



PHANTOM[®]
T-SERIES



SMARTER IMAGING FOR BETTER LIVES

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PHANTOM T3610 T2410

HIGH-SPEED CAMERAS

1280 x 800 up to 38,040 fps (T3610)
up to 24,270 fps (T2410)
BSI sensor delivers optimal sensitivity

FEATURES & BENEFITS

ULTRAHIGH FRAME RATES IN AN UPDATED COMPACT PLATFORM

- A custom back side illuminated (BSI) sensor drives the camera's speed and sensitivity, optimizing image performance for high-speed motion analysis.
- Exposure times down to 190 ns with FAST Option, independent of frame rate, eliminates motion blur for fast-moving applications like ballistic research and spray dynamics.
- The camera's Binned mode combines pixels for increased vertical resolution at the highest frame rates.
- The convenient T-Series platform provides premium I/O connectivity and workflow features in a compact housing.

WORKFLOW FLEXIBILITY

- 10Gb Ethernet (optional) allows for the fastest data download directly from the camera's RAM buffer, up to 256 GB.
- On-camera controls and an optional CineMag interface allows for complete standalone operation, eliminating the need for a computer. Offload later from the camera body or a dedicated CineStation.

FRAME RATES & EXPOSURE		
Top FPS at Max Resolution	3610: 38,040	2410: 24,270
Maximum FPS	3610: 772,000 (875,000 w/ FAST Option*)	2410: 558,330
Minimum FPS	100	
CAR Increments	Standard: 256 x 32, Binned: 128 x 64	
Minimum Exposure	1 μs Standard, 190ns with FAST Option*	
Electronic Shutter	Global Shutter	
PIV Features	Shutter-off mode with a straddle time of 230ns Supports Burst Mode	
Exposure Features	EDR (Extreme Dynamic Range); Auto-Exposure	

IMAGING		
Sensor Type	CMOS; Back Side Illuminated (BSI)	
Maximum Resolution	1280 x 800 Standard	640 x 384 Binned
Bit Depth	12-bit	
Pixel Size	18.5 μm	Binned: 37 μm
Sensor Size	23.7 x 14.8 mm; 28mm Diagonal	
ISO Daylight (12232 STD)	Mono 40,000D; Color 12,500	Binned: Mono 40,000; Color 10,000
ISO Tungsten (12232 STD)	Mono 125,000T; Color 12,500	Binned: Mono 125,000; Color 10,000
Exposure Index	Mono 40,000-200,000; Color 12,500-64,000	

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)	T3610		T2410	
	Standard Mode	Binned Mode (Mono Output Only)	Standard Mode	Binned Mode (Mono Output Only)
1280 x 800	38,040 (2.2)	-	24,270 (3.5)	-
1280 x 640	47,510 (2.2)	-	30,310 (3.5)	-
1280 x 480	63,250 (2.2)	-	40,360 (3.5)	-
1280 x 384	78,940 (2.2)	-	50,370 (3.5)	-
1280 x 320	94,590 (2.2)	-	60,360 (3.5)	-
1280 x 256	117,970 (2.2)	-	75,280 (3.5)	-
1280 x 192	156,710 (2.2)	-	100,000 (3.5)	-
1280 x 128	233,330 (2.2)	-	148,880 (3.5)	-
1280 x 96	308,820 (2.3)	-	197,050 (3.6)	-
1280 x 64	456,520 (2.3)	-	291,300 (3.6)	-
1280 x 32	772,000 std; 875,000 with FAST* (2.3)	-	558,330 (3.6)	-
640 x 384	-	156,710 (2.3)	-	100,000 (3.5)
640 x 256	-	233,330 (2.3)	-	148,880 (3.6)
640 x 192	-	308,820 (2.3)	-	197,050 (3.6)
640 x 128	-	456,520 (2.3)	-	291,300 (3.6)
640 x 64	-	772,000 std; 875,000 with FAST* (2.3)	-	558,330 (3.6)
512 x 384	78,940 (5.5)	156,710 (2.3)	100,000 (4.4)	-
512 x 256	117,970 (5.5)	233,330 (2.3)	148,880 (4.5)	-
512 x 128	233,330 (5.5)	456,520 (2.9)	291,300 (4.6)	-
512 x 64	456,520 (5.6)	772,000 std; 875,000 with FAST* (3.0)	558,330 (4.6)	-

*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	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
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 (front); Micro HDMI type D
Accessory Power	4-pin Hirose (front) for 12V monitors up to 1 Amp



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.
Highlighted 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.

MEMORY & STORAGE

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

MECHANICAL

Housing Variants	CineMag and Non-CineMag Compatible Variants
Size	5 x 5 x 8" (12.7 x 12.7 x 20.3 cm) <i>(Not including handle. Handle adds 2" (5 cm) to height.)</i>
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.

GLOBAL SUPPORT NETWORK

The Phantom T-Series 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.

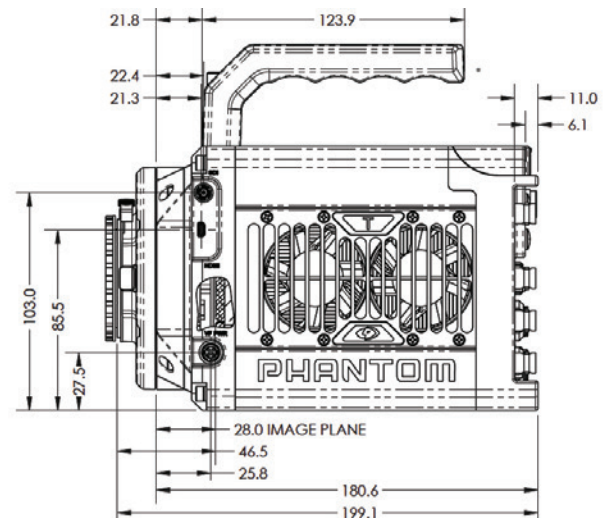
Learn more about our service offering at www.phantomhighspeed.com/Support

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—50°C
Storage Temperature	-20—70°C
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 214-1, Test Condition B
Relative Humidity	≤85% non condensing
Regulatory	CE Emissions – CE Compliant EN 61326-1, Class A CE Immunity – CE Compliant EN 61326-1, Class A FCC – CFR 47, Part 15, Subpart B & ICES-003, Class A Safety – IEC 60950-1 (2012)



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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