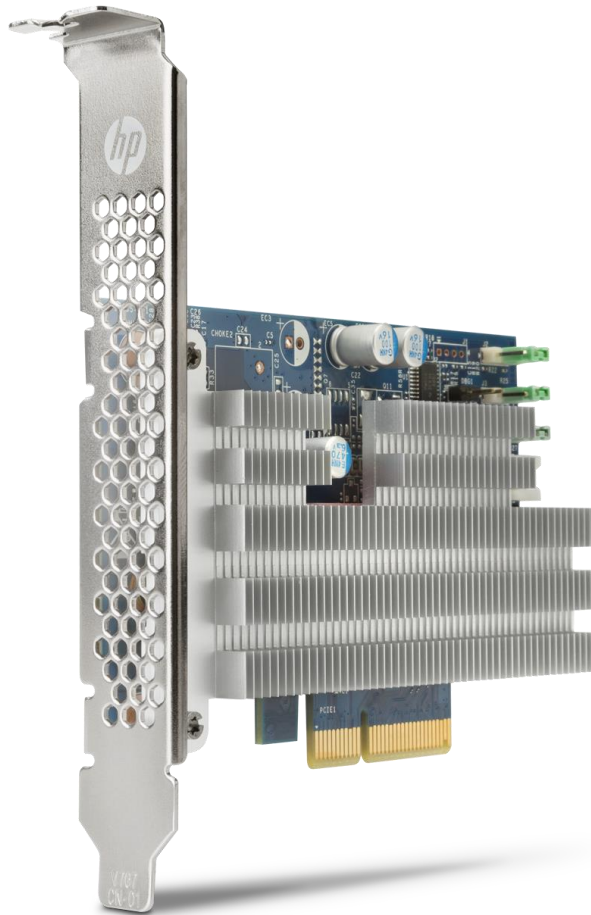


Overview

PCIe Solid State Drives for HP Workstations



Introduction

Storage technology with NAND media is outgrowing the bandwidth limitations of the SATA bus. New high performance Storage solutions will connect directly to the PCIe bus for revolutionary performance improvements. These components will be available in a variety of form factors and performance levels, designed specifically for certain market segments, and ultimately the costs will continue to decline as the technology evolves.

Performance

HP Z Turbo Drive

The HP Z Turbo Drive features a PCIe connected SSD, and this enables performance levels greater than 1GB/s. This performance is available at a price that is at parity with today's comparable SATA SSDs. This will enable the highest price/performance ratio for client grade SSDs.

The HP Z Turbo Drive will be supported on desktop platforms of HP Z Workstations. It will support storage configurations as a Boot device and as a Data device. The performance gains are significant when connecting to the PCIe bus. The sequential read and write performance is roughly twice as fast as today's SATA SSD products.

Overview

HP Z Turbo Drive 256GB & 512GB SSD

The HP Z Turbo Drive is supported on all current desktop workstation platforms, including Z230, Z420, Z620, Z820, and Z440, Z640, Z840. It is supported as a boot device and a data device(s). It is also supported by our current offering of Operating Systems, including Linux, and does not require a separate driver. It does require a BIOS update for any system shipped prior to the Z Turbo Drive launch. It can be configured with additional hard drives, both SATA and SAS, and with multiple Z Turbo drives per system. All supported configurations are not available as factory options in all regions.

Operating System Support

Microsoft Windows 7 64-bit, Microsoft Windows 8.1 64-bit, Microsoft Windows 10 64-bit, RHEL 6,7; SUSE 11,12; Ubuntu 14.04.

Note: Not supported for 32-bit Microsoft Windows Operating Systems.

Support for OPAL hardware encryption: No

Support for Secure Erase: Yes

Supported in HP Performance Advisor: yes (includes wear gauge)

Approved PCIe slots:

Recommended slot order for Z820

1. Slot 1
2. Slot 6
3. Slot 3 (Requires 2nd CPU)
4. Slot 4 (Requires 2nd CPU)

Z620 - Slot 4, Slot 5

Z420 - Slot 4, Slot 5

Z230 - Slot 4

Recommended slot order for Z840

1. Slot 1
2. Slot 6
3. Slot 3 (Requires 2nd CPU)
4. Slot 4 (Requires 2nd CPU)

Z640 - Slot 4, Slot 5, Slot 3 (in order of preference)

Z440 - Slot 4, Slot 5, Slot 3 (in order of preference)

For RAID support, there are some specific differences and thus restrictions as compared to SATA/SAS HDDs or SSDs. Software RAID is used, as there is not a good solution today for hardware based RAID.

- Windows RAID with Boot Configuration: Limited support for RAID 1*, No support for RAID 0, 5, 10
- Windows RAID with Data Configuration: Support for RAID 0, 1; No support for RAID 5, 10
- Linux RAID with Boot Configuration: Functional for RAID 0, 1*; No support for RAID 5, 10
- Linux RAID with Data Configuration: Functional for RAID 0, 1, 5, 10**

* RAID 1 can be set up, yet will not provide complete, redundant protection as the boot partition is not replicated on both drives.

An OS boot partition cannot be protected by software RAID 1.

** Limited testing has been done with Linux to confirm RAID support and performance characteristics

HP Z Turbo Drive G2

The new HP Z Turbo Drive G2 features the next generation PCIe SSD. This M.2 form factor device uses PCIe Gen3 x4 which enables performance levels greater than 2GB/s, which is roughly 4x greater than SATA SSDs. The Random Read performance is significantly improved also, due to the NVMe controller technology used on the device. This performance is available at a price that is comparable to commercial SATA SSDs.

Overview

The HP Z Turbo Drive G2 will be supported on desktop platforms of HP Z Workstations including Z240, Z440, Z640 and Z840. It will support storage configurations as a Boot device and as a Data device. It also can be configured with other storage components including SATA and SAS drives and controllers. Not all configurations are available from the factory.

The HP Z Turbo Drive G2 is supported on the current desktop workstation platforms, including Z240, Z440, Z640, and Z840. It is supported as a boot device and a data device(s). It is also supported by our current offering of Operating Systems, including Linux, and may require a separate driver, depending on OS. It does require a BIOS update for any system shipped prior to the Z Turbo Drive G2 launch, minimum BIOS is 1.53. It can be configured with additional hard drives, both SATA and SAS, and with multiple Z Turbo drives per system. All supported configurations are not available as factory options in all regions.

NVMe devices require a driver for proper detection and operation. Microsoft Windows 8 and higher have an inbox NVMe driver. For Windows 7, HP recommends the Microsoft hotfix which provides an NVMe driver (listed below). In addition, the Samsung NVMe driver, version 1.4.7.6, can be used with specific Samsung M.2 devices. (available at <http://www.hp.com>). Also note that the new NVMe driver will not support the original HP Z Turbo Drive, which requires an AHCI driver.

KB2990941 (<https://support.microsoft.com/en-us/kb/2990941>)

KB3087873 (<https://support.microsoft.com/en-us/kb/3087873>)

Operating System Support

Microsoft Windows 7 64-bit, Microsoft Windows 8.1 64-bit, Microsoft Windows 10 64-bit, RHEL 6,7; SUSE 11,12; Ubuntu 14.04.

Note: Not supported for 32-bit Microsoft Windows Operating Systems.

Support for OPAL hardware encryption: No

Support for Secure Erase: Yes

Supported in HP Performance Advisor: yes (includes wear gauge)

Approved PCIe slots :

Recommended slot order for Z840

1. Slot 1
2. Slot 6
3. Slot 3 (Requires 2nd CPU)
4. Slot 4 (Requires 2nd CPU)

Z640 - Slot 4, Slot 5, Slot 3 (in order of preference)

Z440 - Slot 4, Slot 5, Slot 3 (in order of preference)

Z240 - Native Motherboard slot first, then available PCIe Gen3 slot (either #1 or #4)

RAID support details are similar to the data listed above for HP Z Turbo Drive.

Z1 G3 Platform Note

There are two, adjacent Z Turbo Drive native slots. The Thermal Solution for Z1 G3 is a one-piece heatsink which accommodates both M.2 modules, thus only 1 Thermal Solution kit is required when using one or two M.2 modules. When ordering M.2 modules with the original configuration from the factory, the Thermal Solution will be included.

Overview

Models

HP Z Turbo Drive 256GB SSD	G3G88AA
HP Z Turbo Drive 512GB SSD	G3G89AA
HP Z Turbo Drive G2 128GB SSD	Note 1
HP Z Turbo Drive G2 256GB SSD	M1F73AA
HP Z Turbo Drive G2 512GB SSD	M1F74AA
HP Z Turbo Drive G2 1TB SSD	T9H98AA
HP Z Turbo Drive Quad Pro 2x256GB PCIe SSD	N2M98AA
HP Z Turbo Drive Quad Pro 2x512GB PCIe SSD	N2M99AA
HP Z Turbo Drive Quad Pro 2x1TB PCIe SSD	T9H99AA
HP Z Turbo Drive G2 256GB PCIe SSD (Z240 MB)	T6U42AA
HP Z Turbo Drive G2 512GB PCIe SSD (Z240 MB)	T6U43AA
HP Z Turbo Drive G2 1TB PCIe SSD (Z240 MB)	W6C19AA
HP Z Turbo Drive G2 256GB PCIe SSD (Z1 G3)	W5A06AA
HP Z Turbo Drive G2 512GB PCIe SSD (Z1 G3)	W5A07AA
HP Z Turbo Drive G2 1TB PCIe SSD (Z1 G3)	T0K72AA
HP Z Turbo Drive Thermal Solution (Z1 G3)	W0T85AA
HP Z Turbo Drive G2 256GB TLC SSD	Y1T46AA
HP Z Turbo Drive G2 512GB TLC SSD	Y1T49AA
HP Z Turbo Drive G2 1TB TLC SSD	Y1T52AA
HP Z Turbo Drive G2 256GB TLC PCIe SSD (Z2 MB)	Y1T47AA
HP Z Turbo Drive G2 512GB TLC PCIe SSD (Z2 MB)	Y1T50AA
HP Z Turbo Drive G2 1TB TLC PCIe SSD (Z2 MB)	Y1T53AA
HP Z Turbo Drive G2 256GB TLC PCIe SSD (Z1 G3)	Y1T48AA
HP Z Turbo Drive G2 512GB TLC PCIe SSD (Z1 G3)	Y1T51AA
HP Z Turbo Drive G2 1TB TLC PCIe SSD (Z1 G3)	Y1T54AA
HP Z Turbo Drive G2 256GB SED SSD	Y1T55AA
HP Z Turbo Drive G2 512GB SED SSD	Y1T58AA
HP Z Turbo Drive G2 512GB SED (Z2 MB)	Y1T59AA
HP Z Turbo Drive G2 256GB SED (Z2 MB)	Y1T56AA
HP Z Turbo Drive G2 256GB SED (Z1 G3)	Y1T57AA
HP Z Turbo Drive G2 512GB SED (Z1 G3)	Y1T60AA
HP Z Turbo Drive G2 256GB TLC (Z2 Mini)	Y7B60AA
HP Z Turbo Drive G2 256GB MLC (Z2 Mini)	Y7B58AA
HP Z Turbo Drive G2 512GB MLC (Z2 Mini)	Y7B58AA

NOTE 1: Not available today as After Market Option

Technical Specifications

PCIe SSDs for HP Workstations

HP Z Turbo Drive 256GB SSD

Capacity	256GB								
Protocol	PCIe								
Form Factor	Half-height, half-length								
Controller	AHCI								
NAND Type	MLC								
Endurance	146TB								
Interface	PCI Express 2.0 x4 electrical x4 physical								
Operating Temperature	32° to 158° F (0° to 70° C)								
Performance	<table> <tr> <td>Sequential Read</td> <td>1080 MB/s</td> </tr> <tr> <td>Sequential Write</td> <td>800 MB/s</td> </tr> <tr> <td>Random Read</td> <td>120K IOPS</td> </tr> <tr> <td>Random Write</td> <td>60K IOPS</td> </tr> </table>	Sequential Read	1080 MB/s	Sequential Write	800 MB/s	Random Read	120K IOPS	Random Write	60K IOPS
Sequential Read	1080 MB/s								
Sequential Write	800 MB/s								
Random Read	120K IOPS								
Random Write	60K IOPS								

HP Z Turbo Drive 512GB SSD

Capacity	512GB								
Protocol	PCIe								
Form Factor	Half-height, half-length								
Controller	AHCI								
NAND Type	MLC								
Endurance	292TB								
Interface	PCI Express 2.0 x4 electrical x4 physical								
Operating Temperature	32° to 158° F (0° to 70° C)								
Performance	<table> <tr> <td>Sequential Read</td> <td>1170 MB/s</td> </tr> <tr> <td>Sequential Write</td> <td>950 MB/s</td> </tr> <tr> <td>Random Read</td> <td>122K IOPS</td> </tr> <tr> <td>Random Write</td> <td>72K IOPS</td> </tr> </table>	Sequential Read	1170 MB/s	Sequential Write	950 MB/s	Random Read	122K IOPS	Random Write	72K IOPS
Sequential Read	1170 MB/s								
Sequential Write	950 MB/s								
Random Read	122K IOPS								
Random Write	72K IOPS								

HP Z Turbo Drive G2 128GB SSD

Capacity	128GB								
Protocol	PCIe								
Form Factor	M.2 in Half-height, half-length card								
Controller	NVMe								
NAND Type	MLC								
Endurance	73TB								
Reliability (MTBF)	1.5M hours								
Interface	PCI Express 3.0 x4 electrical x4 physical								
Operating Temperature	32° to 158° F (0° to 70° C)								
Performance	<table> <tr> <td>Sequential Read</td> <td>2000 MB/s</td> </tr> <tr> <td>Sequential Write</td> <td>650 MB/s</td> </tr> <tr> <td>Random Read</td> <td>300K IOPS</td> </tr> <tr> <td>Random Write</td> <td>83K IOPS</td> </tr> </table>	Sequential Read	2000 MB/s	Sequential Write	650 MB/s	Random Read	300K IOPS	Random Write	83K IOPS
Sequential Read	2000 MB/s								
Sequential Write	650 MB/s								
Random Read	300K IOPS								
Random Write	83K IOPS								

HP Z Turbo Drive G2 256GB SSD

Capacity	256GB
Protocol	PCIe

Technical Specifications

Form Factor	M.2 in Half-height, half-length card	
Controller	NVMe	
NAND Type	MLC	
Endurance	146TB	
Reliability (MTBF)	1.5M hours	
Interface	PCI Express 3.0 x4 electrical x4 physical	
Operating Temperature	32° to 158° F (0° to 70° C)	
Performance	Sequential Read	2150 MB/s
	Sequential Write	1260 MB/s
	Random Read	300K IOPS
	Random Write	100K IOPS

HP Z Turbo Drive G2 512GB SSD

Capacity	512GB	
Protocol	PCIe	
Form Factor	M.2 in Half-height, half-length card	
Controller	NVMe	
NAND Type	MLC	
Endurance	292TB	
Reliability (MTBF)	1.5M hours	
Interface	PCI Express 3.0 x4 electrical x4 physical	
Operating Temperature	32° to 158° F (0° to 70° C)	
Performance	Sequential Read	2150 MB/s
	Sequential Write	1550 MB/s
	Random Read	300K IOPS
	Random Write	100K IOPS

HP Z Turbo Drive G2 1TB SSD

Capacity	1TB	
Protocol	PCIe	
Form Factor	M.2 in Half-height, half-length card	
Controller	NVMe	
NAND Type	MLC	
Endurance	600TB	
Reliability (MTTF)	1.5M hours	
Interface	PCI Express 3.0 x4 electrical x4 physical	
Operating Temperature	32° to 158° F (0° to 70° C)	
Performance	Sequential Read	2500 MB/s
	Sequential Write	1550 MB/s
	Random Read	210K IOPS
	Random Write	130K IOPS

Technical Specifications

HP Z Turbo Drive Quad Pro 2x256GB PCIe SSD	Capacity	512GB
	Protocol	PCIe
	Form Factor	PCIe Card, Full Height PCIe Slot
	Controller	NVMe
	NAND Type	MLC
	Endurance	146TB
	Reliability (MTBF)	1.5M hours
	Interface	PCIe Gen3 x4 architecture
	Operating Temperature	32° to 158° F (0° to 70° C)
	Performance	Sequential Read 2150 MB/s
		Sequential Write 1260 MB/s
		Random Read 300K IOPS
		Random Write 100K IOPS
HP Z Turbo Drive Quad Pro 2x512GB PCIe SSD	Capacity	1TB
	Protocol	PCIe
	Form Factor	PCIe Card, Full Height PCIe Slot
	Controller	NVMe
	NAND Type	MLC
	Endurance	292TB
	Reliability (MTBF)	1.5M hours
	Interface	PCIe Gen3 x4 architecture
	Operating Temperature	32° to 158° F (0° to 70° C)
	Performance	Sequential Read 2150 MB/s
		Sequential Write 1550 MB/s
		Random Read 300K IOPS
		Random Write 100K IOPS
HP Z Turbo Drive Quad Pro 2x1TB PCIe SSD	Capacity	2TB
	Protocol	PCIe
	Form Factor	PCIe Card, Full Height PCIe Slot
	Controller	NVMe
	NAND Type	MLC
	Endurance	600TB
	Reliability (MTBF)	PCI Express 3.0 x4 electrical x4 physical
	Interface	32° to 158° F (0° to 70° C)
	Operating Temperature	2TB
	Performance	Sequential Read 3200 MB/s
		Sequential Write 1800 MB/s
		Random Read 430K IOPS
		Random Write 320K IOPS
Capacity	256GB	

Technical Specifications

**HP Z Turbo Drive G2
256GB PCIe SSD (Z240
MB)**

Protocol	PCIe								
Form Factor	M.2 in native slot on motherboard								
Controller	NVMe								
NAND Type	MLC								
Endurance	146TB								
Reliability (MTBF)	1.5M hours								
Interface	PCI Express 3.0 x4 electrical x4 physical								
Operating Temperature	32° to 158° F (0° to 70° C)								
Performance	<table> <tr> <td>Sequential Read</td> <td>2150 MB/s</td> </tr> <tr> <td>Sequential Write</td> <td>1260 MB/s</td> </tr> <tr> <td>Random Read</td> <td>300K IOPS</td> </tr> <tr> <td>Random Write</td> <td>100K IOPS</td> </tr> </table>	Sequential Read	2150 MB/s	Sequential Write	1260 MB/s	Random Read	300K IOPS	Random Write	100K IOPS
Sequential Read	2150 MB/s								
Sequential Write	1260 MB/s								
Random Read	300K IOPS								
Random Write	100K IOPS								

**HP Z Turbo Drive G2
512GB PCIe SSD (Z240
MB)**

Capacity	512GB (one M.2 PCIe NVMe module)								
Protocol	PCIe								
Form Factor	M.2 in native slot on motherboard								
Controller	NVMe								
NAND Type	MLC								
Endurance	292TB								
Reliability (MTBF)	1.5M hours								
Interface	PCI Express 3.0 x4 electrical x4 physical								
Operating Temperature	32° to 158° F (0° to 70° C)								
Performance	<table> <tr> <td>Sequential Read</td> <td>2260 MB/s</td> </tr> <tr> <td>Sequential Write</td> <td>1550 MB/s</td> </tr> <tr> <td>Random Read</td> <td>300K IOPS</td> </tr> <tr> <td>Random Write</td> <td>100K IOPS</td> </tr> </table>	Sequential Read	2260 MB/s	Sequential Write	1550 MB/s	Random Read	300K IOPS	Random Write	100K IOPS
Sequential Read	2260 MB/s								
Sequential Write	1550 MB/s								
Random Read	300K IOPS								
Random Write	100K IOPS								

**HP Z Turbo Drive G2 1TB
PCIe SSD (Z240 MB)**

Capacity	1TB								
Protocol	PCIe								
Form Factor	M.2 in native slot on motherboard								
Controller	NVMe								
NAND Type	MLC								
Endurance	600TB								
Reliability (MTBF)	1.5M hours								
Interface	PCI Express 3.0 x4 electrical x4 physical								
Operating Temperature	32° to 158° F (0° to 70° C)								
Performance	<table> <tr> <td>Sequential Read</td> <td>2500 MB/s</td> </tr> <tr> <td>Sequential Write</td> <td>1550 MB/s</td> </tr> <tr> <td>Random Read</td> <td>210K IOPS</td> </tr> <tr> <td>Random Write</td> <td>130K IOPS</td> </tr> </table>	Sequential Read	2500 MB/s	Sequential Write	1550 MB/s	Random Read	210K IOPS	Random Write	130K IOPS
Sequential Read	2500 MB/s								
Sequential Write	1550 MB/s								
Random Read	210K IOPS								
Random Write	130K IOPS								

**HP Z Turbo Drive G2
256GB PCIe SSD (Z1 G3)**

Capacity	256GB
Protocol	PCIe

Technical Specifications

Form Factor	M.2 in native slot on motherboard	
Controller	NVMe	
NAND Type	MLC	
Endurance	146TB	
Reliability (MTBF)	1.5M hours	
Interface	PCI Express 3.0 x4 electrical x4 physical	
Operating Temperature	32° to 158° F (0° to 70° C)	
Performance	Sequential Read	2150 MB/s
	Sequential Write	1260 MB/s
	Random Read	300K IOPS
	Random Write	100K IOPS

HP Z Turbo Drive G2 512GB PCIe SSD (Z1 G3)	Capacity	512GB (one M.2 PCIe NVMe module)		
	Protocol	PCIe		
	Form Factor	M.2 in native slot on motherboard		
	Controller	NVMe		
	NAND Type	MLC		
	Endurance	292TB		
	Reliability (MTBF)	1.5M hours		
	Interface	PCI Express 3.0 x4 electrical x4 physical		
	Operating Temperature	32° to 158° F (0° to 70° C)		
	Performance	Sequential Read	2150 MB/s	
		Sequential Write	1550 MB/s	
		Random Read	300K IOPS	
		Random Write	100K IOPS	

HP Z Turbo Drive G2 1TB PCIe SSD (Z1 G3)	Capacity	1TB		
	Protocol	PCIe		
	Form Factor	M.2 in native slot on motherboard		
	Controller	NVMe		
	NAND Type	MLC		
	Endurance	600TB		
	Reliability (MTBF)	1.5M hours		
	Interface	PCI Express 3.0 x4 electrical x4 physical		
	Operating Temperature	32° to 158° F (0° to 70° C)		
	Performance	Sequential Read	2500 MB/s	
		Sequential Write	1550 MB/s	
		Random Read	210K IOPS	
		Random Write	130K IOPS	

HP Z Turbo Drive Thermal Capacity Solution (Z1 G3)	Heatsink accommodates 2 PCIe SSD modules
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Technical Specifications

HP Z Turbo Drive G2 256GB TLC SSD

Capacity	256GB								
Protocol	PCIe								
Form Factor	M.2 in Half-height, half-length card								
Controller	NVMe								
NAND Type	3D TLC								
Endurance	75TBW (TB Written)								
Reliability (MTBF)	1.5M hours								
Interface	PCI Express 3.0 x4 electrical x4 physical								
Operating Temperature	32° to 158° F (0° to 70° C)								
Performance	<table> <tr> <td>Sequential Read</td> <td>2800 MB/s</td> </tr> <tr> <td>Sequential Write</td> <td>320 MB/s (1100 MB/s max/Turbo)</td> </tr> <tr> <td>Random Read</td> <td>250K IOPS</td> </tr> <tr> <td>Random Write</td> <td>180K IOPS</td> </tr> </table>	Sequential Read	2800 MB/s	Sequential Write	320 MB/s (1100 MB/s max/Turbo)	Random Read	250K IOPS	Random Write	180K IOPS
Sequential Read	2800 MB/s								
Sequential Write	320 MB/s (1100 MB/s max/Turbo)								
Random Read	250K IOPS								
Random Write	180K IOPS								

HP Z Turbo Drive G2 512GB TLC SSD

Capacity	512GB								
Protocol	PCIe								
Form Factor	M.2 in Half-height, half-length card								
Controller	NVMe								
NAND Type	3D TLC								
Endurance	150TBW (TB Written)								
Reliability (MTBF)	1.5M hours								
Interface	PCI Express 3.0 x4 electrical x4 physical								
Operating Temperature	32° to 158° F (0° to 70° C)								
Performance	<table> <tr> <td>Sequential Read</td> <td>2800 MB/s</td> </tr> <tr> <td>Sequential Write</td> <td>660 MB/s (1600 MB/s max/Turbo)</td> </tr> <tr> <td>Random Read</td> <td>260K IOPS</td> </tr> <tr> <td>Random Write</td> <td>260K IOPS</td> </tr> </table>	Sequential Read	2800 MB/s	Sequential Write	660 MB/s (1600 MB/s max/Turbo)	Random Read	260K IOPS	Random Write	260K IOPS
Sequential Read	2800 MB/s								
Sequential Write	660 MB/s (1600 MB/s max/Turbo)								
Random Read	260K IOPS								
Random Write	260K IOPS								

HP Z Turbo Drive G2 1TB TLC SSD

Capacity	1TB								
Protocol	PCIe								
Form Factor	M.2 in Half-height, half-length card								
Controller	NVMe								
NAND Type	3D TLC								
Endurance	300TBW (TB Written)								
Reliability (MTBF)	1.5M hours								
Interface	PCI Express 3.0 x4 electrical x4 physical								
Operating Temperature	32° to 158° F (0° to 70° C)								
Performance	<table> <tr> <td>Sequential Read</td> <td>3000 MB/s</td> </tr> <tr> <td>Sequential Write</td> <td>1150 MB/s (1700 MB/s max/Turbo)</td> </tr> <tr> <td>Random Read</td> <td>360K IOPS</td> </tr> <tr> <td>Random Write</td> <td>330K IOPS</td> </tr> </table>	Sequential Read	3000 MB/s	Sequential Write	1150 MB/s (1700 MB/s max/Turbo)	Random Read	360K IOPS	Random Write	330K IOPS
Sequential Read	3000 MB/s								
Sequential Write	1150 MB/s (1700 MB/s max/Turbo)								
Random Read	360K IOPS								
Random Write	330K IOPS								

Technical Specifications

HP Z Turbo Drv G2 256GB TLC PCIe SSD (Z2 MB)	Capacity	256GB	
	Protocol	PCIe	
	Form Factor	M.2 in native slot on motherboard	
	Controller	NVMe	
	NAND Type	3D TLC	
	Endurance	75TBW (TB Written)	
	Reliability (MTBF)	1.5M hours	
	Interface	PCI Express 3.0 x4 electrical x4 physical	
	Operating Temperature	32° to 158° F (0° to 70° C)	
	Performance	Sequential Read	2800 MB/s
		Sequential Write	320 MB/s (1100 MB/s max/Turbo)
		Random Read	250K IOPS
Random Write		180K IOPS	

HP Z Turbo Drv G2 512GB TLC PCIe SSD (Z2 MB)	Capacity	512GB	
	Protocol	PCIe	
	Form Factor	M.2 in native slot on motherboard	
	Controller	NVMe	
	NAND Type	3D TLC	
	Endurance	150TBW (TB Written)	
	Reliability (MTBF)	1.5M hours	
	Interface	PCI Express 3.0 x4 electrical x4 physical	
	Operating Temperature	32° to 158° F (0° to 70° C)	
	Performance	Sequential Read	2800 MB/s
		Sequential Write	660 MB/s (1600 MB/s max/Turbo)
		Random Read	260K IOPS
Random Write		260K IOPS	

Technical Specifications

HP Z Turbo Drv G2 1TB TLC PCIe SSD (Z2 MB)	Capacity	1TB
	Protocol	PCIe
	Form Factor	M.2 in native slot on motherboard
	Controller	NVMe
	NAND Type	3D TLC
	Endurance	300TBW (TB Written)
	Reliability (MTBF)	1.5M hours
	Interface	PCI Express 3.0 x4 electrical x4 physical
	Operating Temperature	32° to 158° F (0° to 70° C)
	Performance	Sequential Read 3000 MB/s
		Sequential Write 1150 MB/s (1700 MB/s max/Turbo)
		Random Read 360K IOPS
		Random Write 330K IOPS
HP Z Turbo Drive G2 256GB TLC PCIe SSD (Z1 G3)	Capacity	256GB
	Protocol	PCIe
	Form Factor	M.2 in native slot on motherboard
	Controller	NVMe
	NAND Type	3D TLC
	Endurance	75TBW (TB Written)
	Reliability (MTBF)	1.5M hours
	Interface	PCI Express 3.0 x4 electrical x4 physical
	Operating Temperature	32° to 158° F (0° to 70° C)
	Performance	Sequential Read 2800 MB/s
		Sequential Write 320 MB/s (1100 MB/s max/Turbo)
		Random Read 250K IOPS
		Random Write 180K IOPS
HP Z Turbo Drive G2 512GB TLC PCIe SSD (Z1 G3)	Capacity	512GB
	Protocol	PCIe
	Form Factor	M.2 in native slot on motherboard
	Controller	NVMe
	NAND Type	3D TLC
	Endurance	150TBW (TB Written)
	Reliability (MTBF)	1.5M hours
	Interface	PCI Express 3.0 x4 electrical x4 physical
	Operating Temperature	32° to 158° F (0° to 70° C)
	Performance	Sequential Read 2800 MB/s
		Sequential Write 660 MB/s (1600 MB/s max/Turbo)
		Random Read 260K IOPS
		Random Write 260K IOPS

Technical Specifications

HP Z Turbo Drive G2 1TB TLC PCIe SSD (Z1 G3)	Capacity	1TB	
	Protocol	PCIe	
	Form Factor	M.2 in native slot on motherboard	
	Controller	NVMe	
	NAND Type	3D TLC	
	Endurance	300TBW (TB Written)	
	Reliability (MTBF)	1.5M hours	
	Interface	PCI Express 3.0 x4 electrical x4 physical	
	Operating Temperature	32° to 158° F (0° to 70° C)	
	Performance	Sequential Read	3000 MB/s
		Sequential Write	1150 MB/s (1700 MB/s max/Turbo)
		Random Read	360K IOPS
		Random Write	330K IOPS
HP Z Turbo Drive G2 256GB SED SSD	Capacity	256GB	
	Protocol	PCIe	
	Form Factor	M.2 in Half-height, half-length card	
	Controller	NVMe	
	NAND Type	3D MLC	
	Endurance	150TBW (TB Written)	
	Reliability (MTBF)	1.5M hours	
	Interface	PCI Express 3.0 x4 electrical x4 physical	
	Operating Temperature	32° to 158° F (0° to 70° C)	
	Performance	Sequential Read	3100 MB/s
		Sequential Write	1400 MB/s
		Random Read	330K IOPS
		Random Write	280K IOPS
Self-Encrypting Drive Support	OPAL 2		
HP Z Turbo Drive G2 512GB SED SSD	Capacity	512GB	
	Protocol	PCIe	
	Form Factor	M.2 in Half-height, half-length card	
	Controller	NVMe	
	NAND Type	MLC	
	Endurance	300TBW (TB Written)	
	Reliability (MTBF)	1.5M hours	
	Interface	PCI Express 3.0 x4 electrical x4 physical	
	Operating Temperature	32° to 158° F (0° to 70° C)	
	Performance	Sequential Read	3200 MB/s
		Sequential Write	1700 MB/s
		Random Read	330K IOPS
		Random Write	300K IOPS

Technical Specifications

Self-Encrypting Drive Support OPAL 2

**HP Z Turbo Drive G2
512GB SED (Z2 MB)**

Capacity 512GB
Protocol PCIe
Form Factor M.2 in native slot on motherboard
Controller NVMe
NAND Type 3D MLC
Endurance 300TBW (TB Written)
Reliability (MTBF) 1.5M hours
Interface PCI Express 3.0 x4 electrical x4 physical
Performance
Sequential Read 3200 MB/s
Sequential Write 1700 MB/s
Random Read 330K IOPS
Random Write 300K IOPS
Self-Encrypting Drive Support OPAL 2

**HP Z Turbo Drive G2
256GB SED (Z2 MB)**

Capacity 256GB
Protocol PCIe
Form Factor M.2 in native slot on motherboard
Controller NVMe
NAND Type 3D MLC
Endurance 150TBW (TB Written)
Reliability (MTBF) 1.5M hours
Interface PCI Express 3.0 x4 electrical x4 physical
Operating Temperature 32° to 158° F (0° to 70° C)
Performance
Sequential Read 3100 MB/s
Sequential Write 1400 MB/s
Random Read 330K IOPS
Random Write 280K IOPS
Self-Encrypting Drive Support OPAL 2

Technical Specifications

HP Z Turbo Drive G2 256GB SED (Z1 G3)

Capacity	256GB
Protocol	PCIe
Form Factor	M.2 in native slot on motherboard
Controller	NVMe
NAND Type	3D MLC
Endurance	150TBW (TB Written)
Reliability (MTBF)	1.5M hours
Interface	PCI Express 3.0 x4 electrical x4 physical
Operating Temperature	32° to 158° F (0° to 70° C)
Performance	Sequential Read 3100 MB/s
	Sequential Write 1400 MB/s
	Random Read 330K IOPS
	Random Write 280K IOPS
Self-Encrypting Drive Support	OPAL 2

HP Z Turbo Drive G2 512GB SED (Z1 G3)

Capacity	512GB
Protocol	PCIe
Form Factor	M.2 in native slot on motherboard
Controller	NVMe
NAND Type	3D MLC
Endurance	300TBW (TB Written)
Reliability (MTBF)	1.5M hours
Interface	PCI Express 3.0 x4 electrical x4 physical
Operating Temperature	32° to 158° F (0° to 70° C)
Performance	Sequential Read 3200 MB/s
	Sequential Write 1700 MB/s
	Random Read 330K IOPS
	Random Write 300K IOPS
Self-Encrypting Drive Support	OPAL 2

Summary of Changes

Date of change:	Version History:		Description of change:
	From v1 to v2		
June 11, 2014	From v3 to v4	Removed	Removed the Z Turbo Drives.
September 2, 2014	From v4 to v5	Added	Add slot recommendations for Z840, Z640, Z440, details for Boot, note for support of Secure erase, and Linux support
December 1, 2014	From v5 to v6	Changed	HP Z Turbo Drive compatibility
February 1, 2015	From v6 to v7	Added	Support for Z440, 640 and 840 Workstations
		Removed	third party tools support for Secure Erase
April 1, 2015	From v7 to v8	Added	Z Turbo Drives G2 256 and 512GB
		Removed	Fusion ioFX
June 1, 2015	From v8 to v9	Added	RAID Compatibility
		Changed	Messaging and Compatibility
February 1, 2016	From v9 to v10	Added	HP Z240 Workstations compatibility
		Changed	Z Turbo Drives and Z Turbo Drive Quad Pro Specs
March 1, 2016	From v10 to v11	Changed	Z Turbo G2 NVMe devices comments and driver links
April 1, 2015	From v11 to v12	Added	HP Z Turbo Drive G2 1TB for all current platforms, 256,512GB and 1TB; Support Z240 and Z1 G3, HP Z Turbo Drive Thermal Solution (Z1 G3)
June 7, 2016	From v12 to v13	Added	Z1 G3 Platform Note
		Changed	HP Z Turbo Drive 256GB & 512GB SSD combined performance specs
September 1, 2016	From v13 to v14	Added	new models for SED versions and Turbo Drives Quad Pro, 256GB TLC drive, as well as Z240 specs
		Changed	edits to MTTF info
October 1, 2016	From v14 to v15	Added	Minor specs to TLC drive, as well as Z1 G3, and Z2 drives
		Changed	updates for TLC and SED parts
November 1, 2016	From v15 to v16	Added	HP Z Turbo Drive Quad Pro 2x1TB PCIe SSD
January 1, 2017	From v16 to v17	Added	HP Z Turbo Drive G2 256GB TLC, HP Z Turbo Drive G2 512GB TLC, HP Z Turbo Drive G2 1TB TLC

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