



# 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
<b>M4 2.5" SATA</b>		
240GB to 960GB	Up to 500MB/s Read Up to 260MB/s Write	60,000 IOPS Read 55,000 IOPS Write
<b>M4P 2.5" SATA</b>		
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
<b>NAND Type</b>	MLC	
<b>Performance</b>		
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
<b>Reliability</b>		
MTBF	>3M hours	>2M hours
Power Loss Protection	SafeDATA (pFail)	SafeDATA (pFail)
Data Reliability	10 years at 40°C	10 years at 40°C
Data Retention	66 bits per 1KB	120 bits per 2048 bytes
Endurance	Up to 1,200 Total Drive Writes	Up to 2,100 Total Drive Writes
Warranty	1 Year	1 Year
<b>Power</b>		
Input Voltage	5 V +/- 5%	5 V +/- 5%
Idle (typical)	490 mA	390 mA
Operational (typical)	604/953 mA	640/1,080 mA
<b>Environmental</b>		
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)
<b>Mechanical</b>		
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
<b>M4 2.5" SATA (Secure) Industrial Operating Temperature (-40°C to +85°C)</b>	
HRAA2S0960EI001	960GB
HRAA2S0480EI001	480GB
HRAA2S0240EI001	240GB
<b>M4 2.5" SATA (Coating Secure) Industrial Operating Temperature (-40°C to +85°C)</b>	
HRAA2S0960EICC1	960GB
HRAA2S0480EICC1	480GB
HRAA2S0240EICC1	240GB
<b>M4P 2.5" SATA (Standard) Commercial Operating Temperature (0°C to +70°C)</b>	
HRBA2X1920EC001	1920GB
HRBA2X0960EC001	960GB
HRBA2X0480EC001	480GB
HRBA2X0240EC001	240GB
<b>M4P 2.5" SATA (Standard) Industrial Operating Temperature (-40°C to +85°C)</b>	
HRBA2X1920EI001	1920GB
HRBA2X0960EI001	960GB
HRBA2X0480EI001	480GB
HRBA2X0240EI001	240GB
<b>M4P 2.5" SATA (Coating) Commercial Operating Temperature (0°C to +70°C)</b>	
HRBA2X1920ECCC1	1920GB
HRBA2X0960ECCC1	960GB
HRBA2X0480ECCC1	480GB
HRBA2X0240ECCC1	240GB
<b>M4P 2.5" SATA (Coating) Industrial Operating Temperature (-40°C to +85°C)</b>	
HRBA2X1920EICC1	1920GB
HRBA2X0960EICC1	960GB
HRBA2X0480EICC1	480GB
HRBA2X0240EICC1	240GB

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.



For more information, please visit: [www.smartm.com](http://www.smartm.com)

### Headquarters/North America:

T: (+1) 800-956-7627 • T: (+1) 510-623-1231  
F: (+1) 510-623-1434 • E: [info@smartm.com](mailto:info@smartm.com)

### Latin America:

T: (+55) 11 4417-7200 • E: [sales.br@smartm.com](mailto:sales.br@smartm.com)

### EMEA:

T: (+44) 0 7826-064-745 • E: [sales.euro@smartm.com](mailto:sales.euro@smartm.com)

### Asia/Pacific:

T: (+65) 6678-7670 • E: [sales.asia@smartm.com](mailto:sales.asia@smartm.com)

### Customer Service:

T: (+1) 510-623-1231 • E: [customers@smartm.com](mailto:customers@smartm.com)