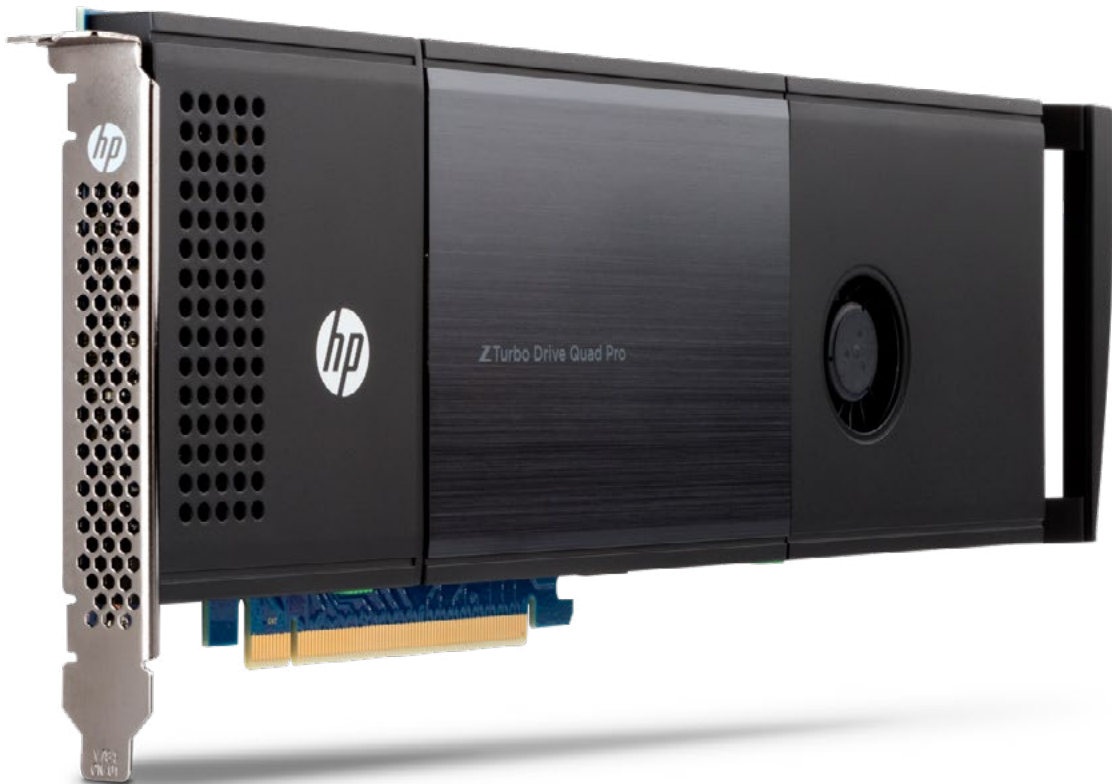


FAQs

# HP Z Turbo Drive Quad Pro



## Product performance/implementation

### What is the HP Z Turbo Drive PCIe SSD?

The HP Z Turbo Drive PCIe SSD is the family name for an M.2 PCIe connected SSD. The M.2 PCIe card used in the HP Z Turbo Drive family uses one M.2 SSD module and requires a PCIe Gen3 x4 slot for maximum performance. These new storage components are compatible with many HP Z Workstations.

### What new technology is used in the HP Z Turbo Drive G2 and HP Z Turbo Drive Quad Pro PCIe SSDs?

The new HP Z Turbo Drive G2 and HP Z Turbo Drive Quad Pro PCIe SSDs incorporate NVMe SSD technology that uses PCIe Gen3 for incredible performance gains over SATA SSDs. Individual M.2 modules have up to 6x the sequential performance compared to SATA SSDs.

### What is the HP Z Turbo Drive Quad Pro?

The HP Z Turbo Drive Quad Pro is a solution that supports four M.2 PCIe connected SSD modules. Each M.2 PCIe module used in the HP Z Turbo Drive Quad Pro requires 4 PCIe Gen3 lanes for maximum performance, thus the HP Z Turbo Drive Quad Pro requires a PCIe Gen3 x16 slot in order to support the four M.2 modules at full performance. The HP Z Turbo Drive Quad Pro is supported on the HP Z440, Z640, and Z840.



### How is the new HP Z Turbo Drive Quad Pro different from the HP Z Turbo Drive G2?

The HP Z Turbo Drive Quad Pro uses the same PCIe NVMe modules as the HP Z Turbo Drive G2, but has several distinguishing features:

- It will support four PCIe NVMe M.2 modules on a single card
- For full performance, the HP Z Turbo Drive Quad Pro requires a PCIe Gen3 x16 slot, instead of a PCIe Gen3 x4 slot
- Sudden power loss protection is supported with onboard management and super caps for energy storage

### What is sudden power loss protection?

The HP Z Turbo Drive Quad Pro monitors the power to the M.2 modules. If power is lost unexpectedly, it will signal the M.2 storage modules to move all volatile data into non-volatile memory using a bank of super caps to provide power until the M.2 modules have stored all data. These super caps are part of the power loss protection circuitry and will not need to be replaced over the life of the card. This will assure all data on the HP Z Turbo Drive Quad Pro is stored away. This means performance-enhancing features, such as drive caching, can be enabled without concern for data loss.

### What storage capacities are available with the new HP Z Turbo Drive Quad Pro?

The new HP Z Turbo Drive Quad Pro uses NVMe SSD modules available in 256 GB<sup>1</sup>, 512 GB<sup>1</sup> and 1 TB<sup>1</sup> capacities. Thus, the maximum total capacity is 4 TB. It is possible to order the card with less than four SSD modules and then add additional M.2 SSD modules later. HP expects to offer higher capacity devices in the future as they become available in the industry.

### How does the performance of a PCIe SSD compare to a SATA SSD?

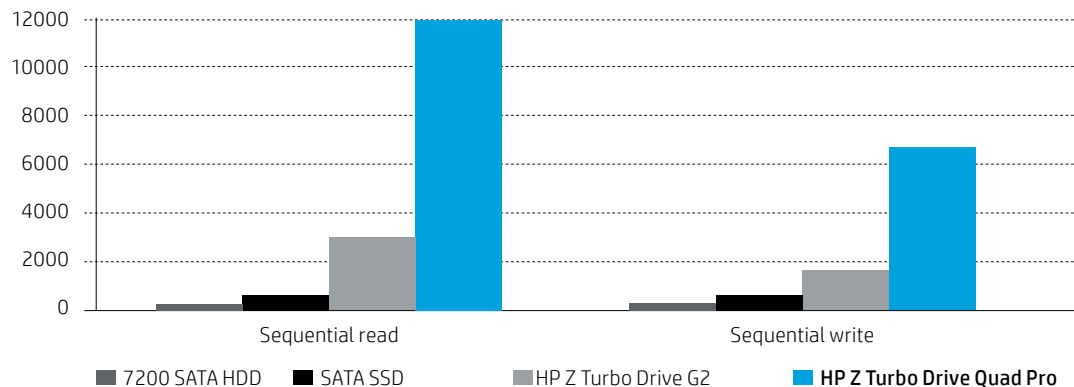
The HP Z Turbo Drive G2 and HP Z Turbo Drive Quad Pro PCIe SSDs significantly outperform standard SATA SSDs. All SATA SSDs are limited by the 6 GB/s SATA bandwidth. The sequential performance of the new HP Z Turbo Drive G2 and HP Z Turbo Drive Quad Pro PCIe SSDs are up to 6x faster than standard SATA SSDs.

	HP Z Turbo Drive Quad Pro* (4 modules in RAID 0)	HP Z Turbo Drive G2	SATA SSD	SATA 7200 HDD
Sequential read	12,000 MB/s	3,200 MB/s	550 MB/s	150 MB/s
Sequential write	6,600 MB/s	1,700 MB/s	500 MB/s	150 MB/s
Random read	1,300 K IOPS	330 K IOPS	100 K IOPS	0.46 K IOPS

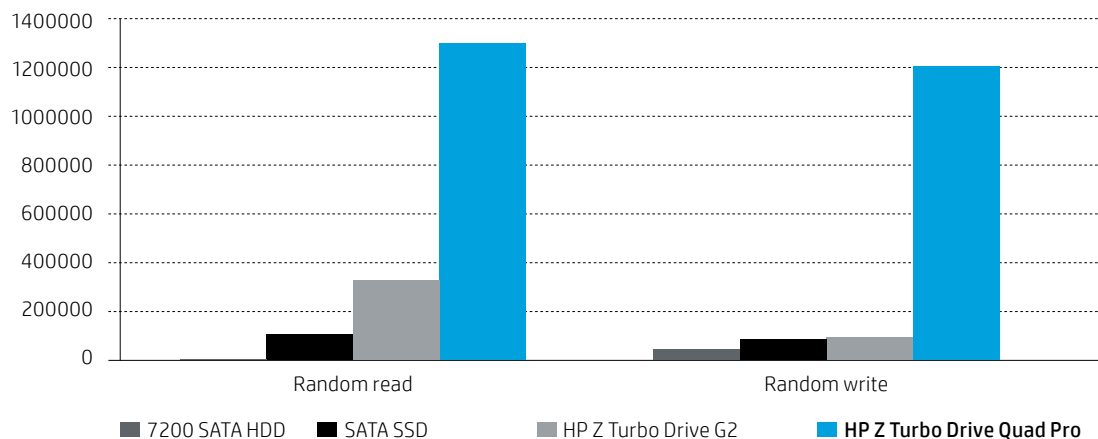
\* Sequential read performance tested with Iometer 1.1.0 with 12 workers, queue depth of 128, file size of 128 K.

### R/W performance comparisons\*

#### Sequential R/W performance\*\* (MB/s)



#### Random R/W performance\*\* (IOPS)



\* Performance specifications for 512 GB capacity for Micron M600, HP Z Turbo Drive G2 and SSD modules with HP Z Turbo Drive Quad Pro. Smaller capacity SSDs may have lower performance characteristics.

\*\* Performance measurements tested with Iometer 1.1.0 with 12 workers, queue depth of 128, file size of 128 KB used for sequential measurements, file size of 4 KB used for random measurements.

### Are there any significant differences when using an M.2 PCIe SSD as compared to a SATA SSD?

There are a couple of differences with respect to the storage driver requirements and RAID connectivity. There is a specific NVMe storage driver that is required. Also, the HP Z Turbo Drive does not use any of the onboard storage controllers, nor will it appear in any of the onboard storage controller option ROM utilities. Because the HP Z Turbo Drive does not use the onboard storage controllers, the drivers for the onboard storage controllers will not be used for the HP Z Turbo Drive.

**Can I use the HP Z Turbo Drive Quad Pro as a boot device?**

Yes, one of the SSD modules can be used as the boot device. Configuring RAID on a boot partition is not supported. Multiple SSD modules in the HP Z Turbo Drive Quad Pro cannot be used in a RAID array as a boot volume. RAIDed boot of OS partitions can be created based on the limitations of the software RAID capability supported in the OS.

**Can I use the HP Z Turbo Drive G2 as a boot device, and then use the HP Z Turbo Drive Quad Pro as a data device?**

Yes, this will enable the maximum capacity and performance for high bandwidth storage I/O workflows.

**Can I use RAID with the individual SSD modules in the HP Z Turbo Drive Quad Pro?**

Yes. For RAID support, there are specific differences and restrictions as compared to SATA/SAS HDDs or SSDs. Since there is not a good solution today for hardware based RAID, software RAID is used. See the table below for support details.

**Software RAID support with HP Z Turbo Drive PCIe SSD**

	Boot configuration	Data configuration (non-boot)
<b>Windows RAID</b>	Limited support – RAID 1* No support – RAID 0, 5, 10	Supports RAID 0, 1 No support – RAID 5, 10
<b>Linux®</b>	Functional** – RAID 0, 1* No support – RAID 5, 10	Functional** – 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. RAIDing the boot partition is not supported by HP.

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

**Can I add more than one HP Z Turbo Drive Quad Pro to my system?**

Yes. The technical requirement is for each device to be able to plug into a PCIe slot that supports Gen3 x16. The maximum number of drives supported is constrained by the available PCIe slots. When using more than one card in a system, please ensure that the card ID switches are set up correctly. See installation manual for more details.

**Factory/ordering support:**

- HP Z440 Workstation: 1 HP Z Turbo Drive Quad Pro
- HP Z640 Workstation: 1 HP Z Turbo Drive Quad Pro
- HP Z840 Workstation: 1 HP Z Turbo Drive Quad Pro

**Is there a special driver that is required for the new HP Z Turbo Drive Quad Pro SSD modules?**

Yes, NVMe devices require a driver for proper detection and operation. Windows 8 and higher have an inbox NVMe driver. For Windows 7, HP recommends using the Microsoft NVMe Driver. This driver is supplied in two separate QFE's. KB2990941 must be installed first. After installation of KB2990941, KB3087873 must be installed. Also note that the new NVMe driver will not support the original HP Z Turbo Drive, which requires an AHCI driver.

For Linux®, the NVMe driver was merged into version 3.3 of the Linux kernel. See below for supported operating systems.

**What is the endurance rating of the SSD modules used in the HP Z Turbo Drive Quad Pro in TBW (Total Bytes Written)?**

The multi-level cell (MLC) NAND used on the HP Z Turbo Drive is rated at 3,000 program / erase cycles. This level of endurance compares favorably to some of the SATA SSDs that HP supports in HP Z Workstations. The 256 GB<sup>1</sup> capacity version is specified at 146 TB<sup>1</sup> TBW (80 GB/day for 5 years), and the 512 GB<sup>1</sup> capacity version is specified at 292 TB<sup>1</sup> TBW (160 GB/day for 5 years).

**Which HP Z Workstation platforms will support the HP Z Turbo Drive Quad Pro?**

The HP Z Turbo Drive Quad Pro is supported on the HP Z440, Z640, and Z840 Workstations. Note that the HP Z Turbo Drive Quad Pro is not supported on the HP Z240 workstation platforms.

**Will the HP Z Turbo Drive Quad Pro be supported on Z420, Z620, and Z820?**

No, the HP Z Turbo Drive G2 (NVMe) is not supported on these platforms. HP supports NVMe technology solutions on current and new platforms.

**Will the platforms support both HP Z Turbo Drive Quad Pro and other SATA/SAS drives?**

Yes, HP supports many other storage components and controllers to enable various storage solutions. Most of these combinations are technically supported, yet not all of these component configurations and RAID support options are available from the factory.

**Is it possible to use the HP Z Turbo Drive Quad Pro with add-in SAS controllers?**

It is technically feasible to support other SAS controllers in addition to the HP Z Turbo Drive, though they may not be available as factory supported configurations.

**Do the SSD Modules in the HP Z Turbo Drive Quad Pro have an OROM (Option ROM) for boot?**

The current M.2 modules supported do not have an OROM. If they did, the HP Z Workstation BIOS would disable the OROM on the M.2 module and use the integrated code in the BIOS to support booting from the HP Z Turbo Drive.

**What happens if OROM from my add-in storage controller causes issues booting from the HP Z Turbo Drive Quad Pro?**

If conflicts are discovered between an external OROM and the HP Z Turbo Drive Quad Pro through the BIOS, disable the OROM for the slot where the add-in storage controller resides.

**Will the platforms support both the NVMe (HP Z Turbo Drive G2 and HP Z Turbo Quad Pro) and the AHCI version of the original HP Z Turbo Drive?**

Yes, but HP will not support mixing the drives as a factory configuration, and HP does not recommend or support RAID with the different versions.

**Which PCIe slots support the HP Z Turbo Drive Quad Pro?**

The following slots are tested and approved for the HP Z Turbo Drive Quad Pro on all supported HP Workstations (in order of preference):

HP Z840: Slot 6, Slot 4 (requires 2<sup>nd</sup> CPU), Slot 2<sup>2</sup>

HP Z640: Slot 5, Slot 2<sup>2</sup>

HP Z440: Slot 5, Slot 2<sup>2</sup>

**Which operating systems are supported?**

All varieties of the HP Z Turbo Drive are supported with Windows 7 64, Windows 8.1 64, Windows 10 64, RHEL 6, SLED 11 SP3, and Ubuntu 14.04.

**Is there a specific BIOS required to use the HP Z Turbo Drive Quad Pro?**

Yes, the minimum BIOS revision of 1.62 for HP Z440, Z640, and Z840 Workstations is required.

**Will HP Performance Advisor support the HP Z Turbo Drive Quad Pro?**

Yes, HP Performance Advisor will recognize all installed HP Z Turbo Drives. Newer technology NVMe cards, including the HP Z Turbo Drive G2 and HP Z Turbo Drive Quad Pro, do not currently expose the SMART attributes used by HP Performance Advisor to calculate and report wear level and life expectancy information. HP hopes to provide this additional information if/when the capability to extract this information is added to the disk controller driver.

**Are there any additional thermal concerns when using the HP Z Turbo Drive Quad Pro?**

No, the internal cooling solution within the HP Workstation desktop platforms will allow the HP Z Turbo Drive Quad Pro to operate over a broad temperature range without throttling down the performance of the SSD modules.

**Does the HP Z Turbo Drive Quad Pro support hardware encryption?**

The HP Z Turbo Drive Quad Pro is designed to support SSD modules with the hardware encryption feature. Today, there are no SSD modules offered that support hardware encryption. It is possible that future products may be released with hardware encryption features.

**Does the HP Z Turbo Drive Quad Pro have the ability to do Secure Erase?**

Yes, the SSD modules in the HP Z Turbo Drive Quad Pro support Secure Erase.

**Can I use the HP Z Turbo Drive Quad Pro in other HP Systems?**

The HP Z Turbo Drive Quad Pro has been developed exclusively for use in the supported HP Z Workstation platforms. Other HP platforms may provide support at a later date.

**Can I use the HP Z Turbo Drive Quad Pro in other non-HP Systems?**

No, the HP Z Turbo Drive Quad Pro has been engineered and qualified exclusively to support demanding HP Z Workstation users and their workflows.

<sup>1</sup> For hard drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 16 GB (for Windows 7) of system and up to 30 GB (for Windows 8) disk is reserved for system recovery software.

<sup>2</sup> Use of the HP Z Turbo Drive Quad Pro in Slot 2 will necessitate moving the primary graphics card to an x8 or x4 PCIe slot, which could lead to reduced graphics performance.

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