PHANTOM
TMX-SERIES

PHANTOM
TMX 7510
TMX 6410
TMX 5010

HIGH-SPEED CAMERA

Up to 76,000 fps at 1280 x 800 (7510), over 300,000 fps at 1280 x 192 and 640 x 384 Very high sensitivity

FEATURES & BENEFITS

DESIGNED FOR TRUE HIGH-SPEED APPLICATIONS

- 3 performance models offer extreme high frame rates at larger resolutions, up to 1.75 Million fps* at 1280 x 32 and 640 x 64 (TMX7510). 1 μs minimum exposure standard, 95ns with 95nsFAST option. The TMX7510 and 6410 also can even achieve 38ns with the 38nsFAST option.
- Real data, for real results: Frame rates are actual, with no interpolation. 2 x 2 Binning Mode provides double the vertical resolution at high frame rates for added flexibility.
- Very high native light sensitivity, made possible by the back side illuminated (BSI) sensor.

FOCUS ON DATA MANAGEMENT

- Record multiple experiments with up to 512GB of memory that can be partitioned up to 511 times.
- 10Gb Ethernet is standard for the fastest data download directly from the camera's RAM buffer.
- Use the Phantom CineMag V, for up to 8TB of nonvolatile memory and fast image transfer.

with export controlled FAST options

VISION BY
FORZA

ViSiON RESEARCH /AMETEK®

IMAGE & SENSITIVITY

Sensor Type	CMOS, Back Side Illuminated (BSI) with Global Shutter	
Maximum Resolution	1280 x 800	Binned 640 x 384
CAR Increments	256 x 32	Binned 128 x 64
Pixel Size	18.5 μm	Binned 37 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 %	77.6% mono 70.9% color	72.0% mono
Max. SNR (dB)	39.4	45.2
Absolute Sensitivity Threshold (p)	31.8 mono 38.4 color	98.9
Saturation Capacity (e-)	8736 mono 9432 color	33,184
Temporal Dark Noise (e-)	24.18	70.69
Dynamic Range (dB)	51.0	53.4

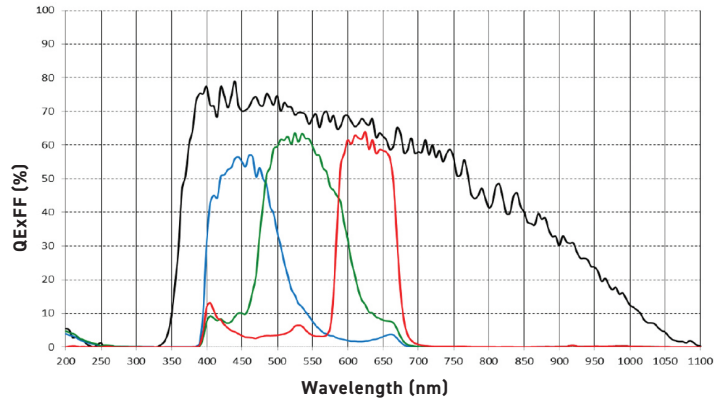- *Reported measurements were taken at 532 nm with both monochrome and color cameras*

- *Visit: www.phantomhighspeed.com/emva for more information on EMVA 1288*

Back Panel

SPECTRAL RESPONSE

Quantum Efficiency Monochrome and Color

CONNECTIVITY & SIGNALS

Ethernet	10Gb and Gigabit standard	
Timecode	IRIG-B modulated and un-modulated	
Port Descriptions	Ethernet	Locking RJ45
	Power	Fischer 3-pin
	Battery back-up	Fischer 3-pin
	VF (View Finder) Power	Hirose 4-pin
	Range Data	Fischer 8-pin
	Remote	Fischer 5-pin
	GPS	Fischer 6-pin
	Capture	Fischer 12-pin
	USB	Yes for WiFi dongle
	Video output	3G-SDI (2 BNCs)
	Dedicated BNC	Trigger, Timecode-in, 3G-SDI
	Programmable I/O BNC	4 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, via PCC over Ethernet, Remote Port, via Image-based auto trigger (IBAT)	
Synchronization	External Sync via FSync or IRIG Timecode	
Recording Features	Burst mode, Continuous recording & AutoSave to CineMag	
Video Output	3G-SDI	
Accessory Power	4-pin Hirose for 12V monitors up to 1 Amp	

MEMORY & STORAGE

RAM Buffer	128GB, 256GB, 512GB RAM options
Multi-Cine	Up to 511 Partitions
Non-Volatile Media	Phantom CineMag V optional. Supports auto-save, direct record and video playback.
Media Transfer Rates	2TB CineMag V = 1,000 Mpx/sec 8TB CineMag V = 1,200 Mpx/sec

FRAME RATES & EXPOSURE

Top FPS at Max Resolution	7510: 76,000	6410: 65,940	5010: 50,725
Maximum FPS	7510: 772,050 1,750,000 with FAST options*	6410: 758,330 1,516,660 with FAST options*	5010: 583,330 1,166,660 with FAST option*
Minimum FPS	100		
Minimum Exposure	1 µs standard, 95ns with 95ns FAST option* (TMX 7510 / 6410) 38ns with 38nsFAST option*		
PIV Features	Shutter-off mode with a straddle time of 229ns Supports Burst Mode		
Exposure Features	Extreme Dynamic Range (EDR), Auto Exposure		

FRAME RATE CHART

Table provides examples of common resolutions and frame rates. The record times shown are for 256GB RAM at the frame rate shown. Duration will be 1/2 for 128GB and double for 512GB. Binned Mode has Mono Output Only.

MAXIMUM FRAME RATE - FPS; (256GB RECORD TIME - SEC)

| Resolution (H x V)	TMX-7510 Standard	TMX-7510 Binned	TMX-6410 Standard	TMX-6410 Binned	TMX-5010 Standard	TMX-5010 Binned
1280 x 800	76,000 (2.2)		65,940 (2.5)		50,725 (3.3)	
1280 x 640	94,590 (2.2)		81,980 (2.5)		63,060 (3.3)	
1280 x 480	126,500 (2.2)		109,630 (2.5)		84,330 (3.3)	
1280 x 448	134,610 (2.2)		116,660 (2.5)		89,740 (3.3)	
1280 x 384	156,710 (2.2)		135,820 (2.5)		104,470 (3.3)	
1280 x 320	187,500 (2.2)		162,500 (2.5)		125,000 (3.3)	
1280 x 256	233,330 (2.2)		202,220 (2.5)		155,550 (3.3)	
1280 x 192	308,820 (2.2)		267,640 (2.5)		205,880 (3.3)	
640 x 384		308,820 (2.2)		267,640 (2.5)		205,880 (3.3)
1280 x 160	375,000 (2.2)		325,000 (2.5)		250,000 (3.3)	
640 x 320		375,000 (2.2)		325,000 (2.5)		250,000 (3.3)
1280 x 128	456,520 (2.2)		395,650 (2.6)		304,340 (3.4)	
640 x 256		456,520 (2.2)		395,650 (2.6)		304,340 (3.4)
1280 x 96	617,640 (2.2)		535,290 (2.6)		411,760 (3.3)	
640 x 192		617,640 (2.2)		535,290 (2.6)		411,760 (3.3)
1280 x 64	772,050 (2.7)		758,330 (2.7)		583,330 (3.5)	
640 x 128		772,050 (2.7)		758,330 (2.7)		583,330 (3.5)
FAST OPTION						
1280 x 64	875,000 (2.3)		758,330 (2.7)		583,330 (3.5)	
640 x 128		875,000 (2.3)		758,330 (2.7)		583,330 (3.5)
1280 x 32	1,750,000 (2.3)		1,516,660 (2.7)		1,166,660 (3.5)	
640 x 64		1,750,000 (2.3)		1,516,660 (2.7)		1,166,660 (3.5)

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

CONTROL

Software & OS	Phantom PCC (Windows 64); 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
Primary File Format	Phantom Cine RAW (.cine)
Alternative File Formats	Easily convert to formats including .mp4, Apple ProRes .mov, .avi, Tiff, JPG, PNG and many more using PCC. Cine files are directly compatible with many major video editing and motion analysis programs
Highlighted Software Features	Integrated Data Acquisition (NI-DAQ), DIC Calibration Support with Sync-Snapshot menu, Continuous recording, Image Processing

MECHANICAL

Housing Variants	CineMag and non-CineMag compatible variants
Size (Without Handle)	Non-CineMag: 7 x 7 x 11.7" (17.8 x 17.8 x 29.7 cm) CineMag: 7 x 7.4 x 11.7" (17.8 x 18.6 x 29.7 cm)
Weight	20 lbs (9.1 kg)
Lens Mounts	F-Mount standard (aperture support for Nikon G-style lenses). Also available: Canon EF (with electronic focus and iris control), C-mount, M42-Mount
Mounting Points	2 (4 total) on the bottom, 2 (4 total) on side, 4 (8 total) on handle
Internal Shutter	Standard, for remote black references
Cooling	Active cooling. Quiet mode disables fans during capture
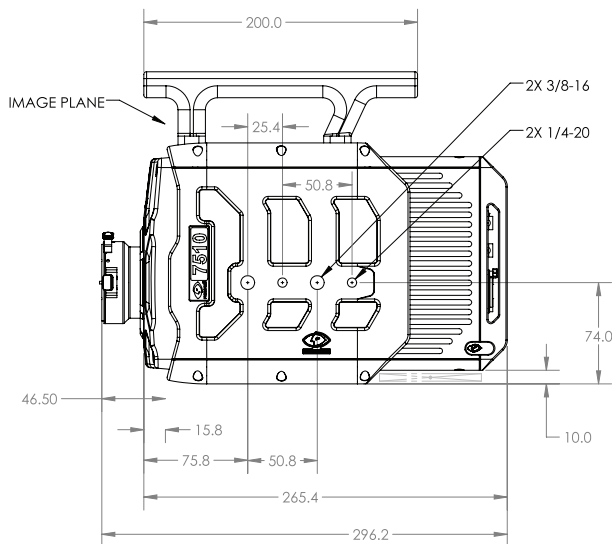
POWER

AC Power	100-240 VAC, 400W power supply included
Voltage Range	20-28VDC Primary and Secondary
Power Consumption	325W typical, 395W maximum with accessories (Max frame rate, CineMag, View Finder, Remote)

ENVIRONMENTAL

Operating Temperature	-10 to +50°C
Storage Temperature	-20 to +70°C
Operational Shock	Rated 30G; sawtooth wave, 11ms, +/- 10 pulses all axes
Operational Vibration	MIL-STD-202H Method 214-i; Test Condition A. Rated 5.3 Grms; 15 min/axis
Regulatory	Made in the USA **Emissions** – CE & UKCA Compliant EN 61326-1 **Immunity** – CE & UKCACompliant 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

Phantom cameras are supported by Vision Research's Global Service and Support network, providing PhantomCare services from multiple sites around the globe.

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.