	640 x 12	Binned 320 x 24
Pixel Size	18 µm	Binned 36 µm
Sensor Size	23 x 17.2 mm	
Bit Depth	12 bit	

	EMVA 1288 Measurements (at 532 nm)	
	Standard Mode	**Binned Mode**
Quantum Efficiency %	71.6% mono 53.3% color	63.80%
Max. SNR (dB)	40.7	43.7
Absolute Sensitivity Threshold (p)	19.8 mono 24.2 color	46.7
Saturation Capacity (e-)	11,700 mono 21,024 color	23,183
Temporal Dark Noise (e-)	13.65	29.27
Dynamic Range (dB)	58.3	57.8

- *Reported measurements were taken at 532 nm with both monochrome and color cameras*
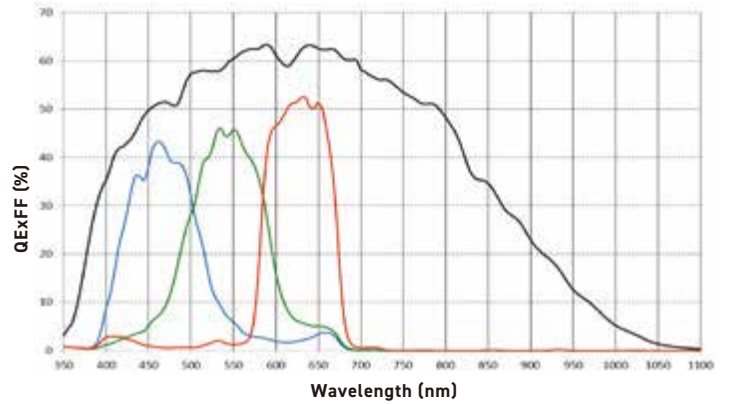- *Visit: www.phantomhighspeed.com/emva for more information on EMVA 1288*

VEO S-model

L-model

SPECTRAL RESPONSE

Quantum Efficiency Monochrome and Color

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, Time-code-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). *Cameras prior to 2021 had HDMI type A port.*		
Accessory Power	4-pin Hirose (front) for 12V monitors up to 1 Amp		

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

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		
Minimum Exposure	1 µs Standard	709 ns with Fast Option**, all models	
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		

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)						
	VEO 1310		**VEO 1010**		**VEO 610**	
Resolution (H x V)	**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

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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

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 and universal M42 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

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
Relative Humidity	≤85% non condensing
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
Regulatory	**Emissions** – CE Compliant EN 61326-1 **Immunity** – CE Compliant EN 61326-1 **FCC** – CFR 47, Part 15, Subpart B & ICES-0003, Class A **KC Emissions** - KC Compliant KN32 **KC Immunity** - KC Compliant KN35 **Safety** - IEC 60950-1

GLOBAL SUPPORT NETWORK

The Phantom VEO product line is supported by Vision Research's Global Service and Support network, offering PhantomCare service from multiple sites around the globe. Maximize the value of your Phantom camera with professional support services designed to meet your needs.

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

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