PHANTOM
T4040

HIGH-SPEED CAMERA

New 4.2 Mpx BSI Sensor
9,350 fps at 2560 x 1664
37,200 fps at 1280 x 832 Binned

FEATURES & BENEFITS

UNPRECEDENTED FOUR MEGAPIXEL FRAME RATES

- All new 4.2 Megapixel back side illuminated (BSI) sensor at 39.8 Gpx/s image throughput
- Binning combines pixels for increased vertical resolution at frame rates above 37,200
- Exposure times down to 250 ns with Fast Option, independent of frame rate
- Convenient T-Series platform provides premium connectivity and workflow features in a compact housing

FAST & FLEXIBLE WORKFLOW

- 10Gb Ethernet provides 7X faster data download directly from the camera's RAM buffer, up to 256 GB
- Multi-Cine partitions the RAM and eliminates downtime between shots for multiple short events
- Direct record to a Phantom CineMag™ for long duration recording with up to 1.3 Gpx/s image throughput
- On-camera controls, SDI/HDMI video out and CineMag, up to 8TB, enable a secure and efficient untethered workflow

VISION BY FORZA

IMAGE & SENSITIVITY

Sensor Type	CMOS, Back Side Illuminated (BSI) with Global Shutter	
Maximum Resolution	2560 x 1664	Binned 1280 x 832
CAR Increments	512 x 32	Binned 256 x 64
Pixel Size	9.27 μm	Binned 18.54 μm
Sensor Size	23.7 x 15.4 mm	
Bit Depth	12 bit	

	EMVA 1288 Measurements (at 532 nm)	
	Standard Mode	**Binned Mode**
Quantum Efficiency %	85.4% mono 71% color	82.4% mono
Max. SNR (dB)	39.9	45.4
Absolute Sensitivity Threshold (p)	28.4 mono 37.1 color	76.2
Saturation Capacity (e-)	9703 mono 11733 color	34,684
Temporal Dark Noise (e-)	23.7	62.2
Dynamic Range (dB)	52.0	54.8

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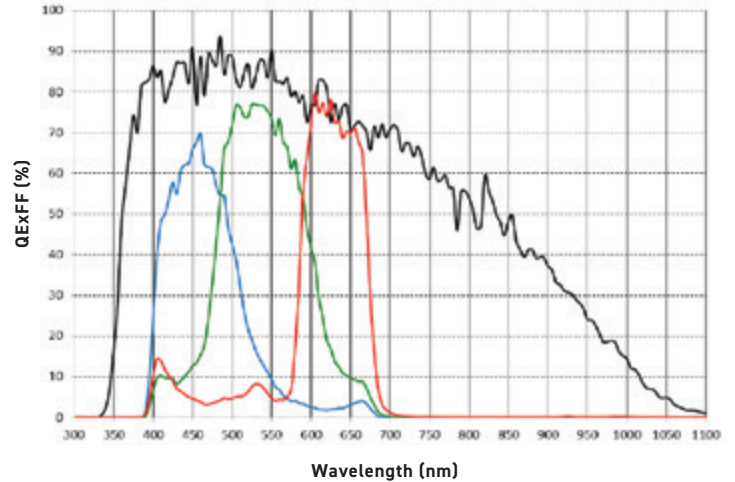
- *Visit: www.phantomhighspeed.com/emva for more information on EMVA 1288*

Back Panel

SPECTRAL RESPONSE

Quantum Efficiency Monochrome and Color

CONNECTIVITY & SIGNALS

Ethernet	Gigabit and 10Gb Ethernet (standard)
Timecode	IRIG-B Modulated and Un-modulated
Port Descriptions	Fischer 8-pin Ethernet; Fischer 3-pin for Primary and Backup Power; Fischer 5-pin for Remote; Fischer 8-pin for Range Data; USB for WiFi Dongle; 3 Dedicated BNCs for Trigger, Timecode-in and SDI Video; 3 BNCs for Programmable I/O
Programmable I/O Signals	Programmable I/O (3 ports) for Fsync, Strobe, Ready, Timecode-out, Event, Pretrigger Assign and define signals in PCC
Hardware Trigger	Dedicated BNC
Software Trigger	Trigger button; via Ethernet; via Remote port; via Image-based auto trigger (IBAT)
Synchronization	External Sync via FSync or IRIG Timecode
Recording Features	Burst Mode; Image-based Auto Trigger, Continuous Recording
Video Output	3G-SDI via BNC (rear), Din and Micro HDMI type D (front)
Accessory Power	4-pin Hirose (front) for 12V monitors up to 1 Amp

MEMORY & STORAGE

RAM Buffer	64GB, 128GB, 256GB RAM Options
Multi-Cine	Up to 63 Partitions
Non-Volatile Media	Phantom CineMag 5 optional. Supports auto-save, direct record and video playback.
Media Transfer Rates	2TB CineMag 5 = 1 Gpx/s 8TB CineMag 5 = 1.3 Gpx/s

FRAME RATES & EXPOSURE

Top FPS at Max Resolution	9,350 at 2560 x 1664
1 Megapixel FPS	37,200 at 2560 x 416 Standard or 1280 x 832 Binned
Maximum FPS	444,440 fps at 2560 x 32 Standard or 1280 x 64 Binned
Minimum FPS	100
Minimum Exposure	1 µs standard; 250 ns with FAST Option*
PIV Features	Shutter-off mode with a straddle time of 364ns; Supports Burst Mode
Exposure Features	EDR (Extreme Dynamic Range); Auto-Exposure

FRAME RATE CHART

Table provides examples of common resolutions and frame rates. Additional resolutions are available, reducing horizontal resolution increases record time. The record times shown are for 128GB RAM at the frame rate shown. Duration will be ½ for 64GB and double for 256GB RAM.

| Maximum Frame Rate - FPS; (128GB Record Time - Sec)					
Resolution (H x V)	Standard Mode	Resolution (H x V)	Standard Mode	Binned Mode (Mono Output Only)	
2560 x 1664	9,350 (2.2)	1280 x 832	-	37,200 (2.3)	
2560 x 1600	9,730 (2.2)	1024 x 768	20,250 (5.3)	40,200 (2.9)	
1536 x 1536	10,130 (3.6)	1280 x 640	-	48,190 (2.3)	
2560 x 1440	10,810 (2.2)	1024 x 512	30,300 (5.4)	60,150 (2.9)	
2048 x 1152	13,510 (2.7)	768 x 256	-	119,400 (3.8)	
1024 x 1024	15,180 (5.4)	1280 x 128	-	228,570 (2.3)	
1536 x 768	20,250 (3.6)	1280 x 64	-	444,440 (2.3)	
2560 x 512	30,300 (2.2)	1024 x 640	24,240 (5.4)	48,190 (2.8)	
2560 x 256	60,500 (2.2)	1024 x 256	60,150 (5.4)	119,400 (2.8)	
2560 x 128	119,400 (2.2)	512 x 128	117,400 (10.2)	228,570 (5.6)	
2560 x 32	444,440 (2.3)	512 x 64	225,570 (10.6)	444,440 (5.7)	

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

PHANTOM®

CONTROL

Software & OS	Phantom PCC (Windows x64); SDK available for C/C++, C#, Python, MatLab and LabView
On-Camera Controls	Standard Feature. 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 Features	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	CineMag and Non-CineMag Compatible
Size	5 x 5 x 8" (12.7 x 12.7 x 20.3 cm) *(Not including handle. Handle adds 2" (5 cm) to height.)*
Weight	9.4 lbs (4.3 kg)
Lens Mounts	F-Mount standard (aperture support for Nikon G-style lenses). Also available: Canon EF (with electronic focus and iris control), PL, C-mount and universal M42 mount
Mounting Points	Standard 1/4 x 20 and 3/8" mounting points on bottom (2 each). Remove handle and add cheese plate for top mounting. Side mounting bracket available for vertical positioning.
Internal Shutter	Standard, for remote black references
Cooling	Active cooling. Quiet mode disables fans during capture.
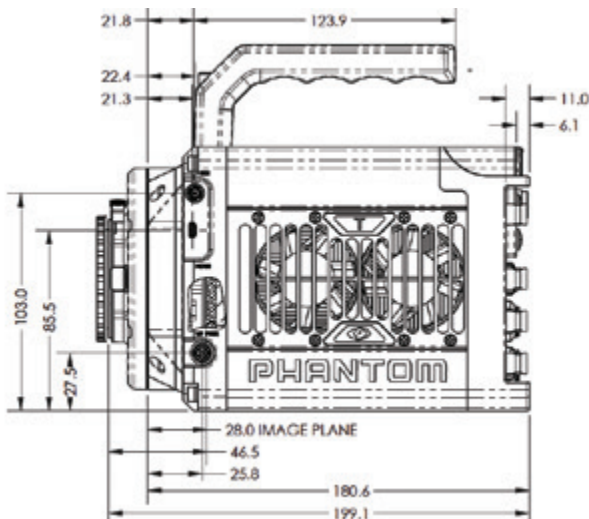
POWER

AC Power	100-240 VAC, 280W power supply included
Voltage Range	20-28V
Power Consumption	225W max with CineMag; 170W max typical without CineMag
Battery Options	Works with 24V battery sources only, input through dedicated backup power port

ENVIRONMENTAL

Operating Temperature	-10 to +50°C
Storage Temperature	-20 to +70°C
Relative Humidity	≤85% non condensing
Operational Shock	30G, 11msec sawtooth, 3 axes, 2 directions per axis, 10 shocks per direction (60 pulses total)
Operational Vibration	7.5 Grms, 50Hz-2KHz, 3 axes, 15 min/axis, IAW MIL-STD-202H Method 214-I, Test Condition B
Regulatory	**Emissions** – CE & UKCA Compliant EN 61326-1, Class A **Immunity** – CE & UKCA Compliant EN 61326-1, Class A **FCC** – CFR 47, Part 15, Subpart B & ICES-003, Class A **Safety** – IEC 60950-1 (2012)

GLOBAL SUPPORT NETWORK

The Phantom T-Series 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**

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.

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