

DATA SHEET

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Phantom v1840 / v2640

Phantom® v1840 / v2640

Unprecedented image quality
from the world's fastest
4Mpx family

Key Benefits:

The **Phantom v1840 and v2640**, the Phantom Ultrahigh-Speed family's newest additions, offer **4Mpx resolution and exceptional image quality with very high throughput.**

- ▶ **Exceptional Image Quality:** Industry leading low noise and high dynamic range, coupled with outstanding sensitivity, provide the best imaging results.
 - **Low Noise:** Noise of 7.2 e⁻, the lowest noise floor of any Phantom camera, for the cleanest image, especially in the hard-to-capture dark regions.
 - **High Dynamic Range:** 64 dB, the highest of Phantom Global Shutter cameras, for the most detail.
 - **High Sensitivity:** Color ISO - 3,200D, Mono ISO - 16,000D, and **Binned** Color ISO - 5,000D, Mono ISO - 25,000D for outstanding light sensitivity.
- ▶ **High Speed:** At full 4Mpx resolution, the v2640 reaches 26 Gpx/sec and the v1840 achieves 18Gpx/sec.

Key Features:

- 4 Mpx sensor (2048 x 1952)
- v2640 - 26Gpx/sec throughput
- v1840 - 18Gpx/sec throughput
- Dynamic Range: 64 dB
- Noise level: 7.2 e⁻
- 1µs minimum exposure standard, 499ns/142ns
minimum exposure with export controlled FAST option
- 5 Available modes:
 - Standard, with CDS
 - HS, for 34% throughput increase
 - Bright Field, for reduced noise in bright backgrounds
 - Binning in Standard and HS for increased throughput and sensitivity
- Up to 288GB memory, and 10Gb Ethernet standard
- Phantom CineMag® IV (1TB & 2TB) and CineMag V (2TB & 8TB) compatible for the most high-speed storage
- Sturdy, metal body construction
- Made in USA

Resolution	Max Frames per second (fps)		Max Record Time (288GB RAM)		Download Time using 10Gb Ethernet (on an optimized system)
	v2640	v1840	v2640	v1840	
2048 x 1944 (Max)	6,600	4,510	7.8 sec	10.6 sec	9 minutes
1920 x 1080	12,510	8,570	7.9 sec	10.8 sec	9 minutes
1280 x 720	19,690	13,540	11.3 sec	15.4 sec	9 minutes

v1840 / v2640

Binning

Binning groups 2x2 pixels in a square to create one large pixel. This effectively converts the 4Mpx sensor with a maximum resolution of 2048 x 1952 pixels to a 1Mpx sensor with a 1024 x 976 maximum resolution consisting of very large 27 µm pixels. Binning is available on monochrome and color cameras, and provides a monochrome image.

Benefits of Binning:

Significantly increased light sensitivity:

In Binned modes, the v1840 and v2640 have ISO ratings equivalent to the Phantom UHS-12 Series, the industry leaders in high-speed light sensitivity.

Increased Frame Rates:

At full resolution, the v2640 achieves 25,030 fps in HS Binned mode, equivalent to a Phantom v2512. The v1840 reaches 19,530 fps, close to a Phantom v2012.

Expanded Flexibility:

Converting between 4Mpx and 1Mpx capabilities greatly expands the cameras' usefulness. Switch to the 4Mpx when the application requires significant detail, then switch to a 1Mpx when increased frame rate is needed.



V2640, with a 2TB CineMag

Ultimate Flexibility: The v1840 and v2640 have five operating modes to meet all your research needs.

- **Standard mode**, for exceptional image quality
- **High Speed (HS) mode**, increasing throughput by 34% at full resolution
- **Bright Field (BF) mode**, ideal for clean images in bright to very bright backgrounds, Bright Field mode is specially engineered with a much larger full well, increasing the maximum Signal-to-Noise Ratio (SNR).
- **Binned modes** significantly increasing sensitivity and frame rates.
- The export controlled **FAST option**, reduces minimum exposure to 142ns, significantly reducing motion blur.

Built on UHS Platform: The v1840 and v2640 have all of the standard features of the proven Phantom Ultrahigh-Speed family for ease and continuity of use.

	Standard (CDS)	Standard Binned	HS (High Speed)	HS Bright Field	HS Binned
Image Quality					
Read out noise [e-] (typical)	7.2	11.9	18.8	58	29.7
Dynamic range [dB] (typical)	64	66.2	56.7	59.8	58.5
Mono: ISO (D)	16,000	25,000	12,500	2,500	25,000
Adjustable E.I. (D)	16,000 - 80,000	25,000-125,000	12,500-62,500D	2,500-12,500D	25,000-125,000D
Color: ISO (D)	3,200	5,000	3,200	500	5,000
Adjustable E.I. (D)	3,200-16,000	5,000-25,000	3,200-16,000	500-2,500	5,000-25,000
Minimum Exposure	1µs	1µs	1µs	1µs	1µs
Minimum Exposure with FAST option	499ns	499ns	142ns	142ns	142ns
Straddle time	490ns	490ns	696ns	696ns	696ns
Frames Per Second (FPS) v2640 / v1840					
2048 x 1952	4,855 / 3,320	/	6,600 / 4,510	6,600 / 4,510	/
1024 x 976	9,440 / 6,470	18,390 / 12,670	14,740 / 10,110	14,740 / 10,110	25,030 / 19,530

Data Storage and Management Focus:

Memory: The cameras can be equipped with **72GB, 144GB, or 288GB** of memory that can be segmented into 63 partitions for multiple, shorter cines.

Non-volatile Memory: Data can be securely saved on to a 1TB or 2TB Phantom CineMag IV, or a 2TB or 8TB CineMag V. 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. 10Gb Ethernet transfers data at up to 600 MB/second on optimized systems.

Sensor Specifications:

The Phantom v1840 and v2640 are based on a Vision Research designed **custom CMOS sensor**. The Standard modes feature **Correlated Double Sampling (CDS)** performed directly on the sensor to provide the lowest noise possible.

Sensor specifications include:

Parameter	Specification	Benefit
Sensor Resolution	2048 x 1952	4Mpx resolution for high detail in the image
Bit Depth	12-bit	4096 gray levels for optimal image quality
Dynamic Range	64 dB (typical)	High Image quality with low noise to show the maximum, cleanest detail possible
Noise	7.2 e- (typical)	
Pixel Size	13.5 Micron	High light sensitivity, critical for increased frame rates
Sensor Size	27.6 x 26.3	Compatible with common 35mm Nikon F and Canon EOS lenses
Electronic Shutter	Global	Each pixel integrates simultaneously, reducing image artifacts
Minimum Exposure	1µs standard, 142ns with export controlled FAST option.	Helps eliminate motion blur

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

Connectivity:

Both the v1840 and v2640 include **Programmable I/O** on up to four BNC ports. Programmable I/O provides the ability to assign and define the parameters of various signals including: F-Sync, Strobe, Event, Pre-trigger, Memgate, Timecode-out, Ready, Aux and Auto-Trigger. They also contain the same signals and connectors as the UHS-12 Series cameras for ease of use and compatibility.

Camera Control:

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

Advanced Features:

Image-Based Auto-Trigger	PIV features
Multi-Cine	Burst Mode
Continuous Recording	Internal Mechanical Shutter
SYNC-to-Trigger	Quiet Fans



Phantom v1840 and v2640 - Back Panel

Phantom[®] v1840 / v2640



Phantom v1840

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 with a full menu of professional support services.

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

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.



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V1840					
Resolution		Maximum Frame Rates		Maximum Frame Rates	
H	V	Standard Mode	HS / HS BF Mode	Standard Binned	HS Binned
2048	1952	3,320	4,510		
2048	1600	4,030	5,490		
2048	1440	4,460	6,080		
1920	1080	5,880	8,570		
1792	976	6,470	10,110		
1280	720	8,610	13,540		
1024	976	6,470	10,110	12,670	17,240
896	720	8,610	13,540	16,740	25,850
640	480	12,480	19,840	23,960	37,100
256	320	17,810	28,760	33,620	52,260
256	64	56,330	102,500	94,710	150,840
896	16	94,710	197,380	143,660	225,000
1792	8	106,850	225,000		

V2640					
Resolution		Maximum Frame Rates		Maximum Frame Rates	
H	V	Standard Mode	HS / HS BF Mode	Standard Binned	HS Binned
2048	1952	4,855	6,600		
2048	1600	5,885	8,020		
2048	1440	6,510	8,880		
1920	1080	8,575	12,510		
1792	976	9,440	14,740		
1280	720	12,540	19,695		
1024	976	9,440	14,740	18,390	25,030
896	720	12,540	19,695	24,230	37,360
640	480	18,120	28,760	34,490	53,290
256	320	25,765	41,500	48,060	74,460
256	64	79,200	142,270	129,550	204,270
896	16	129,600	261,190	190,060	303,460
1792	8	144,970	303,460		

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.