



PHANTOM[®]
T-SERIES

DATASHEET



PHANTOM T4040 T2540

HIGH-SPEED CAMERAS

New 4.2MP BSI Sensor
2560 x 1664 pixels
up to 9,350 fps (T4040)
up to 5,540 fps (T2540)

FEATURES & BENEFITS

UNPRECEDENTED 4.2 MEGAPIXEL FRAME RATES

- All new 4.2MP BSI (back side illuminated) sensor at 25GP/s & 40GP/s image throughput.
- Binned mode combines pixels for increased vertical resolution at the highest frame rates.
- Exposure times down to 250 ns with FAST mode option, independent of frame rate.
- Convenient T-Series platform provides premium connectivity & workflow features in a compact housing.
- Phantom T2540-K225 model has a reduced maximum frame rate of 225,000 fps.

FAST & FLEXIBLE WORKFLOW

- 10Gb Ethernet provides 7x faster data download directly from camera's RAM buffer – up to 256GB.
- Multi-Cine partitions RAM & eliminates downtime between shots for multiple short events.
- Record video to a Phantom CineMag 5e™ for long duration recording – up to 1.3GP/s image throughput.
- On-camera controls, SDI/HDMI video out & CineMag 5e create a secure & efficient untethered workflow.

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West Coast
1414 Soquel Ave, Suite 200
Santa Cruz, CA 95062
USA
phone: 1-408-203-2727
www.hadlandimaging.com

East Coast
10 Park Place, Suite 507
Butler, NJ 07405
USA
phone: 1-862-228-2185

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IMAGE & SENSITIVITY

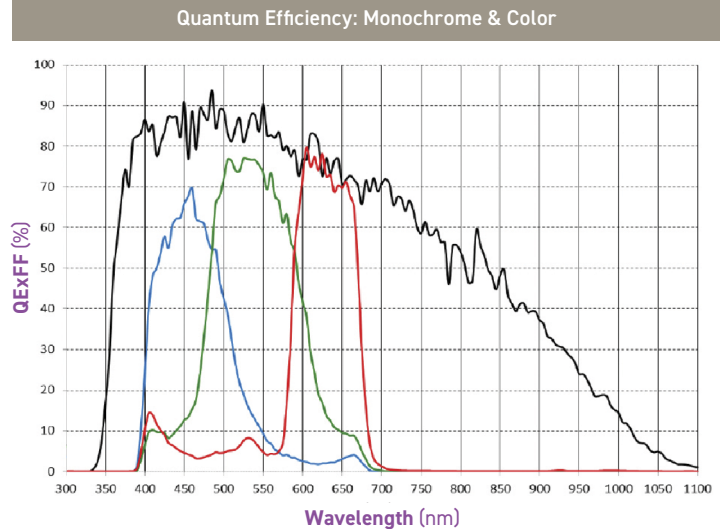
Sensor Type	Forza Silicon CMOS BSI (back side illuminated) with Global Shutter	
Maximum Resolution	2560 x 1664	1280 x 832 Binned
CAR Increments	512 x 32	256 x 64 Binned
Pixel Size	9.27 µm	18.54 µm Binned
Sensor Size	23.7 x 15.4 mm	
Bit Depth	12-bit	
	EMVA 1288 Measurements @ 532 nm	
	Standard Mode	Binned 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

Measurements recorded at 532 nm with monochrome & color cameras using the EMVA 1288 3.1 standard. Visit www.phantomhighspeed.com/emva for more about EMVA 1288.



Phantom T-Series Rear Panel

SPECTRAL RESPONSE



CONNECTIVITY & SIGNALS

Ethernet	Gigabit & 10Gb Ethernet
Timecode	IRIG-B modulated & unmodulated
Port Descriptions	Rear Ports SDI: BNC – 3G-SDI video out 3 STROBE: BNC – Programmable I/O RANGE DATA: Fischer 8-pin for input & embed frames with acquisition data REMOTE: Fischer 5-pin for RS-232 serial comm. 2 TC IN: Timecode-In for IRIG-B 5 READY: BNC – Programmable I/O BATTERY BACKUP: Fischer 3-pin, backup power 1 TRIGGER: BNC – Trigger-In, TTL, switch closure 4 FSYNC: BNC – Programmable I/O PRIMARY DC INPUT: Fischer 3-pin for main power USB: USB-A port for WiFi dongle ETHERNET: Fischer 8-pin for control/data transfer Front Ports SDI: DIN (mini-BNC) 3G-SDI video out HDMI: HDMI Type A video out VF PWR: HIROSE 4-pin for monitor/viewfinder CineMag Models CINEMAG PORT: top compartment of camera for Phantom CineMag 5e 2TB & 8TB recording media
Programmable I/O Signals	Programmable I/O (3 ports) for FSync, Strobe, Ready, Timecode-Out, Event, Pre-trigger, assign & define signals in PCC
Hardware Trigger	Dedicated BNC
Software Trigger	Trigger button via Ethernet, Remote port & Image-Based Auto Trigger (IBAT)
Synchronization	External Sync via FSync or IRIG Timecode
Recording Features	Burst Mode; Image-Based Auto Trigger (IBAT) & Continuous Recording
Video Output	3G-SDI via BNC, Din & Micro HDMI Type D
Accessory Power	HIROSE 4-pin for 12V monitors up to 1 Amp



MEMORY & STORAGE	
RAM Buffer	64GB, 128GB, & 256GB RAM options
Multi-Cine	Up to 63 partitions
Nonvolatile Media	Optional Phantom CineStation 5 , portable external CineMag drive & Phantom CineMag 5e ; 2TB & 8TB SSD capacities; hot-swappable; supports autosave, direct recording & video playback
Media Transfer Rates	2TB Phantom CineMag 5e = 1GP/s 8TB Phantom CineMag 5e = 1.3GP/s

FRAME RATES & EXPOSURE		
	T4040	T2540
Top FPS @ Max Resolution	9,350 fps	5,840 fps
1 Megapixel FPS	37,200 fps @ 2560 x 416 1280 x 832 Binned	23,250 fps @ 2560 x 416 1280 x 832 Binned
Maximum FPS	444,440 fps	277,770 fps T2540-K225: 225,000 fps
Minimum FPS	100 fps	
Minimum Exposure	1.04 µs standard; 250 ns with FAST* option	
PIV Features	Shutter Off Mode with straddle time of 364 ns; supports Burst Mode	
Exposure Features	EDR (Extreme Dynamic Range) & autoexposure	

FRAME RATE CHART

Examples of common resolutions & frame rates. Record times (seconds) are for 128GB RAM at frame rate shown. Duration will be half for 64GB & double for 256GB RAM. Reducing horizontal resolution increases record time. Additional resolutions are available.

MAXIMUM FRAME RATES FOR 128GB RECORD TIME IN SECONDS						
Resolution (H x V)	T4040		T2540		T2540-K225	
	Standard	Binned	Standard	Binned	Standard	Binned
2560 x 1664	9,350 fps (2.2)		5,840 fps (3.5)		5,840 fps (3.5)	
1536 x 1536	10,130 fps (3.6)		6,330 fps (5.8)		6,330 fps (5.8)	
2560 x 1440	10,810 fps (2.2)		6,750 fps (3.5)		6,750 fps (3.5)	
2048 x 1152	13,510 fps (2.2)		8,440 fps (3.5)		8,440 fps (3.5)	
1280 x 832		37,200 fps (2.3)		23,250 fps (3.5)		23,250 fps (3.5)
2560 x 640	24,240 fps (2.2)		15,150 fps (3.5)		15,150 fps (3.5)	
1280 x 640		48,190 fps (2.3)		30,120 fps (3.5)		30,120 fps (3.5)
2560 x 512	30,300 fps (2.2)		18,930 fps (3.5)		18,930 fps (3.5)	
1280 x 512		60,150 fps (2.2)		37,590 fps (3.5)		37,590 fps (3.5)
2560 x 256	60,150 fps (2.2)		37,590 fps (3.5)		37,590 fps (3.5)	
1280 x 256		119,400 (2.2)		74,620 fps (3.5)		74,620 fps (3.5)
2560 x 128	119,400 fps (2.2)		74,620 fps (3.5)		74,620 fps (3.5)	
1280 x 128		228,570 fps (2.3)		142,850 fps (3.7)		142,850 fps (3.7)
2560 x 64	228,570 fps (2.3)		142,850 fps (3.6)		142,850 fps (3.6)	
1280 x 64		444,440 fps (2.3)		277,770 fps (3.8)		225,000 fps (4.6)
2560 x 32	444,440 fps (2.3)		277,770 fps (3.8)		225,000 fps (4.6)	

* Export controlled FAST option.



CONTROL

Software & OS	Phantom Camera Control (PCC) – Windows 64; SDK for C/C++, C#, Python, MatLab & LabView
On-Camera Controls	Standard Feature. Access menu system with encoder, viewed on video monitor. Buttons for trigger, play & 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 & more using PCC. Cine files compatible with video editing & 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 & more.

POWER

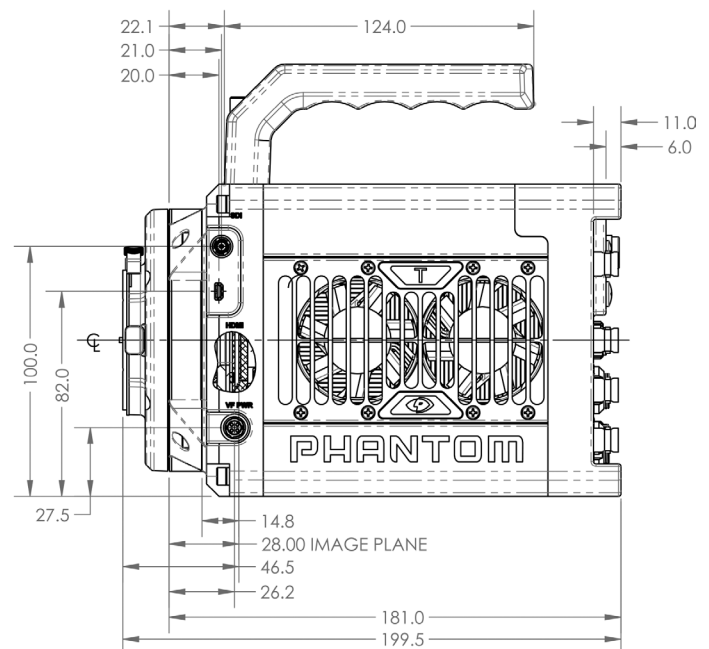
AC Power	100V to 240V AC, 280W power supply included
Voltage Range	20V to 28V DC
Power Consumption	225W max with CineMag; 170W max typical without CineMag
Battery Options	Works with 24V battery sources only, input through dedicated backup power port.

ENVIRONMENTAL

Operating Temperature	14° to 122° F (-10° to 50° C)
Storage Temperature	-4° to 158° F (-20° to 70° C)
Relative Humidity	≤ 85% noncondensing
Operational Shock	30G, 11 msec sawtooth, 3 axes, 2 directions per axis, 10 shocks per direction (60 pulses total)
Operational Vibration	7.5 gRMS, 50Hz to 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)

MECHANICAL

Housing Variants	CineMag & non-CineMag
Dimensions	5 x 5 x 8 inches (12.7 x 12.7 x 20.3 cm) Not including handle. Handle adds 2 in (5 cm) to height.
Weight	9.4 lb (4.3 kg)
Lens Mounts	Nikon F mount (aperture support for G style lenses) Canon EF mount (with electronic focus & iris control) PL mount C mount M42 mount
Mounting Points	1/4-20 : 5 total – 2 bottom, 1 side & 2 on handle 3/8-16 : 2 total – 2 on bottom M5x0.8 : 12 total – 4 bottom, 4 side & 4 on top Remove handle & 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 video capture



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For more information

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Specifications subject to change.

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