



SMART RUGGED™

M4 & M4P | 2.5" SATA

SMART's RUGGED M4 and M4P 2.5" SATA solid state drives (SSDs) combine high performance, superior reliability and data security into a single ruggedized design, making them the ideal solutions for ground and air defense, industrial automation, transportation, medical and telecommunication applications. The SMART M4 and M4P SSDs are designed to meet the needs of applications where temperature tolerances are as important as high performance and reliability. A robust set of diagnostic information is provided through SSD-specific S.M.A.R.T attributes which can be used to monitor the health of the drives.

The M4 and M4P feature two HW-based erase triggers, one on each end of the drives. In addition, the SATA connect has 30 micro inches of gold plating for a more reliable connection. The M4 and M4P are also available with staking, conformal coating, specialty firmware and extended burn in, if needed. The M4 and M4P automatically protect all data written with AES 256-bit encryption. Also included is the Security Erase feature per the ATA-8 specification whereby the encryption key will be deleted in less than one second. The M4 and M4P both feature the write-protect feature.

Features & Benefits

- High Random and Sequential I/O Performance
- Cost-Effective MLC Flash
- Ruggedized Enclosure for Shock and Vibration
- Thermal Sensor
- Static and Dynamic Wear-Leveling
- Firmware Updatable
- Low Power Management
- Ideal for High and Low Temperature Applications
- AES 256-Bit Encryption to Automatically Protect All Data Written to the Drive
- TCG Opal 2.0 Compliant for M4



Applications

- Ground and Air Defense
- Industrial Automation
- Transportation
- Medical
- Telecommunication

Product Family Overview

Capacity	Sequential Performance	Random Performance
M4 2.5" SATA		
240GB to 960GB	Up to 500MB/s Read Up to 260MB/s Write	60,000 IOPS Read 55,000 IOPS Write
M4P 2.5" SATA		
240GB to 960GB	Up to 525MB/s Read Up to 500MB/s Write	70,000 IOPS Read 50,000 IOPS Write

Specifications

	M4 2.5" SATA	M4P 2.5" SATA
NAND Type	MLC	
Performance		
Host Interface Rate (maximum)	6Gb/s (Backwards compatible to 3Gb/s & 1.5Gb/s)	
Capacities	240GB to 960GB	240GB to 1920GB
Burst	600MB/s	
Sequential Read (maximum)	Up to 500MB/s	Up to 525MB/s
Sequential Write (maximum)	Up to 260MB/s	Up to 500MB/s
Random Read (maximum)	60,000 IOPS	70,000 IOPS
Random Write (maximum)	55,000 IOPS	50,000 IOPS
Reliability		
MTBF	>3M hours	>2M hours
Power Loss Protection	SafeDATA (pFail)	SafeDATA (pFail)
Data Reliability	1 in 10 ¹⁵ bits read for M4	1 in 10 ¹⁷ bits read for M4P
Data Retention	1 year @ 55°C for M4	10 years at 40°C for M4P
Endurance	Up to 1,200 Total Drive Writes	Up to 2,100 Total Drive Writes
Warranty	1 Year	1 Year
Power		
Input Voltage	5 V +/- 5%	5 V +/- 5%
Idle (typical)	490 mA	390 mA
Operational (typical)	604/953 mA	640/1,080 mA
Environmental		
Operating Shock	1500G half-sine, 0.5 msec, 1 shock along each axis, X, Y, Z in each direction	
Operating Vibration	16.4 g rms 15-2000 Hz random, 3-axes	
Operating Temperature	Industrial: -40°C to +85°C	Commercial: 0°C to +70°C Industrial: -40°C to +85°C
Storage Temperature	-55°C to +95°C	
Humidity	5% to 95% non-condensing	5% to 95% non-condensing
Altitude	24,384m (80,000 ft)	30,480m (100,000 ft)
Mechanical		
Length	100.45 mm	100.45 mm
Width	69.85 mm	69.85 mm
Height	7.0 mm	7.0 mm



Ordering Information

Part Number	Density
M4 2.5" SATA (Secure) Industrial Operating Temperature (-40°C to +85°C)	
HRAA2S0960EI001	960GB
HRAA2S0480EI001	480GB
HRAA2S0240EI001	240GB
M4 2.5" SATA (Coating Secure) Industrial Operating Temperature (-40°C to +85°C)	
HRAA2S0960EICC1	960GB
HRAA2S0480EICC1	480GB
HRAA2S0240EICC1	240GB
M4 2.5" SATA (Secure) Industrial Operating Temperature (-40°C to +85°C) 0% OP + Application Compatibility Enhancements	
HRAA2S0512ZILM1	512GB
HRAA2S0512ZILM2	512GB
HRAA2S0256ZILM1	256GB
HRAA2S0256ZILM2	256GB
M4 2.5" SATA (Secure) Industrial Operating Temperature (-40°C to +85°C) 0% OP + WP Extension Cable	
HRAA2S0256EIGD1	256GB
HRAA2S0256EIGD2	256GB
M4P 2.5" SATA (Standard) Industrial Operating Temperature (-40°C to +85°C)	
HRBA2X1920EI001	1920GB
HRBA2X0960EI001	960GB
HRBA2X0480EI001	480GB
HRBA2X0240EI001	240GB
M4P 2.5" SATA (Coating) Industrial Operating Temperature (-40°C to +85°C)	
HRBA2X1920EICC1	1920GB
HRBA2X0960EICC1	960GB
HRBA2X0480EICC1	480GB
HRBA2X0240EICC1	240GB
M4P 2.5" SATA (Secure) Industrial Operating Temperature (-40°C to +85°C) With Extended testing to -54°C	
HRBA2X0960EILM1	960GB

One gigabyte, or GB, equals one billion bytes when referring to drive capacity. Accessible capacity may vary based on the operating environment and drive formatting.

Commercial temperature versions also available. They are identified with a "C" vs. "I" as 12th digit.

For more information, please visit: www.smartm.com

*Product images are for promotional purposes only. Labels may not be representative of the actual product.

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