

### Overview

#### HP Z4 G5 Workstation



#### Front

1. Integrated Front Handle
2. Power Button
3. HDD Activity LED
4. Headphone/microphone combo
5. Front I/O Premium<sup>2</sup>:  
2 SuperSpeed USB Type-C™ 20 Gbps signaling rate (USB Power Delivery 3.0),  
2 SuperSpeed USB Type-A 5 Gbps signaling rate [left-most Type-A port supports BC1.2 (Battery Charging)]  
  
Front I/O Entry:  
4 SuperSpeed USB Type-A 5 Gbps signaling rate [left-most Type-A ports supports BC1.2 (Battery Charging)]
6. SD Card Reader
7. 2x External 5.25" bay<sup>1</sup>

<sup>1</sup>Only 1 external 5.25" drive configurable from factory

<sup>2</sup>Premium Front IO is shown on photography

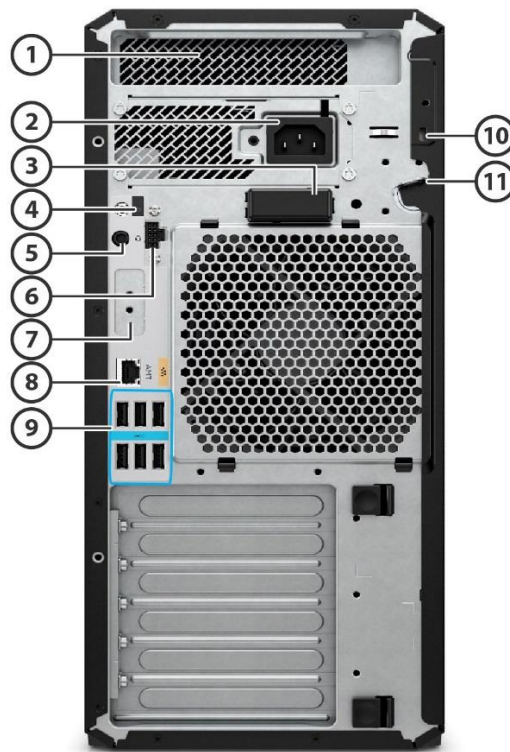
### Overview



### Internal View

- 1 Intel® Xeon® Processor (Sapphire Rapids)
- 2 8 DIMM slots for DDR5 ECC Memory
- 3
  - Slot 1: PCIe x16 Gen5
  - Slot 2: PCIe x4 Gen4
  - Slot 3: PCIe x4 Gen4
  - Slot 4: PCIe x16 Gen4
  - Slot 5: PCIe x16 Gen4
- 4 2 PCIe x4 Gen4 configurable with M.2 SSDs
- 5 5 SATA ports
- 6 3 Internal USB Ports. 1 single USB2.0 port, 1 dual USB2.0 port, 1 USB3.0 port (for the SD card reader)
- 7 2 Internal 3.5" bays
- 8 2 External 5.25" bays
- 9 Choice of 525W, 775W, or 1125W 90% Efficient Power Supplies
- 10 1 Internal NVMe connector to front removable M.2 carrier

### Overview



### Rear View

1. Integrated Rear Handle
2. Power Connector (Choice of 525W, 775W, or 1125W 90% Efficient Power Supplies)
3. External Antenna
4. Rear Power Button
5. Audio In/Out
6. Manageability Port (optional)
7. Flex I/O Module (optional)
8. 1 RJ-45 Integrated LAN Port (1GbE AMT)
9. 6 SuperSpeed USB Type-A 5Gbps Signaling Rate
10. Kensington Lock Slot
11. Padlock loop

**Form Factor** Tower

### Operating Systems

#### Preinstalled:

- Windows 11 Pro for Workstations<sup>2</sup>
- Windows 11 Pro for Workstations (preinstalled with Windows 10 Pro for Workstations Downgrade)<sup>2,3</sup>
- Ubuntu Linux 22.04<sup>4</sup>
- HP Linux<sup>®</sup>-ready (minimal OS ready for customer OS installation)<sup>5</sup>

#### License Only:

- Red Hat<sup>®</sup> Enterprise Linux<sup>®</sup> Desktop Workstation (includes paper license with 1 year support; no preinstalled OS)<sup>6</sup>

#### Supported:

- Windows 11, version 22H2, 21H2<sup>2</sup>
- Windows 10, version 22H2, 21H2<sup>2</sup>
- Red Hat<sup>®</sup> Enterprise Linux<sup>®</sup> Workstation 8 & 9<sup>6</sup>
- SUSE Linux<sup>®</sup> Enterprise Desktop 15<sup>6</sup>

### Overview

- Ubuntu 20.04 & 22.04 LTS<sup>5</sup>

Web-supported only:

- Windows 11 Enterprise<sup>2,1</sup>
- Windows 10 Enterprise<sup>2,1</sup>

<sup>1</sup> Windows Enterprise sold separately and requires that customer have an enterprise license from Microsoft.

<sup>2</sup> Not all features are available in all editions or versions of Windows. Systems may require upgraded and/or separately purchased hardware, drivers, software or BIOS update to take full advantage of Windows functionality. Windows is automatically updated and enabled. High speed internet and Microsoft account required. ISP fees may apply and additional requirements may apply over time for updates. See <http://www.windows.com>.

<sup>3</sup>This system is preinstalled with Windows 10 Pro software and also comes with a license for Windows 11 Pro software and provision for recovery software. You may only use one version of the Windows software at a time. Switching between versions will require you to uninstall one version and install the other version. You must back up all data (files, photos, etc.) before uninstalling and installing operating systems to avoid loss of your data.

<sup>4</sup> Not all features are available in all editions or versions of Ubuntu. Systems may require upgraded and/or separately purchased hardware, drivers, software or BIOS to take full advantage of Ubuntu functionality. Ubuntu may be automatically updated. ISP fees may apply and additional requirements may apply over time for updates.

<sup>5</sup>A certified preloaded version of Ubuntu® 20.04 LTS is available from HP for this platform. Not all features are available in all editions or versions of Ubuntu. Systems may require upgraded and/or separately purchased hardware, drivers, software or BIOS to take full advantage of Ubuntu functionality. Ubuntu may be automatically updated. ISP fees may apply, and additional requirements may apply over time for upgrades.

<sup>6</sup>For detailed Linux® OS/hardware support information, see:

[http://www.hp.com/support/linux\\_hardware\\_matrix](http://www.hp.com/support/linux_hardware_matrix)

**NOTE:** Your product does not support Windows 8 or Windows 7. In accordance with Microsoft's support policy, HP does not support the Windows® 8 or Windows 7 operating system on products configured with Intel® and AMD® 7th generation and forward processors or provide any Windows® 8 or Windows 7 drivers on <http://www.support.hp.com>. A full list of HP products and the Windows 10 versions tested is available on the HP support website. <https://support.hp.com/us-en/document/c05195282>

### Overview

#### Processors

Name <sup>1</sup>	Cores	Threads	Frequency (GHz)				Cache (MB)	Max Memory Speed(MT/s)		TDP (W)
			Base Frequency	All-Core Frequency	Max Turbo Frequency <sup>2</sup>	ITBM 3.0 Frequency <sup>2</sup>		1 DIMM per Channel	2 DIMM per Channel	
Intel® Xeon® W7-2495X	24	48	2.5	3.3	4.8	4.8	45	4800	4400	225
Intel® Xeon® W7-2475X	20	40	2.6	3.4	4.8	4.8	37.5	4800	4400	225
Intel® Xeon® W5-2465X	16	32	3.1	3.7	4.7	4.7	33.75	4800	4400	200
Intel® Xeon® W5-2455X	12	24	3.2	3.9	4.6	4.6	30	4800	4400	200
Intel® Xeon® W5-2445	10	20	3.1	4.0	4.6	4.6	26.25	4800	4400	175
Intel® Xeon® W3-2435	8	16	3.1	4.0	4.5	4.5	22.5	4400	4400	165
Intel® Xeon® W3-2425	6	12	3.0	3.7	4.4	4.4	15	4400	4400	130
Intel® Xeon® W3-2423	6	12	2.1	3.1	4.2	4.2	15	4400	4400	110

#### Notes:

- Xeon W-2400 processors all feature Intel® vPro® Technology<sup>3</sup>
- Xeon W-2400 processors all support Hyper-Threading
- Xeon W-2400 processors do not offer integrated graphics

<sup>1</sup> Multicore is designed to improve performance of certain software products. Not all customers or software applications will necessarily benefit from use of this technology. Performance and clock frequency will vary depending on application workload and your hardware and software configurations. Intel's numbering, branding and/or naming is not a measurement of higher performance.

<sup>2</sup> Intel Turbo Boost Max (ITBM) performance varies depending on hardware, software, and overall system configuration. See <http://www.intel.com/technology/turboboost> for more information.

<sup>3</sup> Intel vPro® requires Windows 10 Pro 64 bit or higher, a vPro supported processor, vPro enabled chipset, vPro enabled wired LAN and/or Wi-Fi 6E WLAN and TPM 2.0. Some functionality requires additional 3rd party software in order to run. Features of vPro® Essentials and Enterprise vary. See <http://intel.com/vpro>

### Overview

<b>Color</b>	Black
<b>Convertibility</b>	No
<b>Expansion Slots</b> (see system board section for more details)	<ul style="list-style-type: none"> <li>•Slot 1: PCIe x16 Gen5</li> <li>•Slot 2: PCIe x4 Gen4</li> <li>•Slot 3: PCIe x4 Gen4</li> <li>•Slot 4: PCIe x16 Gen4</li> <li>•Slot 5: PCIe x16 Gen4</li> </ul>
<b>Expansion Bays</b> (see storage section for more details)	1 internal 3.5" bays 2 external 5.25" bays
<b>Front I/O</b>	Front I/O Premium: 2 SuperSpeed USB Type-C™ 20 Gbps signaling rate (USB Power Delivery 3.0), 2 SuperSpeed USB Type-A 5 Gbps signaling rate, 1 headphone/microphone combo, SD card reader (optional). [left-most Type-A ports supports BC1.2 (Battery Charging)]  Front I/O Entry: 4 SuperSpeed USB Type-A 5 Gbps signaling rate, 1 headphone/microphone combo, SD card reader (optional). [left-most Type-A ports supports BC1.2 (Battery Charging)]
<b>Internal I/O [5]</b>	3 Internal USB ports and 5 SATA ports.
<b>Rear I/O</b>	Audio In/Out, 6x SuperSpeed USB Type-A 5Gbps signaling rate, 1 RJ-45 Integrated LAN port (1GbE AMT) Optional: Flex I/O Module
<b>Optional I/O</b>	Flex I/O Module (Serial Port v3, Dual USB-A 3.2 Gen1, USB-C 3.2 Gen2, 10GbE single port, 2.5GbE LAN single port, 1 GbE single port, 1GbE Fiber single port LC, WiFi6 + BT5.2 WLAN w/ INTAnt) External Antenna
<b>On-board RAID Support</b>	SATA RAID 0 Striped Array SATA RAID 1 Mirrored Array SATA RAID 10 Striped/Mirrored SATA RAID 5 Parity Array
<b>Chassis Dimensions (H x W x D)</b>	Footprint: H: 15.2" (386 mm) W: 6.65" (169 mm) D: 17.5" (445 mm) Maximum: H: 15.2" (386 mm) W: 6.65" (169 mm) D: 18" (458.6 mm)
<b>Packaged Dimensions</b>	H: 22.5" (572 mm) W: 12.4" (314 mm) D: 22.2" (563 mm)
<b>Palletization Profile</b>	6 units x 3 layers = 18 units per pallet 1200x1000x1836mm (pallet included)
<b>Rack Dimensions</b>	4U
<b>Weight</b>	Exact weights depend upon configuration (System weight only). Minimum: 10.5 kg (23.2 lbs.) Typical: 12.6 kg (27.8 lbs.) Maximum: 19.5 kg (42.9 lbs.)
<b>Temperature</b>	Operating: 5° to 40°C (40° to 104°F) <sup>1</sup> Non-operating: -40° to 60°C (-40° to 140°F) Above 1524 m (5,000 feet) altitude, the maximum operating temperature is reduced by 1° C (1.8° F) for every 305 m (1,000 feet) increase in elevation Maximum rate of change: 10 °C/hr No direct sustained sunlight

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<sup>1</sup>40°C has been validated for configs up to a 220W CPU, 2x NVIDIA® A4000 graphics cards, 8x64GB of RAM, 4TB of M.2 storage, 4TB of HDD storage, and a 1125W PSU

#### Humidity

Operating: Operating: 8% to 85% RH, non-condensing, 35° C maximum wet bulb

Non-operating: 8% to 90%, non-condensing, 35° C maximum wet bulb

#### Maximum Altitude (non-pressurized)<sup>6</sup>

Operating (with Rotational Hard Drives): 3,048 m (10,000 feet)

Operating (with only Solid-State Drives): 5,000 m (16,404 feet)

Non-operating: 9,144m (30,000ft)

**NOTE:** Above 1524 m (5,000 feet) altitude, maximum operating temperature is reduced by 1° C (1.8° F) per 305 m (1,000 feet) elevation increase

#### Power Supply

Choice of 80 Plus Gold (90% efficiency at 50% load) Power Supplies:

- 1125W (@100V/15A or 200V/10A) ([Delta Efficiency Report](#))
- 775W (@100V/15A or 200V/10A) ([Delta Efficiency Report](#))
- 525W (@100V/15A or 200V/10A) ([Delta Efficiency Report](#))

**NOTE:** not all configurations are supported on all power supplies. Configuration support depends on total system power budget and having sufficient number or type of PCIe supplemental power connectors. Confirm power supply and configuration support using configurator on [hp.com](#).

- 1125W supports up to 600W of auxiliary graphics power (dependent on system configuration)
- 775W supports up to 400W of auxiliary graphics power (dependent on system configuration)
- 525W supports up to 100W of auxiliary graphics power (dependent on system configuration)

**NOTE:** updating graphics after purchase may require additional power distribution cables and/or auxiliary graphics adapters to support the new graphics configuration.

#### Workstation ISV Certifications

See the latest list of certifications at

<http://www.hp.com/united-states/campaigns/workstations/partnerships.html>

#### Chipset

Intel® W790 chipset

#### Memory

8 DIMM slots, supporting up to 512GB, DDR5 4800 MT/s speed depending on the system configuration

### Supported Components

#### Processors

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
<b>Intel® Xeon® W-2400 Processors</b>				
Intel® Xeon® W7-2495X	Y	N		
Intel® Xeon® W7-2475X	Y	N		
Intel® Xeon® W5-2465X	Y	N		
Intel® Xeon® W5-2455X	Y	N		
Intel® Xeon® W5-2445	Y	N		
Intel® Xeon® W3-2435	Y	N		
Intel® Xeon® W3-2425	Y	N		
Intel® Xeon® W3-2423	Y	N		

#### SATA Hard Drives

	Factory Configured	Option Kit	Option Kit Part Number
1TB 7200RPM SATA 3.5in Enterprise HDD <sup>1,2</sup>	Y	Y	W0R10AA
2TB 7200RPM SATA 3.5in Enterprise HDD <sup>1,2</sup>	Y	Y	2Z274AA
4TB 7200 RPM SATA 3.5in Enterprise HDD <sup>1,2</sup>	Y	Y	K4T76AA/AT
8TB 7200RPM SATA 3.5in Enterprise HDD <sup>1,2</sup>	Y	Y	2Z273AA
12TB 7200 RPM SATA-6G 3.5in Enterprise HDD <sup>1,2</sup>	Y	Y	5S461AA

**NOTE:** Starting November 1, 2023, HP PCs with Windows require Windows to be installed on SSD. HDD can only be configured as additional data drives and not as the boot drive.

#### PCIe Solid State Drives

Z Turbo 512GB PCIe-4x4 TLC SSD Module	Y	Y	38T80AA	
Z Turbo 512GB 2280 PCIe-4x4 SED OPAL2 TLC M.2 SSD Module	Y	Y	38T81AA	
Z Turbo 1TB 2280 PCIe-4x4 SED OPAL2 TLC M.2 SSD Module	Y	Y	38T76AA	
Z Turbo 1TB PCIe-4x4 TLC SSD Module	Y	Y	38T77AA	
HP 1TB 2280 PCIe-4x4 NVMe M.2 India Solid State Drive	Y	Y	9A1X3AA	
Z Turbo 2TB 2280 PCIe-4x4 SED OPAL2 TLC M.2 SSD Module	Y	Y	38T79AA	
Z Turbo 2TB PCIe-4x4 TLC SSD Module	Y	Y	38T75AA	
Z Turbo 4TB 2280 PCIe-4x4 TLC M.2 SSD Module	Y	Y	5S496AA/AT	
Z Turbo 4TB 2280 PCIe-4x4 SED OPAL2 TLC M.2 SSD Module	Y	Y	5S497AA/AT	
Z Turbo 512GB PCIe-4x4 TLC Z4/Z6 Kit SSD	Y	Y	56Q73AA	
Z Turbo 512GB 2280 PCIe-4x4 SED OPAL2 TLC M.2 Z4/Z6 Kit SSD	Y	Y	56Q74AA	
Z Turbo 1TB PCIe-4x4 TLC Z4/Z6 Kit SSD	Y	Y	56Q75AA	
Z Turbo 1TB 2280 PCIe-4x4 SED OPAL2 TLC M.2 Z4/Z6 Kit SSD	Y	Y	5Z7E7AA	
Z Turbo 2TB 2280 PCIe-4x4 SED OPAL2 TLC M.2 Z4/Z6 Kit SSD	Y	Y	56Q77AA	
HP 2TB 2280 PCIe-4x4 NVMe M.2 India Solid State Drive	Y	Y	9A1X2AA	
Z Turbo 4TB 2280 PCIe-4x4 SED OPAL2 TLC M.2 Z4/Z6 Kit SSD	Y	Y	5S4A1AA	
<b>HP Z Turbo Drive Dual Pro</b>				
HP Z Turbo Drive Dual Pro PCIe-4x4 NVMe Carrier <sup>3</sup>	Y	Y	56Q86AA	



### Supported Components

HP Z Turbo Drive Dual Pro 512GB TLC SSD	Y	N	
HP Z Turbo Drive Dual Pro 1TB TLC SSD	Y	N	
HP Z Turbo Drive Dual Pro 2TB TLC SSD	Y	N	
HP Z Turbo Drive Dual Pro 4TB TLC SSD	Y	N	
<b>HP Z Turbo Drive Quad Pro</b>			
HP Z Turbo Drive Quad Pro PCIe-4x16 NVMe Carrier	Y	Y	7H9Z3AA
HP Z Turbo Drive Quad Pro 512GB TLC SSD	Y	N	
HP Z Turbo Drive Quad Pro 1TB TLC SSD	Y	N	
HP Z Turbo Drive Quad Pro 2TB TLC SSD	Y	N	
HP Z Turbo Drive Quad Pro 4TB TLC SSD	Y	N	
<b>Intel® Virtual RAID on CPU (Intel® VROC) for NVMe</b>			
Intel VROC NVMe SSD Premium Ctlr Module <sup>5</sup>	N	Y	3FJ81AA
Intel VROC NVMe SSD Standard Ctlr Module <sup>4</sup>	Y	Y	3FJ80AA

**Note 1:** For internal bay install, HDD option kits require separate purchase of 74Y88AA HP Z4 HDD Cable Kit. For external bay install, HDD options kits require separate purchase of 74Y88AA HP Z4 HDD Cable Kit & NQ099AA HP Optical Bay HDD Mounting Bracket.

**Note 2:** Up to (4) 3.5-inch 7200 rpm SATA drives: 1TB, 2TB, 4TB, 8TB, 12TB; 48TB max

**Note 3:** Kit includes dual pro carrier and heatsink. Requires separate purchase of ZTurbo PCIe 4x4 M.2 SSD modules.

**Note 4:** Enables RAID 0, 1 & 10

**Note 5:** Enables RAID 0, 1 & 10 plus RAID 5 with write hole closure options

**NOTE:** For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 36GB of system disk (for Windows) is reserved for system recovery software.

Graphics		Factory Configured	Option Kit	Option Kit Part Number	Supported # of cards
<b>Graphics Cable Adapters</b>	HP DisplayPort To VGA Adapter	N	Y	AS615AA/AT	
	HP DisplayPort To VGA Adapter	N	Y	F7W97AA	
	HP GFX Pwr Cbl CPU-8p to CPU-8p	Y	Y	6J6H7AA	
	HP GFX Pwr Cbl CPU-8p to x2 PCIe 8p(6+2)	Y	Y	6J6H8AA	
	HP DisplayPort to HDMI Adapter	Y	Y	2JA63AA	
	HP (Bulk 12) miniDP-to-DP Adapter Cables	N	Y	2KW87A6	
	HP Single miniDP-to-DP Adapter Cable	Y	Y	2MY05AA	
	HP miniDP-to-DP Adapter (2-pack)	Y	N		
	HP miniDP-to-DP Adapter (4-pack)	Y	N		
	HP miniDP-to-DP Adapter (8-pack)	Y	N		
	HP DisplayPort To DVI Adapter (Bulk 90)	N	Y	FH973A6	
NVIDIA NVLink 3-Slot Bridge	Y	Y	340L3AA		
NVIDIA 3D Stereo Bracket	N	Y	K0A25AA		
<b>Ultra High-End Graphics</b>	NVIDIA® RTX 6000 Ada 48GB <sup>1,3</sup>	Y	Y	79C23AA/AT	2
	NVIDIA® RTX 6000 Ada 48 GB 4DP w/NVIDIA Omniverse Enterprise Graphics	N	Y	9X3E1AA	2
	NVIDIA® RTX A6000 48GB <sup>1,3</sup>	Y	Y	2S6U3AA/AT	2
	NVIDIA® RTX 5000 Ada 32GB <sup>1</sup>	Y	Y	8D6B6AA	2

### Supported Components

	NVIDIA® RTX A5000 24GB <sup>1</sup>	Y	Y	20X23AA/AT	2
	NVIDIA® Quadro® Sync II	N	Y	1WT20AA	
	AMD® Radeon™ Pro W7900 48GB <sup>1</sup>	Y	Y	8F699AA	1
<b>High-End Graphics</b>	NVIDIA® RTX 4500 Ada 24GB <sup>1</sup>	Y	Y	8D6C1AA	2
	NVIDIA® RTX A4500 20GB <sup>1</sup>	Y	Y	5S458AA/AT	2
	NVIDIA® RTX 4000 Ada 20GB	Y	Y	8D6B7AA	2
	NVIDIA® RTX A4000 16GB <sup>1</sup>	Y	Y	20X24AA/AT	2
	NVIDIA® Long-Life RTX A4000E 16GB <sup>1</sup> ,	Y	Y	6H7J7AA	2
	AMD® Radeon™ Pro W6800 32GB <sup>1,3</sup>	Y	Y	340K7AA	2
<b>Midrange Graphics</b>	NVIDIA® RTX 2000 Ada 16GB	Y	Y	8D6B8AA	2
	NVIDIA® RTX A2000 12GB <sup>1</sup>	Y	Y	5Z7D9AA/AT	2
	NVIDIA® Long-Life RTX A2000E 12GB <sup>1</sup>	Y	N		2
	NVIDIA® T1000 8GB <sup>2</sup>	Y	Y	5Z7D8AA/AT	2
	NVIDIA® Long-Life T1000E 8GB <sup>2</sup>	Y	Y	6V9V4AA/AT	2
	NVIDIA® T1000 4GB <sup>2</sup>	Y	Y	20X22AA/AT	2
	AMD Radeon Pro W7600 8GB <sup>1</sup>	Y	Y	8D6B9AA	1
	AMD Radeon Pro W7500 8GB <sup>2</sup>	Y	Y	8D6C2AA	1
	AMD® Radeon™ Pro W6600 8GB <sup>1</sup>	Y	Y	340K5AA	2
	AMD® Radeon™ RX 6700XT 12GB <sup>1</sup>	Y	N		1
<b>Entry</b>	NVIDIA® T400 4GB <sup>2</sup>	Y	Y	5Z7E0AA/AT	2
	AMD® Radeon™ RX 6400 4GB	Y	Y	6Q3U4AA/AT	1
	Intel Arc Pro A40 6GB	Y	Y	6E3Y8AA	1
	NVIDIA® RTX A2000 6GB	Y	Y	7G9D9AV	1

**Note 1:** Single or dual graphics configuration requires the HP Z4 Fan and Front Card Guide. If configured as an after-market option, a separate purchase of the HP Z4 Fan and Front Card Guide 56Q79AA is required. If factory configured, the fan and front card guide is included.

**Note 2:** Dual graphics configuration requires the HP Z4 Fan and Front Card Guide. If configured as an after-market option, a separate purchase of the HP Z4 Fan and Front Card Guide 56Q79AA is required. If factory configured, the fan and front card guide is included.

**Note 3:** Dual graphics configuration requires the HP Z4 PCIe Retainer with Fans. If configured as an after-market option, a separate purchase of the HP Z4 PCIe Retainer with Fans 56Q84AA is required. If factory configured, the PCIe retainer with fans is included.

**NOTE:** If a graphics card is not being configured in this system, it is highly recommended that the following fan AVs be added to the configuration in order to ensure full performance and avoid POST errors when a graphics card is added later: 57L00AV (HP Z4 G5 PCIe Retainer with Fans) and 57K40AV (HP Z4 G5 Fan and Front Card Guide Kit). These fans can be purchased aftermarket as well. Note that the HP Z4 G5 Fan and Front Card Guide Kit is required in order to use the HP Z4 G5 PCIe Retainer with Fans.

### Memory

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
16GB (1x16GB) DDR5 4800 DIMM ECC REG Memory	Y	N		
32GB (2x16GB) DDR5 4800 DIMM ECC REG Memory	Y	N		
64GB (4x16GB) DDR5 4800 DIMM ECC REG Memory	Y	N		
64GB (2x32GB) DDR5 4800 DIMM ECC REG Memory	Y	N		

### Supported Components

128GB (8x16GB) DDR5 4800 DIMM ECC REG Memory	Y	N	1
128GB (4x32GB) DDR5 4800 DIMM ECC REG Memory	Y	N	
256GB (8x32GB) DDR5 4800 DIMM ECC REG Memory	Y	N	1
256GB (4x64GB) DDR5 4800 DIMM ECC REG Memory	Y	N	
512GB (8x64GB) DDR5 4800 DIMM ECC REG Memory	Y	N	1

#### After Market Options

16GB (1x16GB) DDR5 4800 DIMM ECC REG Memory	Y	Y	340K1AA
16GB (1x16GB) DDR5 4800 DIMM ECC Registered India Memory	Y	Y	99T39AA
32GB (1x32GB) DDR5 4800 DIMM ECC REG Memory	Y	Y	340K2AA
32GB (1x32GB) DDR5 4800 DIMM ECC Registered India Memory	Y	Y	99T40AA
64GB (1x64GB) DDR5 4800 DIMM ECC REG Memory	Y	Y	340K3AA

**NOTE 1:** This memory configuration requires the 775W or 1125W PSU

### Multimedia and Audio Devices

	Factory Configured	Option Kit	Option Kit Part Number
Integrated Realtek ALC3205-CG Audio	Y	N	

### Optical and Removable Storage

	Factory Configured	Option Kit	Option Kit Part Number
HP CRU QX428 Removable with 200mm Cable Frame/Carrier <sup>1,4</sup>	Y	N	
HP DX175 Removable HDD Frame/Carrier <sup>2</sup>	Y	Y	1ZX71AA
HP DX175 Removable HDD Spare Carrier <sup>2</sup>	N	Y	1ZX72AA
HP CRU Secure High Performance Storage Module with 2TB M.2 SSD <sup>3</sup>	Y	Y	56Q87AA
HP CRU Secure High Performance Storage Module with 1TB M.2 SSD <sup>3</sup>	Y	Y	56Q88AA
HP CRU Secure High Performance Storage Module with 512GB M.2 SSD <sup>3</sup>	Y	Y	56Q89AA
HP 9.5mm Slim DVD-ROM Drive	Y	Y	K3R63AA
HP 9.5mm Slim BDXL Blu-Ray Writer Drive	Y	Y	K3R65AA
HP 9.5mm Slim SuperMulti DVD Writer	Y	Y	K3R64AA

**Note 1:** Optional separate purchase of HP CRU Secure High Performance Storage (SHIPS) Module(s).

**Note 2:** Only supports 4TB or lower capacity HDDs.

**Note 3:** HP CRU SHIPS Module Kit contains select M.2 SSD for install into a factory configured front removeable storage carrier (HP CRU QX428 Frame/Carrier).

**Note 4:** Front QX428 carrier supports hot-swap capability with front removable drives

### Networking and Communications

	Factory Configured	Option Kit	Option Kit Part Number
HP 10GBase-T Flex Port	Y	Y	56Q71AA
HP 2.5GbE LAN Flex Port	Y	Y	169K0AA/AT
HP Flex 1GbE Single Port NIC	Y	N	

### Supported Components

HP 1GbE Fiber LC Single Flex Port	Y	N	20J15AA
Intel® X550 10GBASE-T Dual Port NIC	Y	Y	1QL46AA
Intel® I225-T1 Single Port 2.5GbE PCIe NIC	Y	Y	406L9AA
Intel® Ethernet I350-T4 4-Port 1Gb NIC	N	Y	W8X25AA
Intel® AX210 Wi-Fi 6 non-vPro +Bluetooth® 5.2 wireless card with Internal Antenna WLAN	N	N	
Allied Telesis AT-2914SX/LC-901 1GB LC Fiber NIC	Y	Y	1C7Q2AA
Allied Telesis AT-2911T/2-901 Dual Port 1GbE NIC	Y	Y	6E3Y9AA/AT
NVIDIA® Mellanox® ConnectX-6 DX Dual Port 10/25GbE SFP28 NIC <sup>1</sup>	Y	Y	436M8AA
HP 10GbE SFP+ SR/SW LC Fiber Optic Transceiver	Y	Y	860T8AA
HP 25GbE SFP28 LC Fiber Optic Transceiver	Y	Y	860T9AA
Intel AX210 Wi-Fi 6E non-vPro + Bluetooth® 5.2 wireless card with External Antenna WLAN	Y	Y	340L7AA

### HP Remote System Controller

	Factory Configured	Option Kit	Option Kit Part Number
HP Remote System Controller	Y	Y	7K6D7AA
HP Remote System Controller Main Board Adapter	Y	Y	7K6D8AA
HP Integrated Remote System Controller	Y	Y	7K6D9AA
HP Remote System Controller for Universal KVM	N	Y	7K7N2AA

### Racking and Physical Security

	Factory Configured	Option Kit	Option Kit Part Number
Z2 Mini/Z2 Tower/Z4/Z6 Depth Adjustable Fixed Rail Rack Kit	N	Y	2A8Y5AA

### Input Devices

	Factory Configured	Option Kit	Option Kit Part Number
HP 320K Wired Keyboard	Y	Y	9SR37AA/ET/UT
HP 125 Wired Keyboard	Y	Y	266C9AA/ET/UT
HP 975 USB+BT Dual-Mode Wireless Keyboard	N	Y	3Z726AA/ET/UT
HP 455 Programmable Wireless Keyboard	N	Y	4R177AA/ET/UT/A6
HP Wired Desktop 320MK Mouse and Keyboard	N	Y	9SR36AA/ET/UT
HP 655 Wireless Keyboard and Mouse Combo	N	Y	4R009AA/ET/UT/A6
HP Wired 320M Mouse	Y	Y	9VA80AA/ET/UT
HP Creator 935 Black Wireless Mouse	N	Y	1D0K8AA/ET/UT
HP 128 LSR Wired Mouse	Y	Y	265D9AA/ET/UT
HP 125 Wired Mouse	N	Y	265A9AA/ET/UT
HP Business Slim Smartcard Keyboard	Y	Y	Z9H48AA/AT

**NOTE:** Keyboard and Mouse are optional or add on features.

### Other Hardware

	Factory Configured	Option Kit	Option Kit Part Number
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### Supported Components

HP Z4 Fan and Front Card Guide Kit <sup>5</sup>	Y	Y	56Q79AA
HP Z4 Memory Cooling Solution <sup>4</sup>	Y	Y	56Q81AA
HP Z4 PCIe Retainer with Fans <sup>5</sup>	Y	Y	56Q84AA
HP 2.5in to 3.5in HDD Adapter Kit	N	Y	J5T63AA
HP Internal Serial+PS/2 Port	Y	Y	56Q78AA
HP Serial Port Flex IO v3	Y	Y	13L56AA/AT
HP Dual USB-A 3.2 Gen1 Flex 2020	Y	Y	141J8AA/AT
HP USB-C 3.2 Gen2 Alt Flex Port 2020	Y	Y	141K6AA/AT
HP Dual TBT4 PCIe x4 Low Profile Card	Y	Y	340L1AA
HP USB 2.0 Type-A Port Adapter Kit <sup>1</sup>	Y	Y	79C24AA
HP Type-C SuperSpeed USB 20Gbps Front IO v2 Premium Module	Y	Y	38T92AA
HP 2.5in HDD/SSD 2-in-1 Optical Bay Bracket	N	Y	K4T74AA
HP Z4 HDD Cable Kit <sup>2</sup>	N	Y	74Y88AA
HP Optical Bay HDD Mounting Bracket <sup>3</sup>	N	Y	NQ099AA
HP Z4 Dust Filter	Y	Y	3DY47AA
HP SD 4 Card Reader Zx G4	Y	Y	2VK54AA
HP C13 1.83m Power Cord Kit	N	Y	6Z1T9AA
C13-C14 2.0m 15A 100-127V Countries Straight Desktop Power Cord	Y	Y	8R881AA
C13-C14 2.0m 10A 200-240V Countries Straight Desktop Power Cord			8R882AA

**Note 1:** The HP USB 2.0 Type-A Port Adapter Kit 79C24AA has a single USB 2.0 type A connector.

**Note 2:** HP Z4 HDD Cable Kit 74Y88AA is required as a separate purchase for HDD option kit install into an internal bay. For external bay install, a separate purchase of 74Y88AA HP Z4 HDD Cable Kit & NQ099AA HP Optical Bay HDD Mounting Bracket is required.

**Note 3:** NQ099AA HP Optical Bay HDD Mounting Bracket is required as a separate purchase for HDD option kits installed into an external bay.

**Note 4:** HP Z4 Memory Cooling Solution 56Q81AA is required as a separate purchase for after-market memory configurations using 32GB Registered DIMMs or greater. If configured from the factory, configurations using 32GB Registered DIMMs or greater will include a memory cooling solution.

**Note 5:** HP Z4 Fan and Front Card Guide 56Q79AA and HP Z4 PCIe Retainer with Fans 56Q84AA are required for specific graphics configurations (see Graphics section).

### Software

	Factory Configured	Option Kit	Support Notes
Data Science Stack	Y	N	1
WSL2/Ubuntu Data Science Stack	Y	N	1
Microsoft Office Home and Business Japan 2021	Y	N	

**Note 1:** Only available with Ubuntu and NVIDIA® graphics

### Operating Systems Windows 11 Pro for Workstations<sup>1,2</sup>

Windows 11 Pro for Workstations (preinstalled with Windows 10 Pro for Workstations Downgrade)<sup>1,2,3</sup>

Ubuntu 22.04 LTS<sup>4</sup>

HP Linux®-ready

### Supported Components

<sup>1</sup> Windows Enterprise sold separately and requires that customer have an enterprise license from Microsoft.

<sup>2</sup> Not all features are available in all editions or versions of Windows. Systems may require upgraded and/or separately purchased hardware, drivers, software or BIOS update to take full advantage of Windows functionality. Windows is automatically updated and enabled. High speed internet and Microsoft account required. ISP fees may apply and additional requirements may apply over time for updates. See <http://www.windows.com>.

<sup>3</sup>This system is preinstalled with Windows 10 Pro software and also comes with a license for Windows 11 Pro software and provision for recovery software. You may only use one version of the Windows software at a time. Switching between versions will require you to uninstall one version and install the other version. You must back up all data (files, photos, etc.) before uninstalling and installing operating systems to avoid loss of your data.

<sup>4</sup> Not all features are available in all editions or versions of Ubuntu. Systems may require upgraded and/or separately purchased hardware, drivers, software or BIOS to take full advantage of Ubuntu functionality. Ubuntu may be automatically updated. ISP fees may apply and additional requirements may apply over time for updates.

**NOTE:** Your product does not support Windows 8 or Windows 7. In accordance with Microsoft's support policy, HP does not support the Windows<sup>®</sup> 8 or Windows 7 operating system on products configured with Intel<sup>®</sup> and AMD<sup>®</sup> 7<sup>th</sup> generation and forward processors or provide any Windows<sup>®</sup> 8 or Windows 7 drivers on <http://www.support.hp.com>. A full list of HP products and the Windows 10 versions tested is available on the HP support website. <https://support.hp.com/us-en/document/c05195282>

### Supported Components

#### HP BIOS

Key features of the HP BIOS include:

- Deployment and manageability – HP BIOS provides several technologies that help integrate the HP Z4 G5 Workstation into the enterprise, such as PXE, remote recovery, remote configuration, remote control, and BIOS (F10) Setup support for 15 languages.
- Network firmware updates – Update your BIOS via the cloud or standardize on a BIOS version hosted on an Enterprise network.
- Stability – HP BIOS supports the HP stable product roadmap by releasing only critical BIOS changes to the factory and advanced change notification.
- Class 3 UEFI specification version 2.7
- Absolute Persistence agent – For tracking and tracing services, available in select countries, separate software and purchase of a subscription is required.
- Thermal and power management – The HP BIOS provides and enables thermal and power management technologies so component temperatures are managed for high reliability and to assist in operating the HP Workstation computer in any enterprise environment.
- Acoustic performance – Industry leading acoustic emissions across the range of operating conditions.
- Serviceability – HP BIOS provides diagnostic and detailed service information.
- Upgrades and recovery – HP BIOS provides numerous ways to upgrade HP Workstation computers, including BIOS updates from within Windows (HP Firmware Update and Recovery), Capsule update, HP Client Manager, and fail-safe recovery. In addition, the HP BIOS Configuration Utility enables replication of BIOS settings within Windows while the Replicated Setup feature provides the same capability within BIOS (F10) Setup. The BIOS Configuration Utility is available from the HP support website.
- HP BIOS uses PKI signing of the BIOS for trusted BIOS upgrades and recovery. Additional HP BIOS Features:
  - Power-On password – Helps prevent an unauthorized user from powering on the system.
  - Administrator password – Also known as the BIOS Setup password, this helps prevent unauthorized changes to the system configuration. If the administrator password is not known, the BIOS cannot be updated and changes cannot be made to BIOS settings using BIOS Setup or under the OS.
  - S4/S5 Maximum Power Savings setting supports EU Lot6 requirement and allows the computer to power down below 0.5W in S4/S5 (when turned off). When S4/S5 Maximum Power Savings feature is enabled below features are turned off:
    - Power to expansion connectors / slots
    - Most Wake events other than power buttons and WOL (Wake on LAN supported by embedded Lan controller under S4/S5 Maximum Power Saving Enabled)
    - USB charging ports

#### HP Sure Start Gen7

- BIOS Integrity checking – Sure Start protection ensures that only trusted BIOS code is executed and not rootkits, viruses and malware. Verification is done upon boot up, shutdown and while the system is on.
- Sure Start is set by default to automatically repair the BIOS if corrupted or compromised but is policy driven for better manageability. Start is set by default to automatically repair the BIOS if corrupted or compromised but is policy driven for better manageability.
- Protecting beyond BIOS – Integrity checking and repair is extended to other data that should be protected such as network configuration parameters, platform specific information (i.e. system IDs), secure boot credentials, and other code the system needs to boot.
- Audit enabled – System Audit via Sure Start Event Logs capture data such as incident, repair date and time for troubleshooting and investigating.

### Supported Components

## SOFTWARE COMPONENTS AND APPLICATIONS WITH WINDOWS

### Software

- HP Support Assistant<sup>14</sup>
- HP Image Assistant
- HP Desktop Support Utility
- HP Documentation
- HP Notifications
- HP PC Hardware Diagnostics UEFI
- HP PC Hardware Diagnostics Windows
- HP Performance Advisor<sup>1</sup>
- myHP
- HP Easy Clean<sup>20</sup>
- HP Smart Health<sup>21</sup>
- WSL/Ubuntu Data Science Stack
- HP Privacy Settings
- Touchpoint Customizer for Commercial
- HP Services Scan<sup>23</sup>

### Manageability Features

- HP Driver Packs<sup>2</sup>
- HP UWP Pack
- HP System Software Manager (SSM)
- HP Manageability Integration Kit Gen4<sup>3</sup>
- HP Smart Support<sup>5</sup>
- HP Client Catalog (download)
- HP Image Assistant (download)
- HP Cloud Recovery
- HP Client Management Script Library (download)
- HP BIOSphere Gen6<sup>13</sup>

### Client Security Software

- HP Client Security Suite Gen7<sup>4</sup> including: (including Credential Manager, HP Password Manager<sup>6</sup>, HP Spare Key)
- HP Power On Authentication
- Microsoft Defender<sup>7</sup>

### Security Management

- HP Secure Erase<sup>16</sup>
- HP Wolf Pro Security Edition (optional)<sup>18</sup>
- HP Wolf Security for Business<sup>22</sup> Includes:
  - HP Sure Click<sup>11</sup>
  - HP Sure Sense<sup>12</sup>
  - HP Sure Run Gen5<sup>9</sup>
  - HP Sure Recover Gen4<sup>10</sup>
  - HP Sure Start Gen7<sup>8</sup>
  - HP Tamper Lock
  - HP Sure Admin<sup>17</sup>
- HP Client Security Manager Gen 7<sup>4</sup>

<sup>1</sup> HP Performance Advisor Software – HP Performance Advisor is ready to help you get the most out of your HP Workstation from day one—and every day after. Learn more or download at: <http://hp.com/PerformanceAdvisor>

<sup>2</sup> HP Driver Packs not preinstalled, however available for download at <http://www.hp.com/go/clientmanagement>.



### Supported Components

- <sup>3</sup> HP Manageability Integration Kit can be downloaded from <https://ftp.ext.hp.com/pub/caps-softpaq/cmit/HPMIK.html>
- <sup>4</sup> HP Client Security Manager Gen7 requires Windows and is available on the select HP PCs.
- <sup>5</sup> HP Smart Support automatically collects the telemetry necessary upon initial boot of the product to deliver device-level configuration data and health insights and is available preinstalled on select products, thru HP Factory Configuration Services; or it can be downloaded. For more information about how to enable HP Smart Support or for download, please visit <http://www.hp.com/smart-support>.
- <sup>6</sup> HP Password Manager requires Internet Explorer or Chrome or FireFox. Some websites and applications may not be supported. User may need to enable or allow the add-on / extension in the internet browser.
- <sup>7</sup> Microsoft Defender Opt in and internet connection required for updates.
- <sup>8</sup> HP Sure Start Gen 7 is available on select HP PCs and workstations. See product specifications for availability.
- <sup>9</sup> HP Sure Run Gen5 is available on select Windows 11 based HP Pro, Elite and Workstation PCs with select Intel® or AMD processors
- <sup>10</sup> HP Sure Recover Gen4 is available on select HP PCs and requires Windows 10 and an open network connection. You must back up important files, data, photos, videos, etc. before using HP Sure Recover to avoid loss of data. Network based recovery using Wi-Fi is only available on PCs with Intel Wi-Fi Module
- <sup>11</sup> HP Sure Click requires Windows 10 Pro or higher or Enterprise. See [https://bit.ly/2PrLT6A\\_SureClick](https://bit.ly/2PrLT6A_SureClick) for complete details.
- <sup>12</sup> HP Sure Sense requires Windows 11 Pro or Enterprise and supports Microsoft Internet Explorer, Google Chrome™, and Chromium™. Supported attachments include Microsoft Office (Word, Excel, PowerPoint) and PDF files in read only mode, when Microsoft Office or Adobe Acrobat are installed.
- <sup>13</sup> HP BIOSphere Gen6 features may vary depending on the platform and configurations.
- <sup>14</sup> HP Support Assistant requires Windows and Internet access.
- <sup>16</sup> Secure Erase – For the methods outlined in the National Institute of Standards and Technology Special Publication 800-88 “Clear” sanitation method. HP Secure Erase does not support platforms with Intel® Optane.
- <sup>17</sup> HP Sure Admin requires Windows 11, HP BIOS, HP Manageability Integration Kit from <http://www.hp.com/go/clientmanagement> and HP Sure Admin Local Access Authenticator smartphone app from the Android or Apple store.
- <sup>18</sup> HP Wolf Pro Security Edition is available preloaded on select SKUs and, depending on the HP product purchased, includes a paid 1-year or 3-year license. The HP Wolf Pro Security Edition software is licensed under the license terms of the HP Wolf Security Software – End-User license Agreement (EULA) that can be found at: [https://support.hp.com/us-en/document/ish\\_3875769-3873014-16](https://support.hp.com/us-en/document/ish_3875769-3873014-16) as that EULA is modified by the following: “7. Term. Unless otherwise terminated earlier pursuant to the terms contained in this EULA, the license for the HP Wolf Pro Security Edition (HP Sure Sense Pro and HP Sure Click Pro) is effective upon activation and will continue for either a twelve (12) month or thirty-six (36) month license term (“Initial Term”). At the end of the Initial Term you may either (a) purchase a renewal license for the HP Wolf Pro Security Edition from HP.com, HP Sales or an HP Channel Partner, or (b) continue using the standard versions of HP Sure Click and HP Sure Sense at no additional cost with no future software updates or HP Support.
- <sup>20</sup> HP Easy Clean requires Windows 10 RS3 and higher and will disable the keyboard, touchscreen, and clickpad only. Ports are not disabled. See user guide for cleaning instructions.
- <sup>21</sup> HP Smart Health automatically collects the telemetry necessary upon initial boot of the product to deliver device-level configuration data and health insights and is available preinstalled on select products, thru HP Factory Configuration Services; or it can be downloaded. For more information about how to enable HP Smart Support or for download, please visit <http://www.hp.com/smart-support>.
- <sup>22</sup> HP Wolf Security for Business requires Windows 10 or higher, includes various HP security features and is available on HP Pro, Elite, RPOS and Workstation products. See product details for included security features
- <sup>23</sup> HP Services Scan is provided with Windows Update on select products and will check entitlement on each hardware device to determine if an HP TechPulse-enabled service has been purchased, and will download applicable software automatically. HP TechPulse is a telemetry and analytics platform that provides critical data around devices and applications. For full system requirements or to disable this feature, please visit <http://www.hpdaas.com/requirements> . Not applicable in China.

### System Technical Specifications

#### System Board

<b>System Board Form Factor</b>	Approximately 284.48mm x 297.18mm (11.2x11.9 inches).
<b>Processor Socket</b>	Single LGA-4677
<b>CPU Bus Speed</b>	DMI Gen4 x 8 lanes
<b>Chipset</b>	Intel W790 Alder Lake – WS PCH
<b>Super I/O Controller</b>	Nuvoton SIO21
<b>Memory Expansion Slots</b>	8 DDR5 memory slots
<b>Memory Type Supported</b>	DDR5, RDIMM (Registered) ECC
<b>Memory Modes</b>	Non- Interleaved for single channel. Interleaved when multiple channels are populated
<b>Memory Speed Supported</b>	4800MT/s for 1DPC and 4400MHz for 2DPC
<b>Memory Protection</b>	ECC on data
<b>Maximum Memory</b>	512GB
<b>Memory Configuration (Supported)</b>	16GB, 32GB and 64GB RDIMMs are supported. (64GB RDIMM cannot be mixed with other module capacities in the same system)
<b>NVDIMM Memory</b>	No
<b>PCI Express Connectors</b>	Standard PCIe Slots <ul style="list-style-type: none"> <li>• 1 PCI Express Gen5 slot x16 mechanical/ x16 electrical (full height, full length)</li> <li>• 2 PCI Express Gen4 slot x16 mechanical/ x16 electrical (full height, full length)</li> <li>• 2 PCI Express Gen4 slot x4 mechanical/ x4 electrical (full height, half length)</li> </ul> <p>M.2 Slots:</p> <ul style="list-style-type: none"> <li>• 2 PCI Express Gen4 slot x4.</li> </ul> <p>Other PCIe Connections</p> <ul style="list-style-type: none"> <li>• 1 Front NVMe Storage (SlimSAS PCIe Gen4 x8) (supports two x4 M.2 devices via QX428)</li> </ul>
<b>Supported Drive Interfaces</b>	<p><b>SATA</b> Number of SATA ports: 5 Intel® SATA controller: primary SATA</p> <p><b>Integrated RAID</b> On-board RAID Support Intel® VROC® SATA RAID 0, 1, 5, and 10 supported on Windows 10 and 11, RHEL 8.6 and later, SLE 15 SP4 and later Intel® VROC® NVMe RAID 0, 1, 5, and 10 supported with presence of appropriate VROC upgrade module (after-market kits) on Windows 10 and 11, RHEL 8.6 and later, SLE 15 SP4 and later</p> <p>Factory Configured RAID: None</p>
	<p><b>Integrated Graphics</b> No</p> <p><b>Network Controller</b> WGI219LM. WGI219LMLOM provides Management capabilities: WOL, PXE 2.1, DASH 1.1 and AMT</p>
	<p><b>External SATA (eSATA)</b> No</p> <p><b>Serial</b> 1 internal header (requires optional Serial Port Adapter Kit)</p> <p><b>2<sup>nd</sup> Serial</b> No</p> <p><b>HD Integrated Audio</b> Yes</p>
<b>USB Connector(s)</b>	<p><b>Front</b> Front I/O Entry: 4 USB 3.1 Gen1 Type-A (left-most port supports Battery Charging 1.2)</p> <p>Front I/O Premium: 2x USB 3.2 Gen2x2 Type-C™ (Power Delivery 3.0)</p>

### System Technical Specifications

2x USB 3.1 Gen1 Type-A (left-most port supports Battery Charging 1.2)

- USB Type-C Ports provide 3 Amps @ 5 Volts
- Charging USB Type-A port provides 1.5 Amps @ 5 Volts
- Standard USB Type-A Ports provide 900mA @ 5 Volts

#### Rear

4x USB 3.1 Gen1 Type-A with USB hub and 2x USB 3.2 Gen 1 Type-A without hub.  
(Optional: 2x USB 3.0 Type-A (optional via Flex module) or 1x USB 3.1 Gen2 Type-C charging port (optional via Flex module).

#### Internal

1 USB 3.2 Gen1 header, with a single 12-pin shrouded connector. This header supports a USB Media Card reader.  
1 USB 2.0 single port header  
1 USB 2.0 dual port header.

**Flash ROM** Yes

**CPU Fan Header** Yes

**Memory Fan Header** Yes (dual header)

**Chassis Fan Header** 1 front, one rear and one Aux Fan Header (dual)

**Front PCI Fan Header** Yes (connects to AUX fan header)

**Front Control** Yes

**Panel/Speaker Header**

**CMOS Battery Holder – Lithium** Yes

**Integrated Trusted Platform Module** Integrated TPM 2.0.  
Convertible to FIPS 140-2 Certified Mode through firmware v15.21.  
The TPM module is disabled where restricted by law.

**Power Supply Headers** Yes

**Power Switch, Power LED & Hard Drive LED Header** Yes

**Clear Password Jumper** Yes

**Keyboard/Mouse** USB and PS/2 (option)

<sup>1</sup>Maximum memory capacities assume 64-bit operating systems, such as Genuine Windows® 11 Professional 64 bit, Red Hat Linux 64-bit.

<sup>2</sup>M.2 storage supports compatible devices up to 80mm

### System Technical Specifications

<b>System Configurations</b>		
<b>Example Configuration #1</b>	<b>Processor Info</b>	1x Intel Xeon w3-2425 6C 3.0GHz 4800 130W
	<b>Memory Info</b>	16GB DDR5 (1x16GB) RegRAM
	<b>Graphics Info</b>	1xNvidia T1000
	<b>Disks/Optical/Floppy</b>	1x Internal 4TB M.2 + 1xDVDRW SATA
	<b>PSU</b>	525W
	<b>Other</b>	N/A

<b>Energy Consumption (Watts)</b>	115 VAC		230 VAC		100 VAC	
	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
Windows Idle (S0)	58.901	57.056	59.256	57.246	58.889	57.005
Windows Busy Typ (S0)	201.08		198.26		200.56	
Windows Busy Max (S0)	513.451		206.345		205.432	
Sleep (S3)	3.570	3.489	3.577	3.495	3.569	3.487
Off (S5)	2.100	2.097	2.112	2.110	2.095	2.090
Zero Power Mode (EuP)	0.153		0.193		0.152	

<b>Heat Dissipation (Btu/hr)</b>	115 VAC		230 VAC		100 VAC	
	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
Windows Idle (S0)	200.97	194.67	202.18	195.32	200.988	194.558
Windows Busy Typ (S0)	686.08		676.46		684.31	
Windows Busy Max (S0)	728.508		704.255		701.139	
Sleep (S3)	12.180	11.904	12.204	11.924	12.177	11.897
Off (S5)	7.165	7.154	7.206	7.199	7.148	7.131
Zero Power Mode (EuP)	0.522		0.659		0.518	

<b>Example Configuration #2</b>	<b>Processor Info</b>	1x Intel Xeon w3-2435 8C 3.1GHz 4800 165W
	<b>Memory Info</b>	32GB DDR5 (2x16GB) RegRAM
	<b>Graphics Info</b>	1xNVIDIA Quadro A2000
	<b>Disks/Optical/Floppy</b>	1x 1TB SATA HDD + 1xInternal 4TB M.2 + 1xDVDRW SATA
	<b>PSU</b>	775W
	<b>Other</b>	N/A

<b>Energy Consumption (Watts)</b>	115 VAC		230 VAC		100 VAC	
	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
Windows Idle (S0)	66.084	65.053	66.356	65.226	65.852	64.789
Windows Busy Typ (S0)	258.55		254.89		257.86	
Windows Busy Max (S0)	279.94		275.59		278.95	
Sleep (S3)	3.916	3.808	3.925	3.812	3.912	3.801
Off (S5)	22.36	2.216	2.248	2.224	2.234	2.213
Zero Power Mode (EuP)	0.202		0.241		0.201	

		115 VAC	230 VAC	100 VAC

### System Technical Specifications

Heat Dissipation (Btu/hr)		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	225.47	221.96	226.40	222.55	224.687	221.060
	Windows Busy Typ (S0)	882.17		869.68		879.81	
	Windows Busy Max (S0)	955.15		940.31		951.77	
	Sleep (S3)	13.361	12.992	13.392	13.006	13.347	12.969
	Off (S5)	7.629	7.560	7.670	7.588	7.622	7.550
	Zero Power Mode (EuP)	0.689		0.822		0.685	

<b>Example Configuration #3</b>	<b>Processor Info</b>	1x Intel Xeon w5-2455X 12C 3.2GHz 4800 200W
	<b>Memory Info</b>	64GB DDR5 (4x16GB) RegRAM
	<b>Graphics Info</b>	1xNvidia Quadro A4000
	<b>Disks/Optical/Floppy</b>	2x 1TB SATA HDD + 1xInternal 4TB M.2 + 1xDVDRW SATA
	<b>PSU</b>	1125W
	<b>Other</b>	N/A

Energy Consumption (Watts)		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	82.533	79.464	82.821	79.725	82.412	79.325
	Windows Busy Typ (S0)	400.06		396.25		399.23	
	Windows Busy Max (S0)	411.532		403.423		404.356	
	Sleep (S3)	4.403	4.332	4.409	4.335	4.400	4.328
	Off (S5)	2.411	2.395	2.418	2.400	2.406	2.390
	Zero Power Mode (EuP)	0.236		0.278		0.234	

Heat Dissipation (Btu/hr)		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	281.60	271.13	282.58	272.02	281.18	270.65
	Windows Busy Typ (S0)	1365.00		1352.00		1362.17	
	Windows Busy Max (S0)	1404.558		1376.883		1380.067	
	Sleep (S3)	15.023	14.780	15.043	14.791	15.012	14.767
	Off (S5)	8.226	8.171	8.250	8.177	8.209	8.154
	Zero Power Mode (EuP)	0.805		0.948		0.798	

<b>Example Configuration #4</b>	<b>Processor Info</b>	1x Intel w7-2495X 24C 2.5GHz 4800 225W
	<b>Memory Info</b>	128GB DDR5 (4x32GB) RegRAM
	<b>Graphics Info</b>	1xNVIDIA Quadro A6000
	<b>Disks/Optical/Floppy</b>	2x 4TB 7200 RPM SATA + 2x Internal 4TB M.2 + 1xDVDRW SATA
	<b>PSU</b>	1125W
	<b>Other</b>	N/A

Energy Consumption (Watts)		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
Windows Idle (S0)	596.25	592.56	595.23	596.25	592.56	595.23	

### System Technical Specifications

	Windows Busy Typ (S0)	608.784		600.412		601.314	
	Windows Busy Max (S0)	6.080		5.936		6.085	
	Sleep (S3)	2.361	2.356	2.370	2.361	2.356	2.370
	Off (S5)	0.231	0.279	0.230	0.231	0.279	0.230
	Zero Power Mode (EuP)	596.25		592.56		595.23	

Heat Dissipation (Btu/hr)		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	308.25	298.73	309.32	299.65	307.88	298.33
	Windows Busy Typ (S0)	2034.40		3021.81		2030.92	
	Windows Busy Max (S0)	2077.779		2049.206		2052.285	
	Sleep (S3)	20.744	20.253	20.762	20.267	20.727	20.233
	Off (S5)	8.055	8.038	8.086	8.067	8.048	8.025
	Zero Power Mode (EuP)	0.788		0.951		0.784	

**NOTE:** The numbers in this table are from actual measurements on a single system. There will be some variation from unit to unit.

**NOTE:** The busy power number and associated BTU/hr number for each configuration will be a strong function of the actual application software run on the system. There can be a great deal of variation in this number.

**NOTE:** The Power Supply Efficiency report may be found at the following links:

<https://www.plugloadsolutions.com/80PlusPowerSuppliesDetail.aspx?id=0&type=2>

### System Technical Specifications

<b>Operating Voltage Range</b>	90-269 VAC
<b>Rated Voltage Range</b>	100-240 VAC
<b>Rated Line Frequency</b>	50-60 Hz
<b>Operating Line Frequency Range</b>	47-66 Hz
<b>ENERGY STAR® certified</b> (Config Dependent)	Yes
<b>CECP Compliant @ 220V</b>	Yes
<b>FEMP Standby Power Compliant</b>	Yes, with Wake-on-LAN disabled: <1W in S5 – Power Off
<b>Built-in Self Test (BIST) LED</b>	Yes
<b>Surge Tolerant Full Ranging Power Supply</b> (withstands power surges up to 2000V)	Yes
<b>Hood Lock Header</b>	Yes
<b>ErP Lot 6- Tier 1 Compliance @ 230V</b> (<1W in S5 – Power Off)	Yes
<b>ErP Lot 6- Tier 2 Compliance @ 230V</b> (<0.5W in S5 – Power Off)	Yes

Declared Noise Emissions (Entry-level, Mid-level, and High-end configurations; tested on floor)			
<b>System Configuration (Entry level)</b>	<b>Processor Info</b>	1x Intel Xeon w3-2425 6C 3.0GHz 4800 130W	
	<b>Memory Info</b>	32GB (2x 16GB) DDR5 4800MHz RDIMM	
	<b>Graphics Info</b>	1xNVIDIA Quadro A2000	
	<b>Disks/Optical</b>	1x512GB SSD + 1xInternal 1TB M.2+ 1xDVDRW SATA	
	<b>Power Supply</b>	525W	
<b>Declared Noise Emissions</b>		<b>Sound Power (LWAd, bels)</b>	<b>Deskside Sound Pressure (LpAm, decibels)</b>
	<b>Idle</b>	3.4	15
	<b>Hard drive Operating (Drive Random Seek)</b>	3.4	15
	<b>Active mode</b>	3.3	15
<b>System Configuration (Mid-level)</b>	<b>Processor Info</b>	1x Intel Xeon w5-2455X 12C 3.2GHz 4800 200W	
	<b>Memory Info</b>	128GB (8*16GB) DDR5 4800MHz RDIMM	
	<b>Graphics Info</b>	1xNVIDIA Quadro A4000	
	<b>Disks/Optical</b>	1x1TB HDD + 2xInternal 1TB M.2 SSD + 1xDVDRW SATA	
	<b>Power Supply</b>	775W	
<b>Declared Noise Emissions</b>		<b>Sound Power (LWAd, bels)</b>	<b>Deskside Sound Pressure (LpAm, decibels)</b>
	<b>Idle</b>	3.4	16
	<b>Hard drive Operating (Drive Random Seek)</b>	3.4	16

### System Technical Specifications

	<b>Active mode</b>	3.4	16
<b>System Configuration (High-end)</b>	<b>Processor Info</b>	1x Intel Xeon w7-2495X 24C 2.5GHz 4800 225W	
	<b>Memory Info</b>	512GB (8x64GB) DDR5 4800MHz RDIMM	
	<b>Graphics Info</b>	2xNVIDIA Quadro A6000	
	<b>Disks/Optical</b>	2x4TB HDD + 2xInternal 4TB M.2 SSD + 1xDVDRW SATA	
	<b>Power Supply</b>	1125W	
<b>Declared Noise Emissions</b>		<b>Sound Power (LWAd, bels)</b>	<b>Deskside Sound Pressure (LpAm, decibels)</b>
	<b>Idle</b>	3.7	21
	<b>Hard drive Operating (Drive Random Seek)</b>	3.8	21
	<b>Active mode</b>	4.0	23

### Environmental Requirements

<b>Temperature</b>	Operating: 5° to 40° C (40° to 104° F) Non-operating: -40° to 60° C (-40° to 140° F)
<b>Humidity</b>	Operating: 8% to 85% RH, non-condensing Non-operating: 8% to 90% RH, non-condensing
<b>Maximum Altitude</b>	Operating (with Rotational Hard Drives): 3,048 m (10,000 feet) Operating (with only Solid-State Drives): 5,000 m (16,404 feet)
<b>Dynamic</b>	Non-operating: 9,144 m (30,000 feet) Shock Operating: ½-sine: 40g, 2-3ms (~62 cm/sec) Non-operating: ½-sine: 160 cm/s, 2-3ms (~105g) square: 422 cm/s, 20g <b>NOTE:</b> Values represent individual shock events and do not indicate repetitive shock events
<b>Cooling</b>	Vibration Operating random: 0.5g (rms), 5-300 Hz, up to 0.0025g <sup>2</sup> /Hz Non-operating random: 2.0g (rms), 5-500 Hz, up to 0.0150 g <sup>2</sup> /Hz <b>NOTE:</b> Values do not indicate continuous vibration. Above 1524 m (5,000 feet) altitude, the maximum operating temperature is reduced by 1° C (1.8° F) for every 305 m (1,000 feet) increase in elevation, up to 3048 m (10,000 feet)



### System Technical Specifications

#### Physical Security and Serviceability

<b>Access Panel</b>	Tool-less Includes system board and memory information
<b>Optical Drive</b>	Tool-less, Optical Drive requires a 5.25" bay carrier
<b>Hard Drives</b>	Tool-less
<b>Expansion Cards</b>	Tool-less
<b>Processor Socket</b>	Screw-in processor coolers
<b>Blue User Touch Points</b>	Yes, on tool-less internal chassis mechanisms
<b>Color-coordinated Cables and Connectors</b>	Yes
<b>Memory</b>	Tool-less
<b>System Board</b>	Screw-in
<b>Dual Color Power and HD LED on Front of Computer</b>	Yes
<b>Dual Function Front Power Switch</b>	Yes, causes a fail-safe power off when held for 4 seconds
<b>Padlock Support</b>	Yes (optional): Locks side cover and secures chassis from theft 7.0 mm (0.2756 in) diameter padlock loop at rear of system
<b>Cable Lock Support</b>	Yes, Kensington Cable Lock (optional): Locks side cover and secures chassis from theft 3 mm x 7 mm slot at rear of system
<b>Universal Chassis Clamp Lock Support</b>	Yes (optional): Locks side cover and locks cables to chassis. Secures chassis from theft and allows multiple units to be chained together when used with optional cable with threaded feature at rear of system
<b>Chassis Interlock Sensor</b>	Yes Sensor detects when the access panel has been removed. The access panel must be installed for the system to power ON. Removal of the access panel during operation will power OFF the system.
<b>Solenoid Lock and Hood Sensor</b>	Yes (optional) The Solenoid Hood Lock eliminates the need for a physical key by making the chassis lockable through software and a password. You can also lock and unlock the chassis remotely over the network. The Sensor Kit detects when the access panel has been removed
<b>Rear Port Control Cover</b>	No
<b>Serial, USB, Audio, Network, Enable/Disable Port Control</b>	Yes
<b>Power-On Password</b>	Yes
<b>Setup Password</b>	Yes, prevents an unauthorized person from changing the workstation configuration.
<b>3.3V Aux Power LED on System PCA</b>	None
<b>NIC LEDs (integrated) (Green &amp; Amber)</b>	Yes
<b>CPUs and Heatsinks</b>	A torx driver (T30) is needed to remove the processor heatsink. CPU attached to heatsink via tool-less clip
<b>Power Supply Diagnostic LED</b>	Yes
<b>Front Power Button</b>	Yes
<b>Front Power LED</b>	Yes
<b>Front Hard Drive Activity LED</b>	Yes
<b>Front ODD Activity LED</b>	Yes, on device

### System Technical Specifications

<b>Internal Speaker</b>	Yes
<b>System/Emergency ROM Flash Recovery</b>	Yes
<b>Cooling Solutions</b>	Air cooled forced convection
<b>Power Supply Fans</b>	80 mm x 80 mm x 25 mm (non-serviceable)
<b>CPU Heatsink Fan</b>	108 mm x 108 mm x 25 mm
<b>Chassis Fan</b>	Rear: 120 mm x 120mm x 25 mm Front (optional): 92 mm x 92 mm x 25 mm PCIe Retainer (optional based on configuration): Dual 80 mm x 80 mm x 20 mm
<b>Memory Heatsink Fan</b>	Dual 60 mm x 60 mm x 25 mm Blindmate (optional based on configuration)
<b>Access Panel Key Lock</b>	Yes, side panel barrel keylock (optional from the factory only)
<b>ACPI-Ready Hardware</b>	Advanced Configuration and Power Management Interface (ACPI). <ul style="list-style-type: none"> <li>• Allows the system to wake from a low power mode.</li> <li>• Controls system power consumption, making it possible to place individual cards and peripherals in a low-power or powered-off state without affecting other elements of the system.</li> </ul>
<b>Integrated Chassis Handles</b>	Yes, front handle and dedicated rear recess
<b>Power Supply</b>	Requires T15 Torx or flat blade screwdriver
<b>PCI Card Retention</b>	Yes, rear (all), middle (all), front (full-length cards with extender, using Fan and Front Card Guide Kit)
<b>Flash ROM</b>	Yes
<b>Diagnostic Power Switch LED on board</b>	Yes
<b>Clear Password Jumper</b>	Yes
<b>Clear CMOS Button</b>	Yes
<b>CMOS Battery Holder</b>	Yes
<b>DIMM Connectors</b>	Yes

### Service, Support, and Warranty

On-site Warranty and Service<sup>1</sup>: Three-years, limited warranty and service offering delivers on-site, next business-day<sup>2</sup> service for parts and labor and includes free telephone support<sup>3</sup> 8am – 5pm. Global coverage<sup>2</sup> ensures that any product purchased in one country and transferred to another, non-restricted country will remain fully covered under the original warranty and service offering. 24/7 operation will not void the HP warranty. Storage devices are not covered under warranty for 24/7 operation except for Enterprise class HDDs.

**NOTE 1:** Terms and conditions may vary by country. Certain restrictions and exclusions apply.

**NOTE 2:** On-site service may be provided pursuant to a service contract between HP and an authorized HP third-party provider, and is not available in certain countries. Global service response times are based on commercially reasonable best effort and may vary by country.

**NOTE 3:** Technical telephone support applies only to HP-configured, HP and HP-qualified, third-party hardware and software.

Toll-free calling and 24x7 support service may not be available in some countries.

HP Care Pack Services extend service contracts beyond the standard warranties. Service starts from date of hardware purchase.

To choose the right level of service for your HP product, use the HP Care Pack Services Lookup Tool at:

<http://www.hp.com/go/lookuptool>. Service levels and response times for HP Care Packs may vary depending on your geographic location.

### Certification and Compliance

- USGv6 compliant for Windows OS ([USGv6 Compliance Report](#))
- Completed ISO/IEC 17025 accredited testing designed specifically for the USGv6 Test Program. USGv6 is a test program designated by NIST that provides a proof of compliance to IPv6 (Internet Protocol version 6) specifications outlined in

### System Technical Specifications

current industry standards for common network products. It is meant as a strategic planning guide for USG (United States Government) IT acquisitions to help ensure the completeness, correctness, interoperability and security of early IPv6 product offerings so as to protect early USG investments in the technology. (source: UNH)

Environmental Sustainability questions concerning:

- Ecolabels (EPEAT, TCO, etc.)
- ENERGY STAR, California Energy Commission (CEC)
- Compliance with Environmental legislation (EU ErP, China CECP, EU RoHS and other countries)
- Supply Chain Social Environmental Responsibility (SER) (conflict minerals; human rights, etc.)
- Product specific environmental features (material content, packaging content, recycled content, etc.)
- China Energy Label (CEL)
- 

Please contact [sustainability@hp.com](mailto:sustainability@hp.com)

For country specific Regulatory Compliance approval documents or Regulatory and Safety questions concerning:

- Declarations of Conformity (for self-service, go to [https://www.hp.com/uk-en/certifications/technical/regulations-certificates.html?jumpid=ex\\_r135\\_uk/en/any/corp/hpuk-mu\\_chev/certificates](https://www.hp.com/uk-en/certifications/technical/regulations-certificates.html?jumpid=ex_r135_uk/en/any/corp/hpuk-mu_chev/certificates))
- GS Certificates
- Product Safety Certificates (UL, CB, BIS, etc.)
- EMC Certificates, Declarations of Conformity, or Certificates of Conformity (CE, FCC, ICES, etc.)
- CCC Certificates
- Ergonomics
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Please contact [techregshelp@hp.com](mailto:techregshelp@hp.com)

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## BIOS

<b>PCIe 5.0 Support</b>	Full BIOS support for PCI Express through industry standard interfaces. Supported speeds and slot information vary.
<b>ATA/ATAPI</b>	AT Attachment 6 with Packet Interface (ATA/ATAPI-6), Revision 3b
<b>WMI Support</b>	WMI is Microsoft's implementation of Web-Based Enterprise Management (WBEM) for Windows. WMI is fully compliant with the Distributed Management Task Force (DMTF) Common Information Model (CIM) and WBEM specifications.
<b>BIOS Power On</b>	Users can define a specific date and time for the system to power on.
<b>ROM Based Computer Setup Utility (F10)</b>	Review and customize system configuration settings controlled by the BIOS.
<b>System/Emergency ROM Flash Recovery with Video</b>	Recovers system BIOS in corrupted Flash ROM.
<b>Replicated Setup</b>	Saves BIOS settings to USB flash device in human readable file (HpSetup.txt). BiosConfigurationUtility.exe utility can then replicate these settings on machines being deployed without entering Computer Configuration Utility (F10 Setup).
<b>SMBIOS</b>	System Management BIOS Reference Specification, Version 3.2
<b>Boot Control</b>	Disables the ability to boot from removable media on supported devices.
<b>Memory Change Alert</b>	Alerts management console if memory is removed or changed.
<b>Thermal Alert</b>	Monitors the temperature state within the chassis. Three modes: <ul style="list-style-type: none"><li>• NORMAL – normal temperature ranges.</li><li>• ALERTED – excessive temperatures are detected. Raises a flag so action can be taken to avoid shutdown or provide for a smoother system shutdown.</li><li>• SHUTDOWN – excessive temperatures are encountered. Automatically shuts down the computer without warning before hardware component damage occurs.</li></ul>
<b>Remote ROM Flash</b>	Provides secure, fail-safe ROM image management from a central network console.

### System Technical Specifications

<b>ACPI (Advanced Configuration and Power Management Interface)</b>	Allows the system to enter and resume from low power modes (sleep states). Enables an operating system to control system power consumption based on the dynamic workload. Makes it possible to place individual cards and peripherals in a low-power or powered-off state without affecting other elements of the system. Supports ACPI 6.0 for full compatibility with 64-bit operating systems.
<b>Ownership Tag</b>	A user-defined string stored in non-volatile memory that is displayed in the BIOS splash screen.
<b>Remote Wakeup/Remote Shutdown</b>	System administrators can power on, restart, and power off a client computer from a remote location.
<b>Instantly Available PC (Suspend to RAM – ACPI sleep state S3)</b>	Allows for very low power consumption with quick resume time.
<b>Remote System Installation via F12 (PXE 2.1) (Remote Boot from Server)</b>	Allows a new or existing system to boot over the network and download software, including the operating system.
<b>ROM revision levels</b>	Reports the system BIOS revision level in Computer Configuration Utility (F10 Setup). Version is available through an industry standard interface (SMBIOS and WMI) so that management SW applications can use and report this information.
<b>System board revision level</b>	Allows management SW to read revision level of the system board. Revision level is digitally encoded into the HW and cannot be modified.
<b>Start-up Diagnostics (Power-on Self-Test)</b>	Assesses system health at boot time with selectable levels of testing.
<b>Auto Setup when new hardware installed</b>	System automatically detects addition of new hardware.
<b>Keyboard-less Operation</b>	The system can be booted without a keyboard.
<b>Localized ROM Setup</b>	Common BIOS image supports System Configuration Utility (F10 Setup) menus in 15 languages with local keyboard mappings.
<b>Asset Tag</b>	The user or MIS to set a unique tag string in non-volatile memory.
<b>Per-slot Control</b>	Allows I/O slot parameters (option ROM enable/disable, bifurcation, speed) to be configured individually.
<b>Adaptive Cooling</b>	Control parameters are set according to detected hardware configuration for optimal acoustics.
<b>Pre-boot Diagnostics</b>	(Pre-video) critical errors are reported via beeps and blinks on the power LED.
<b>UEFI Specification Revision</b>	2.7
<b>ACPI</b>	Advanced Configuration and Power Management Interface, Version 6.0
<b>CD Boot</b>	“El Torito” Bootable CD-ROM Format Specification Version 1.0
<b>EHCI</b>	Enhanced Host Controller Interface for Universal Serial Bus, Revision 1.0
<b>PCI Express</b>	PCI Express Base Specification, Revision 2.0 PCI Express Base Specification, Revision 3.0 PCI Express Base Specification, Revision 4.0 PCI Express Base Specification, Revision 5.0
<b>SATA</b>	Serial ATA Specification, Revision 1.0a Serial ATA 3 Gb/s: Serial ATA Specification, Revision 2.5 Serial ATA 6 Gb/s: Serial ATA Specification, Revision 3.0
<b>SPD</b>	JEDEC JESD300-5
<b>TPM</b>	Trusted Computing Group TPM Specification Version 2.0 (Infineon SLB 9672). Common Criteria EAL4+ certified. FIPS 140-2 Certification TCG TPM Certified products list: <a href="http://www.trustedcomputinggroup.org/certification/tpm-certified-products/">http://www.trustedcomputinggroup.org/certification/tpm-certified-products/</a>
<b>UHCI</b>	Universal Host Controller Interface Design Guide, Revision 1.1
<b>USB</b>	Universal Serial Bus Revision 1.1 Specification Universal Serial Bus Revision 2.0 Specification

### System Technical Specifications

- Universal Serial Bus Revision 3.1 Specification
- Universal Serial Bus Revision 3.2 Specification
- USB Battery Charging specification, Revision 1.2
- USB Power Delivery specification Revision 3.0
- SMBIOS** System Management BIOS Reference Specification, Version 3.2

### Social and Environmental Responsibility

**Eco-Label Certifications & Declarations** This product is low halogen except for configurations that include HP Z Turbo Quad Pro PCIe TLC SSD, CRU QX428 removable storage frames, ConnectX-6 DX Amphenol 10 & 25 Gb Transceivers, Intel VROC M.2 RAID module, Broadcom 5720-2P NIC Card, power cords, cables, and peripherals. Service parts obtained after purchase may not be Low Halogen.

This product has received or is in the process of being certified to the following approvals and may be labeled with one or more of these marks:

- IT ECO declaration
- US ENERGY STAR®
- US Federal Energy Management Program (FEMP)
- EPEAT® Gold with Climate+ registered. See [www.epeat.net](http://www.epeat.net) for registration status and tier levels by country
- TCO Certified
- China Energy Conservation Program (CECP)
- China State Environmental Protection Administration (SEPA)
- Taiwan Green Mark
- Korea Eco-label
- Japan PC Green label\*

### Sustainable Impact Specifications

- Product Carbon Footprint (hp.com)
- Ocean-bound plastic in System fan, CPU fan
- 40% post-consumer recycled plastic
- 10% recycled metal
- Low halogen
- Outside Box and corrugated cushions are 100% sustainably sourced and recyclable
- Molded Paper Pulp Cushion inside box is 100% sustainably sourced and recyclable
- Recycled Plastic cushions

### System Configuration

The configuration used for the Energy Consumption and Declared Noise Emissions data for the Workstation model is based on a “Typically Configured Workstation”.

### Energy Consumption (in accordance with US ENERGY STAR® test method)

	115VAC, 60Hz	230VAC, 50Hz	100VAC, 50Hz
Normal Operation (Short idle)	76.42 W	81.45 W	78.99 W
Normal Operation (Long idle)	73.99 W	68.7 W	73.77 W
Sleep	8.52 W	8.64 W	8.56 W
Off	2.92 W	3 W	2.91 W

#### NOTE:

Energy efficiency data listed is for an ENERGY STAR® compliant product if offered within the model family. HP computers marked with the ENERGY STAR® Logo are compliant with the applicable U.S. Environmental Protection Agency (EPA) ENERGY STAR® specifications for computers. If a model family does not offer ENERGY STAR® compliant configurations, then energy efficiency data listed is for a typically configured PC featuring a hard disk drive, a high efficiency power supply, and a Microsoft Windows® operating system.

### System Technical Specifications

Heat Dissipation*	115VAC, 60Hz	230VAC, 50Hz	100VAC, 50Hz
Normal Operation (Short idle)	261.4 BTU/hr	278.6 BTU/hr	270.1 BTU/hr
Normal Operation (Long idle)	253.0 BTU/hr	235.0 BTU/hr	252.3 BTU/hr
Sleep	29.1 BTU/hr	29.5 BTU/hr	29.3 BTU/hr
Off	10.0 BTU/hr	10.3 BTU/hr	1.0 BTU/hr

**\*NOTE:** Heat dissipation is calculated based on the measured watts, assuming the service level is attained for one hour.

#### Longevity and Upgrading

This product can be upgraded, possibly extending its useful life by several years. Upgradeable features and/or components contained in the

Spare parts are available throughout the warranty period and or for up to “5” years after the end of production.

#### Additional Information

- This product is in compliance with the Restrictions of Hazardous Substances (RoHS) directive - 2011/65/EC.
- This HP product is designed to comply with the Waste Electrical and Electronic Equipment (WEEE) Directive – 2002/96/EC.
- This product is in compliance with California Proposition 65 (State of California; Safe Drinking Water and Toxic Enforcement Act of 1986).
- This product is in compliance with the IEEE 1680 (EPEAT) standard at the Gold level, see [www.epeat.net](http://www.epeat.net)
- Plastics parts weighing over 25 grams used in the product are marked per ISO11469 and ISO1043.
- This product is 94.4% recycle-able when properly disposed of at end of life.

#### Packaging Materials

<b>External:</b>	PAPER/Corrugated	1127 g
	PAPER/ Corrugated	332 g
	PAPER/Molded Pulp	508 g
<b>Internal:</b>	PLASTIC/Polyethylene low density – LDPE	50 g
	PLASTIC/Polyethylene Expanded – EPE	9 g

The plastic packaging material contains at least 73.7% recycled content.

The corrugated paper packaging materials contains at least 61.7% recycled content.

#### RoHS Compliance

HP Inc. complies fully with materials regulations. We were among the first companies to extend the restrictions in the European Union (EU) Restriction of Hazardous Substances (RoHS) Directive to our products worldwide through the HP GSE. HP has contributed to the development of related legislation in Europe, as well as China, India, and Vietnam.

We believe the RoHS directive and similar laws play an important role in promoting industry-wide elimination of substances of concern. We have supported the inclusion of additional substances—including PVC, BFRs, and certain phthalates—in future RoHS legislation that pertains to electrical and electronics products.

We met our voluntary objective to achieve worldwide compliance with the new EU RoHS requirements for virtually all relevant products by July 2013, and we will continue to extend the scope of the commitment to include further restricted substances as regulations continue to evolve.

To obtain a copy of the HP RoHS Compliance Statement, see [HP RoHS position statement](#).

### System Technical Specifications

#### Material Usage

This product does not contain any of the following substances in excess of regulatory limits (refer to the HP General Specification for the Environment at [http://www.hp.com/hpinfo/globalcitizenship/environment/supplychain/gen\\_specifications.html](http://www.hp.com/hpinfo/globalcitizenship/environment/supplychain/gen_specifications.html)):

- Asbestos
- Certain Azo Colorants
- Certain Brominated Flame Retardants – may not be used as flame retardants in plastics
- Cadmium
- Chlorinated Hydrocarbons
- Chlorinated Paraffins
- Bis(2-Ethylhexyl) phthalate (DEHP)
- Benzyl butyl phthalate (BBP)
- Dibutyl phthalate (DBP)
- Diisobutyl phthalate (DIBP)
- Formaldehyde
- Halogenated Diphenyl Methanes
- Lead carbonates and sulfates
- Lead and Lead compounds
- Mercuric Oxide Batteries
- Nickel – finishes must not be used on the external surface designed to be frequently handled or carried by the user.
- Ozone Depleting Substances
- Polybrominated Biphenyls (PBBs)
- Polybrominated Biphenyl Ethers (PBBEs)
- Polybrominated Biphenyl Oxides (PBBOs)
- Polychlorinated Biphenyl (PCB)
- Polychlorinated Terphenyls (PCT)
- Polyvinyl Chloride (PVC) – except for wires and cables, and certain retail packaging has been voluntarily removed from most applications.
- Radioactive Substances
- Tributyl Tin (TBT), Triphenyl Tin (TPT), Tributyl Tin Oxide (TBTO)

#### Packaging Usage

HP follows these guidelines to decrease the environmental impact of product packaging:

- Eliminate the use of heavy metals such as lead, chromium, mercury and cadmium in packaging materials.
- Eliminate the use of ozone-depleting substances (ODS) in packaging materials.
- Design packaging materials for ease of disassembly.
- Maximize the use of post-consumer recycled content materials in packaging materials.
- Use readily recyclable packaging materials such as paper and corrugated materials.
- Reduce size and weight of packages to improve transportation fuel efficiency.
- Plastic packaging materials are marked according to ISO 11469 and DIN 6120 standards.

#### End-of-life Management and Recycling

HP offers end-of-life HP product return and recycling programs in many geographic areas. To recycle your product, please go to: <http://www.hp.com/go/reuse-recycle> or contact your nearest HP sales office. Products returned to HP will be recycled, recovered or disposed of in a responsible manner.

The EU WEEE directive (2002/95/EC) requires manufacturers to provide treatment information for each product type for use by treatment facilities. This information (product disassembly instructions) is posted on the Hewlett Packard web site at: <http://www.hp.com/go/recyclers>. These

### System Technical Specifications

instructions may be used by recyclers and other WEEE treatment facilities as well as HP OEM customers who integrate and re-sell HP equipment.

#### HP, Inc. Corporate Environmental Information

For more information about HP's commitment to the environment:

Global Citizenship Report

<http://www.hp.com/hpinfo/globalcitizenship/gcreport/index.html>

Eco-label certifications

<http://www8.hp.com/us/en/hp-information/environment/ecolabels.html>

ISO 14001 certificates:

<http://h20195.www2.hp.com/V2/GetDocument.aspx?docname=c04755842>

and

<http://www.hp.com/hpinfo/globalcitizenship/environment/pdf/cert.pdf>

#### footnotes

- Percentage of ocean-bound plastic contained in each component varies by product
- Recycled plastic content percentage is based on the definition set in the IEEE 1680.1-2018 standard.
- External power supplies, WWAN modules, power cords, cables and peripherals excluded.
- 100% outer box packaging and corrugated cushions made from sustainably sourced certified and recycled fibers.
- Fiber cushions made from 100% recycled wood fiber and organic materials.
- Plastic cushions are made from >90% recycled plastic.
- Recycled metal is expressed as a percentage of the total weight of the metal according to ISO 14021 definitions for metal parts over 25 grams.

## Manageability

### Industry Standard Specifications

### Intel® Active Management Technology (AMT)

This product meets the following industry standard specifications for manageability functionality:

- DASH 1.2 (via Intel® LAN on motherboard)
- Intel® Active Management Technology (AMT) 16.10

An advanced set of remote management features and functionality providing IT administrators the latest and most effective tools to remotely discover, heal, and protect networked client systems regardless of the system's health or power state. AMT 16.10 includes the following advanced management functions:

- Power Management (on, off, reset, graceful shutdown, sleep and hibernate)
  - Support in Max Power Savings (Shutdown and Hibernate Modes)
- Hardware Inventory (includes BIOS and firmware revisions)
- Hardware Alerting
- Agent Presence
- System Defense Filters
- Serial Over LAN (SOL)
- USB Redirect (Media Redirection)
- ME Wake-on-LAN (WOL), even with Maximum Power Savings Enabled
- DASH 1.2 compliance
- Ipv6 Support
- Fast Call for Help – a client inside or outside the firewall may initiate a call for help via BIOS screen, periodic connections, or alert triggered connection
- Remote Scheduled Maintenance – pre-schedule when the system connects to the IT or service provider console for maintenance.
- Remote Alerts – automatically alert IT or service provider if issues arise
- Access Monitor – Provides oversight into Intel® AMT actions to support security requirements



### System Technical Specifications

- PC Alarm Clock
- Microsoft NAP Support
- Host Base set-up and configuration
- Management Engine (ME) firmware roll back
- Local Time Sync to UTC
- Remote Memory Dump Command – Creates memory dump for debug

**Intel® vPro™ Technology** Yes, when configured with an Intel® vPro™ supporting processor.

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### Technical Specifications - Stable & Consistent Offerings

#### Stable & Consistent Offerings

**Global Series SKUs** As part of its commitment to hardware, software, and solution innovation, HP is proud to introduce this breakthrough platform configuration stability to HP Workstation customers. HP Stable & Consistent Offerings are built on the foundation of a carefully chosen set of hardware and software designed and tested to work with all HP Z Workstation platforms through their end of life. These components and their corresponding HP Workstation platform compatibility are outlined in this section.

**Stable & Consistent Offerings** HP Stable & Consistent Offerings are available worldwide to all HP Workstation customers-no special programs, no additional cost-no kidding. Simply select your hardware and software components when you customize your HP Workstation and be assured that you'll be able to buy that same configuration throughout the lifecycle of the product.

Processors	Product #	Offering
	6M6F2AV	Intel Xeon W3-2423
	57M48AV	Intel Xeon W3-2435

Graphics	Product #	Offering
	6Z2Z0AV	NVIDIA Long-Life T1000E
	6Z2Y4AV	NVIDIA Long-Life RTX A2000E
	6Z2Y6AV	NVIDIA Long-Life RTX A4000E
	695F0AV	AMD Radeon RX 6400
	57K43AV	AMD Radeon Pro 6600

Storage	Product #	Offering
	57L12AV	Z Turbo 1TB PCIe-4x4 2280 TLC M.2 Solid State Drive
	57K65AV	1TB 7200RPM SATA 3.5in Enterprise

### Technical Specifications - Storage Drives

#### STORAGE/HARD DRIVES

<b>Performance PCIe SSDs for HP Workstations</b>	<b>Z Turbo 512GB 2280 PCIe-4x4 TLC SSD</b>	<b>Capacity</b>	512GB
		<b>Protocol</b>	PCIe
		<b>Form Factor</b>	M.2
		<b>Controller</b>	NVMe
		<b>NAND Type</b>	3D TLC
		<b>Endurance</b>	300TBW (TB Written)
		<b>Reliability</b>	1.5M hours
		<b>Rated for 24/7/365 operation</b>	No
		<b>Interface</b>	PCI Express 4.0 x4 electrical
		<b>Operating Temperature</b>	32° to 158° F (0° to 70° C)
		<b>Performance</b>	<b>Sequential Read</b> up to 6400MB/s*
			<b>Sequential Write</b> up to 3400MB/s*
			<b>Random Read</b> up to 600K IOPS*
	<b>Random Write</b> up to 600K IOPS*		

\*Actual performance may vary.

**NOTE:** For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 36GB of system disk (for Windows) is reserved for system recovery software.

<b>Z Turbo 512GB 2280 PCIe-4x4 SED OPAL2 TLC M.2 SSD</b>	<b>Capacity</b>	512GB
	<b>Protocol</b>	PCIe
	<b>Form Factor</b>	M.2
	<b>Controller</b>	NVMe
	<b>NAND Type</b>	3D TLC
	<b>Endurance</b>	300TBW (TB Written)
	<b>Reliability</b>	1.5M hours
	<b>Rated for 24/7/365 operation</b>	No
	<b>Interface</b>	PCI Express 4.0 x4 electrical
	<b>Operating Temperature</b>	32° to 158° F (0° to 70° C)
	<b>Performance</b>	<b>Sequential Read</b> up to 6400MB/s*
		<b>Sequential Write</b> up to 3400MB/s*
		<b>Random Read</b> up to 600K IOPS*
	<b>Random Write</b> up to 600K IOPS*	
<b>Self-Encrypting Drive Support</b>	OPAL 2	

\*Actual performance may vary.

**NOTE:** For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 36GB of system disk (for Windows) is reserved for system recovery software.

<b>Z Turbo 1TB 2280 PCIe-4x4 SED OPAL2 TLC M.2 SSD Module</b>	<b>Capacity</b>	1TB
	<b>Protocol</b>	PCIe
	<b>Form Factor</b>	M.2
	<b>Controller</b>	NVMe
	<b>NAND Type</b>	3D TLC
	<b>Endurance</b>	400TBW (TB Written)
	<b>Reliability</b>	1.5M hours

### Technical Specifications - Storage Drives

<b>Rated for 24/7/365 operation</b>	No								
<b>Interface</b>	PCI Express 4.0 x4 electrical								
<b>Operating Temperature</b>	32° to 158° F (0° to 70° C)								
<b>Performance</b>	<table> <tr> <td><b>Sequential Read</b></td> <td>up to 6500MB/s*</td> </tr> <tr> <td><b>Sequential Write</b></td> <td>up to 5000MB/s*</td> </tr> <tr> <td><b>Random Read</b></td> <td>up to 800K IOPS*</td> </tr> <tr> <td><b>Random Write</b></td> <td>up to 800K IOPS*</td> </tr> </table>	<b>Sequential Read</b>	up to 6500MB/s*	<b>Sequential Write</b>	up to 5000MB/s*	<b>Random Read</b>	up to 800K IOPS*	<b>Random Write</b>	up to 800K IOPS*
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<b>Self-Encrypting Drive Support</b>	OPAL 2								

\*Actual performance may vary.

**NOTE:** For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 36GB of system disk (for Windows) is reserved for system recovery software.

<b>Z Turbo 1TB 2280 PCIe-4x4 TLC SSD</b>	<table> <tr> <td><b>Capacity</b></td> <td>1TB</td> </tr> <tr> <td><b>Protocol</b></td> <td>PCIe</td> </tr> <tr> <td><b>Form Factor</b></td> <td>M.2</td> </tr> <tr> <td><b>Controller</b></td> <td>NVMe</td> </tr> <tr> <td><b>NAND Type</b></td> <td>3D TLC</td> </tr> <tr> <td><b>Endurance</b></td> <td>400TBW (TB Written)</td> </tr> <tr> <td><b>Reliability</b></td> <td>1.5M hours</td> </tr> <tr> <td><b>Rated for 24/7/365 operation</b></td> <td>No</td> </tr> <tr> <td><b>Interface</b></td> <td>PCI Express 4.0 x4 electrical</td> </tr> <tr> <td><b>Operating Temperature</b></td> <td>32° to 158° F (0° to 70° C)</td> </tr> <tr> <td><b>Performance</b></td> <td> <table> <tr> <td><b>Sequential Read</b></td> <td>up to 6500MB/s*</td> </tr> <tr> <td><b>Sequential Write</b></td> <td>up to 5000MB/s*</td> </tr> <tr> <td><b>Random Read</b></td> <td>up to 800K IOPS*</td> </tr> <tr> <td><b>Random Write</b></td> <td>up to 800K IOPS*</td> </tr> </table> </td> </tr> </table>	<b>Capacity</b>	1TB	<b>Protocol</b>	PCIe	<b>Form Factor</b>	M.2	<b>Controller</b>	NVMe	<b>NAND Type</b>	3D TLC	<b>Endurance</b>	400TBW (TB Written)	<b>Reliability</b>	1.5M hours	<b>Rated for 24/7/365 operation</b>	No	<b>Interface</b>	PCI Express 4.0 x4 electrical	<b>Operating Temperature</b>	32° to 158° F (0° to 70° C)	<b>Performance</b>	<table> <tr> <td><b>Sequential Read</b></td> <td>up to 6500MB/s*</td> </tr> <tr> <td><b>Sequential Write</b></td> <td>up to 5000MB/s*</td> </tr> <tr> <td><b>Random Read</b></td> <td>up to 800K IOPS*</td> </tr> <tr> <td><b>Random Write</b></td> <td>up to 800K IOPS*</td> </tr> </table>	<b>Sequential Read</b>	up to 6500MB/s*	<b>Sequential Write</b>	up to 5000MB/s*	<b>Random Read</b>	up to 800K IOPS*	<b>Random Write</b>	up to 800K IOPS*
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### Technical Specifications - Storage Drives

\*Actual performance may vary.

**NOTE:** For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 36GB of system disk (for Windows) is reserved for system recovery software.

<b>Z Turbo 2TB 2280 PCIe-4x4 SED OPAL2 TLC M.2 SSD</b>	<b>Capacity</b>	2TB	
	<b>Protocol</b>	PCIe	
	<b>Form Factor</b>	M.2	
	<b>Controller</b>	NVMe	
	<b>NAND Type</b>	3D TLC	
	<b>Endurance</b>	500TBW (TB Written)	
	<b>Reliability</b>	1.5M hours	
	<b>Rated for 24/7/365 operation</b>	No	
	<b>Interface</b>	PCI Express 4.0 x4 electrical	
	<b>Operating Temperature</b>	32° to 158° F (0° to 70° C)	
	<b>Performance</b>	<b>Sequential Read</b>	up to 6500MB/s*
		<b>Sequential Write</b>	up to 5000MB/s*
		<b>Random Read</b>	up to 800K IOPS*
<b>Random Write</b>		up to 800K IOPS*	
<b>Self-Encrypting Drive Support</b>	OPAL 2		

\*Actual performance may vary.

**NOTE:** For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 36GB of system disk (for Windows) is reserved for system recovery software.

<b>Z Turbo 2TB 2280 PCIe-4x4 TLC SSD</b>	<b>Capacity</b>	2TB	
	<b>Protocol</b>	PCIe	
	<b>Form Factor</b>	M.2	
	<b>Controller</b>	NVMe	
	<b>NAND Type</b>	3D TLC	
	<b>Endurance</b>	500TBW (TB Written)	
	<b>Reliability</b>	1.5M hours	
	<b>Rated for 24/7/365 operation</b>	No	
	<b>Interface</b>	PCI Express 4.0 x4 electrical	
	<b>Operating Temperature</b>	32° to 158° F (0° to 70° C)	
	<b>Performance</b>	<b>Sequential Read</b>	up to 6500MB/s*
		<b>Sequential Write</b>	up to 5000MB/s*
		<b>Random Read</b>	up to 800K IOPS*
<b>Random Write</b>		up to 800K IOPS*	

\*Actual performance may vary.

**NOTE:** For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 36GB of system disk (for Windows) is reserved for system recovery software.

<b>Z Turbo 4TB 2280 PCIe-4x4 TLC M.2 SSD</b>	<b>Capacity</b>	4TB
	<b>Protocol</b>	PCIe
	<b>Form Factor</b>	M.2
	<b>Controller</b>	NVMe
	<b>NAND Type</b>	3D TLC

### Technical Specifications - Storage Drives

<b>Endurance</b>	600TBW (TB Written)
<b>Reliability</b>	1.5M hours
<b>Rated for 24/7/365 operation</b>	No
<b>Interface</b>	PCI Express 4.0 x4 electrical
<b>Operating Temperature</b>	32° to 158° F (0° to 70° C)
<b>Performance</b>	<b>Sequential Read</b> up to 6500MB/s* <b>Sequential Write</b> up to 5000MB/s* <b>Random Read</b> up to 700K IOPS* <b>Random Write</b> up to 700K IOPS*

\*Actual performance may vary.

**NOTE:** For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 36GB of system disk (for Windows) is reserved for system recovery software.

<b>Z Turbo 4TB 2280 PCIe-4x4 SED OPAL2 TLC M.2 SSD</b>	<b>Capacity</b> 4TB <b>Protocol</b> PCIe <b>Form Factor</b> M.2 <b>Controller</b> NVMe <b>NAND Type</b> 3D TLC <b>Endurance</b> 600TBW (TB Written) <b>Reliability</b> 1.5M hours <b>Rated for 24/7/365 operation</b> No <b>Interface</b> PCI Express 4.0 x4 electrical <b>Operating Temperature</b> 32° to 158° F (0° to 70° C) <b>Performance</b> <b>Sequential Read</b> up to 6500MB/s* <b>Sequential Write</b> up to 5000MB/s* <b>Random Read</b> up to 700K IOPS* <b>Random Write</b> up to 700K IOPS* <b>Self-Encrypting Drive Support</b> OPAL 2
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\*Actual performance may vary.

**NOTE:** For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 36GB of system disk (for Windows) is reserved for system recovery software.

<b>Z Turbo 512GB PCIe-4x4 TLC Z4/Z6 Kit SSD</b>	<b>Capacity</b> 512GB <b>Protocol</b> PCIe <b>Form Factor</b> M.2 <b>Controller</b> NVMe <b>NAND Type</b> 3D TLC <b>Endurance</b> 300TBW (TB Written) <b>Reliability</b> 1.5M hours <b>Rated for 24/7/365 operation</b> No <b>Interface</b> PCI Express 4.0 x4 electrical <b>Operating Temperature</b> 32° to 158° F (0° to 70° C) <b>Performance</b> <b>Sequential Read</b> up to 6400MB/s* <b>Sequential Write</b> up to 3400MB/s*
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### Technical Specifications - Storage Drives

	<b>Random Read</b>	up to 600K IOPS*
	<b>Random Write</b>	up to 600K IOPS*

\*Actual performance may vary.

**NOTE:** For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 36GB of system disk (for Windows) is reserved for system recovery software.

<b>Z Turbo 512GB 2280 PCIe-4x4 SED OPAL2 TLC M.2 Z4/Z6 Kit SSD</b>	<b>Capacity</b>	512GB	
	<b>Protocol</b>	PCIe	
	<b>Form Factor</b>	M.2	
	<b>Controller</b>	NVMe	
	<b>NAND Type</b>	3D TLC	
	<b>Endurance</b>	300TBW (TB Written)	
	<b>Reliability</b>	1.5M hours	
	<b>Rated for 24/7/365 operation</b>	No	
	<b>Interface</b>	PCI Express 4.0 x4 electrical	
	<b>Operating Temperature</b>	32° to 158° F (0° to 70° C)	
	<b>Performance</b>	<b>Sequential Read</b>	up to 6400MB/s*
		<b>Sequential Write</b>	up to 3400MB/s*
		<b>Random Read</b>	up to 600K IOPS*
		<b>Random Write</b>	up to 600K IOPS*
<b>Self-Encrypting Drive Support</b>	OPAL 2		

\*Actual performance may vary.

**NOTE:** For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 36GB of system disk (for Windows) is reserved for system recovery software.

<b>Z Turbo 1TB PCIe-4x4 TLC Z4/Z6 Kit SSD</b>	<b>Capacity</b>	1TB	
	<b>Protocol</b>	PCIe	
	<b>Form Factor</b>	M.2	
	<b>Controller</b>	NVMe	
	<b>NAND Type</b>	3D TLC	
	<b>Endurance</b>	400TBW (TB Written)	
	<b>Reliability</b>	1.5M hours	
	<b>Rated for 24/7/365 operation</b>	No	
	<b>Interface</b>	PCI Express 4.0 x4 electrical	
	<b>Operating Temperature</b>	32° to 158° F (0° to 70° C)	
	<b>Performance</b>	<b>Sequential Read</b>	up to 6500MB/s*
		<b>Sequential Write</b>	up to 5000MB/s*
		<b>Random Read</b>	up to 800K IOPS*
		<b>Random Write</b>	up to 800K IOPS*

\*Actual performance may vary.

**NOTE:** For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 36GB of system disk (for Windows) is reserved for system recovery software.

<b>Z Turbo 1TB 2280 PCIe-4x4 SED OPAL2 TLC M.2 Z4/Z6 Kit SSD</b>	<b>Capacity</b>	1TB
	<b>Protocol</b>	PCIe
	<b>Form Factor</b>	M.2

### Technical Specifications - Storage Drives

<b>Controller</b>	NVMe	
<b>NAND Type</b>	3D TLC	
<b>Endurance</b>	400TBW (TB Written)	
<b>Reliability</b>	1.5M hours	
<b>Rated for 24/7/365 operation</b>	No	
<b>Interface</b>	PCI Express 4.0 x4 electrical	
<b>Operating Temperature</b>	32° to 158° F (0° to 70° C)	
<b>Performance</b>	<b>Sequential Read</b>	up to 6500MB/s*
	<b>Sequential Write</b>	up to 5000MB/s*
	<b>Random Read</b>	up to 800K IOPS*
	<b>Random Write</b>	up to 800K IOPS*
<b>Self-Encrypting Drive Support</b>	OPAL 2	

\*Actual performance may vary.

**NOTE:** For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 36GB of system disk (for Windows) is reserved for system recovery software.

#### Z Turbo 2TB 2280 PCIe-4x4 SED OPAL2 TLC M.2 Z4/Z6 Kit SSD

<b>Capacity</b>	2TB	
<b>Protocol</b>	PCIe	
<b>Form Factor</b>	M.2	
<b>Controller</b>	NVMe	
<b>NAND Type</b>	3D TLC	
<b>Endurance</b>	500TBW (TB Written)	
<b>Reliability</b>	1.5M hours	
<b>Rated for 24/7/365 operation</b>	No	
<b>Interface</b>	PCI Express 4.0 x4 electrical	
<b>Operating Temperature</b>	32° to 158° F (0° to 70° C)	
<b>Performance</b>	<b>Sequential Read</b>	up to 6500MB/s*
	<b>Sequential Write</b>	up to 5000MB/s*
	<b>Random Read</b>	up to 800K IOPS*
	<b>Random Write</b>	up to 800K IOPS*
<b>Self-Encrypting Drive Support</b>	OPAL 2	

\*Actual performance may vary.

**NOTE:** For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 36GB of system disk (for Windows) is reserved for system recovery software.

#### Z Turbo 4TB 2280 PCIe-4x4 SED OPAL2 TLC M.2 Z4/Z6 Kit SSD

<b>Capacity</b>	4TB	
<b>Protocol</b>	PCIe	
<b>Form Factor</b>	M.2	
<b>Controller</b>	NVMe	
<b>NAND Type</b>	3D TLC	
<b>Endurance</b>	600TBW (TB Written)	
<b>Reliability</b>	1.5M hours	
<b>Rated for 24/7/365 operation</b>	No	



### Technical Specifications - Storage Drives

<b>Interface</b>	PCI Express 4.0 x4 electrical	
<b>Operating Temperature</b>	32° to 158° F (0° to 70° C)	
<b>Performance</b>	<b>Sequential Read</b>	up to 6500MB/s*
	<b>Sequential Write</b>	up to 5000MB/s*
	<b>Random Read</b>	up to 700K IOPS*
	<b>Random Write</b>	up to 700K IOPS*
<b>Self-Encrypting Drive Support</b>	OPAL 2	

\*Actual performance may vary.

**NOTE:** For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 36GB of system disk (for Windows) is reserved for system recovery software.

#### Performance PCIe SSDs for HP Dual Pro Carrier

#### HP Z Turbo Drive Dual Pro 512GB SSD

<b>Capacity</b>	512GB	
<b>Protocol</b>	PCIe	
<b>Form Factor</b>	M.2	
<b>Controller</b>	NVMe	
<b>NAND Type</b>	3D TLC	
<b>Endurance</b>	300TBW (TB Written)	
<b>Reliability</b>	1.5M hours	
<b>Rated for 24/7/365 operation</b>	No	
<b>Interface</b>	PCI Express 4.0 x4 electrical	
<b>Operating Temperature</b>	32° to 158° F (0° to 70° C)	
<b>Performance</b>	<b>Sequential Read</b>	up to 6400MB/s*
	<b>Sequential Write</b>	up to 3400MB/s*
	<b>Random Read</b>	up to 600K IOPS*
	<b>Random Write</b>	up to 600K IOPS*

\*Actual performance may vary.

**NOTE:** For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 36GB of system disk (for Windows) is reserved for system recovery software.

#### HP Z Turbo Drive Dual Pro 1TB SSD

<b>Capacity</b>	1TB	
<b>Protocol</b>	PCIe	
<b>Form Factor</b>	M.2	
<b>Controller</b>	NVMe	
<b>NAND Type</b>	3D TLC	
<b>Endurance</b>	400TBW (TB Written)	
<b>Reliability</b>	1.5M hours	
<b>Rated for 24/7/365 operation</b>	No	
<b>Interface</b>	PCI Express 4.0 x4 electrical	
<b>Operating Temperature</b>	32° to 158° F (0° to 70° C)	
<b>Performance</b>	<b>Sequential Read</b>	up to 6500MB/s*
	<b>Sequential Write</b>	up to 5000MB/s*
	<b>Random Read</b>	up to 800K IOPS*
	<b>Random Write</b>	up to 800K IOPS*

### Technical Specifications - Storage Drives

\*Actual performance may vary.

**NOTE:** For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 36GB of system disk (for Windows) is reserved for system recovery software.

<b>HP Z Turbo Drive Dual Pro 2TB SSD</b>	<b>Capacity</b>	2TB	
	<b>Protocol</b>	PCIe	
	<b>Form Factor</b>	M.2	
	<b>Controller</b>	NVMe	
	<b>NAND Type</b>	3D TLC	
	<b>Endurance</b>	500TBW (TB Written)	
	<b>Reliability</b>	1.5M hours	
	<b>Rated for 24/7/365 operation</b>	No	
	<b>Interface</b>	PCI Express 4.0 x4 electrical	
	<b>Operating Temperature</b>	32° to 158° F (0° to 70° C)	
	<b>Performance</b>	<b>Sequential Read</b>	up to 6500MB/s*
		<b>Sequential Write</b>	up to 5000MB/s*
		<b>Random Read</b>	up to 800K IOPS*
	<b>Random Write</b>	up to 800K IOPS*	

\*Actual performance may vary.

**NOTE:** For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 36GB of system disk (for Windows) is reserved for system recovery software.

<b>HP Z Turbo Drive Dual Pro 4TB SSD</b>	<b>Capacity</b>	4TB	
	<b>Protocol</b>	PCIe	
	<b>Form Factor</b>	M.2	
	<b>Controller</b>	NVMe	
	<b>NAND Type</b>	3D TLC	
	<b>Endurance</b>	500TBW (TB Written)	
	<b>Reliability</b>	1.5M hours	
	<b>Rated for 24/7/365 operation</b>	No	
	<b>Interface</b>	PCI Express 4.0 x4 electrical	
	<b>Operating Temperature</b>	32° to 158° F (0° to 70° C)	
	<b>Performance</b>	<b>Sequential Read</b>	up to 6500MB/s*
		<b>Sequential Write</b>	up to 5000MB/s*
		<b>Random Read</b>	up to 800K IOPS*
	<b>Random Write</b>	up to 800K IOPS*	

\*Actual performance may vary.

**NOTE:** For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 36GB of system disk (for Windows) is reserved for system recovery software.

<b>Performance PCIe SSDs for HP Quad Pro Carrier</b>	<b>HP Z Turbo Drive Quad Pro 512GB SSD</b>	<b>Capacity</b>	512GB
		<b>Protocol</b>	PCIe
		<b>Form Factor</b>	M.2
		<b>Controller</b>	NVMe
		<b>NAND Type</b>	3D TLC
		<b>Endurance</b>	300TBW (TB Written)

### Technical Specifications - Storage Drives

<b>Reliability</b>	1.5M hours								
<b>Rated for 24/7/365 operation</b>	No								
<b>Interface</b>	PCI Express 4.0 x4 electrical								
<b>Operating Temperature</b>	32° to 158° F (0° to 70° C)								
<b>Performance</b>	<table> <tr> <td><b>Sequential Read</b></td> <td>up to 6400MB/s*</td> </tr> <tr> <td><b>Sequential Write</b></td> <td>up to 3400MB/s*</td> </tr> <tr> <td><b>Random Read</b></td> <td>up to 600K IOPS*</td> </tr> <tr> <td><b>Random Write</b></td> <td>up to 600K IOPS*</td> </tr> </table>	<b>Sequential Read</b>	up to 6400MB/s*	<b>Sequential Write</b>	up to 3400MB/s*	<b>Random Read</b>	up to 600K IOPS*	<b>Random Write</b>	up to 600K IOPS*
<b>Sequential Read</b>	up to 6400MB/s*								
<b>Sequential Write</b>	up to 3400MB/s*								
<b>Random Read</b>	up to 600K IOPS*								
<b>Random Write</b>	up to 600K IOPS*								

\*Actual performance may vary.

**NOTE:** For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 36GB of system disk (for Windows) is reserved for system recovery software.

<b>HP Z Turbo Drive Quad Pro 1TB SSD</b>	<b>Capacity</b>	1TB								
	<b>Protocol</b>	PCIe								
	<b>Form Factor</b>	M.2								
	<b>Controller</b>	NVMe								
	<b>NAND Type</b>	3D TLC								
	<b>Endurance</b>	400TBW (TB Written)								
	<b>Reliability</b>	1.5M hours								
	<b>Rated for 24/7/365 operation</b>	No								
	<b>Interface</b>	PCI Express 4.0 x4 electrical								
	<b>Operating Temperature</b>	32° to 158° F (0° to 70° C)								
	<b>Performance</b>	<table> <tr> <td><b>Sequential Read</b></td> <td>up to 6500MB/s*</td> </tr> <tr> <td><b>Sequential Write</b></td> <td>up to 5000MB/s*</td> </tr> <tr> <td><b>Random Read</b></td> <td>up to 800K IOPS*</td> </tr> <tr> <td><b>Random Write</b></td> <td>up to 800K IOPS*</td> </tr> </table>	<b>Sequential Read</b>	up to 6500MB/s*	<b>Sequential Write</b>	up to 5000MB/s*	<b>Random Read</b>	up to 800K IOPS*	<b>Random Write</b>	up to 800K IOPS*
	<b>Sequential Read</b>	up to 6500MB/s*								
	<b>Sequential Write</b>	up to 5000MB/s*								
<b>Random Read</b>	up to 800K IOPS*									
<b>Random Write</b>	up to 800K IOPS*									

\*Actual performance may vary.

**NOTE:** For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 36GB of system disk (for Windows) is reserved for system recovery software.

<b>HP Z Turbo Drive Quad Pro 2TB SSD</b>	<b>Capacity</b>	2TB								
	<b>Protocol</b>	PCIe								
	<b>Form Factor</b>	M.2								
	<b>Controller</b>	NVMe								
	<b>NAND Type</b>	3D TLC								
	<b>Endurance</b>	500TBW (TB Written)								
	<b>Reliability</b>	1.5M hours								
	<b>Rated for 24/7/365 operation</b>	No								
	<b>Interface</b>	PCI Express 4.0 x4 electrical								
	<b>Operating Temperature</b>	32° to 158° F (0° to 70° C)								
	<b>Performance</b>	<table> <tr> <td><b>Sequential Read</b></td> <td>up to 6500MB/s*</td> </tr> <tr> <td><b>Sequential Write</b></td> <td>up to 5000MB/s*</td> </tr> <tr> <td><b>Random Read</b></td> <td>up to 800K IOPS*</td> </tr> <tr> <td><b>Random Write</b></td> <td>up to 800K IOPS*</td> </tr> </table>	<b>Sequential Read</b>	up to 6500MB/s*	<b>Sequential Write</b>	up to 5000MB/s*	<b>Random Read</b>	up to 800K IOPS*	<b>Random Write</b>	up to 800K IOPS*
	<b>Sequential Read</b>	up to 6500MB/s*								
	<b>Sequential Write</b>	up to 5000MB/s*								
<b>Random Read</b>	up to 800K IOPS*									
<b>Random Write</b>	up to 800K IOPS*									

\*Actual performance may vary.

### Technical Specifications - Storage Drives

**NOTE:** For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 36GB of system disk (for Windows) is reserved for system recovery software.

<b>HP Z Turbo Drive Quad Pro 4TB SSD</b>	<b>Capacity</b>	4TB
	<b>Protocol</b>	PCIe
	<b>Form Factor</b>	M.2
	<b>Controller</b>	NVMe
	<b>NAND Type</b>	3D TLC
	<b>Endurance</b>	500TBW (TB Written)
	<b>Reliability</b>	1.5M hours
	<b>Rated for 24/7/365 operation</b>	No
	<b>Interface</b>	PCI Express 4.0 x4 electrical
	<b>Operating Temperature</b>	32° to 158° F (0° to 70° C)
	<b>Performance</b>	<b>Sequential Read</b> up to 6500MB/s*
		<b>Sequential Write</b> up to 5000MB/s*
		<b>Random Read</b> up to 800K IOPS*
	<b>Random Write</b> up to 800K IOPS*	

\*Actual performance may vary.

**NOTE:** For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 36GB of system disk (for Windows) is reserved for system recovery software.

<b>SATA Hard Drives for HP Workstations</b>	<b>1TB 7200RPM SATA 3.5in Enterprise HDD</b>	<b>Capacity</b>	1TB
		<b>Protocol</b>	SATA
		<b>Form Factor</b>	3.5"
		<b>Controller</b>	AHCI
		<b>Reliability</b>	2.0M hours
		<b>Rated Power On Hours</b>	8760/yr
		<b>Annualized Failure Rate (based on Rated POH)</b>	<0.62%
		<b>Rated for 24/7/365 operation</b>	YES
		<b>Height</b>	1 in; 2.54 cm
		<b>Width</b>	<b>Media Diameter</b> 3.5 in; 8.9 cm
			<b>Physical Size</b> 4 in; 10.17 cm
		<b>Interface</b>	Serial ATA (6.0Gb/s), NCQ enabled
		<b>Synchronous Transfer Rate (Maximum)</b>	Up to 600MB/s *
		<b>Buffer</b>	128MB
		<b>Cache</b>	Adaptive
		<b>Seek Time (typical reads, includes controller overhead, including settling)</b>	<b>Single Track</b> 0.32 ms *
			<b>Average</b> 7.45 ms *
	<b>Full Stroke</b> 14.2 ms *		
<b>Rotational Speed</b>	7,200 rpm		
<b>Logical Blocks</b>	1,953,525,168		

### Technical Specifications - Storage Drives

<b>Operating Temperature</b>	41° to 131° F (5° to 55° C)				
<b>Performance</b>	<table> <tr> <td><b>Sequential Read</b></td> <td>up to 226MB/s*</td> </tr> <tr> <td><b>Sequential Write</b></td> <td>up to 226MB/s*</td> </tr> </table>	<b>Sequential Read</b>	up to 226MB/s*	<b>Sequential Write</b>	up to 226MB/s*
<b>Sequential Read</b>	up to 226MB/s*				
<b>Sequential Write</b>	up to 226MB/s*				

\*Actual performance may vary.

**NOTE:** For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 36GB of system disk (for Windows) is reserved for system recovery software.

<b>2TB 7200RPM SATA 3.5in Enterprise HDD</b>	<b>Capacity</b>	2TB				
	<b>Protocol</b>	SATA				
	<b>Form Factor</b>	3.5"				
	<b>Controller</b>	AHCI				
	<b>Reliability</b>	2.0M hours				
	<b>Rated Power On Hours</b>	8760/yr				
	<b>Annualized Failure Rate (based on Rated POH)</b>	<0.62%				
	<b>Rated for 24/7/365 operation</b>	YES				
	<b>Height</b>	1 in; 2.54 cm				
	<b>Width</b>	<b>Media Diameter</b> 3.5 in; 8.9 cm				
		<b>Physical Size</b> 4 in; 10.17 cm				
	<b>Interface</b>	Serial ATA (6.0Gb/s), NCQ enabled				
	<b>Synchronous Transfer Rate (Maximum)</b>	Up to 600MB/s *				
	<b>Buffer</b>	128MB				
	<b>Cache</b>	Adaptive				
	<b>Seek Time</b> (typical reads, includes controller overhead, including settling)	<b>Single Track</b> 0.7 ms *				
		<b>Average</b> 8.5 ms *				
		<b>Full Stroke</b> 15.7 ms *				
	<b>Rotational Speed</b>	7,200 rpm				
	<b>Logical Blocks</b>	3,907,029,168				
	<b>Operating Temperature</b>	41° to 131° F (5° to 55° C)				
	<b>Performance</b>	<table> <tr> <td><b>Sequential Read</b></td> <td>up to 226MB/s*</td> </tr> <tr> <td><b>Sequential Write</b></td> <td>up to 226MB/s*</td> </tr> </table>	<b>Sequential Read</b>	up to 226MB/s*	<b>Sequential Write</b>	up to 226MB/s*
<b>Sequential Read</b>	up to 226MB/s*					
<b>Sequential Write</b>	up to 226MB/s*					

\*Actual performance may vary.

**NOTE:** For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 36GB of system disk (for Windows) is reserved for system recovery software.

<b>4TB 7200 RPM SATA 3.5in Enterprise HDD</b>	<b>Capacity</b>	4TB
	<b>Protocol</b>	SATA
	<b>Form Factor</b>	3.5"
	<b>Controller</b>	AHCI
	<b>Reliability</b>	2.0M hours
	<b>Rated Power On Hours</b>	8760/yr
	<b>Annualized Failure Rate (based on Rated POH)</b>	<0.62%
	<b>Rated for 24/7/365 operation</b>	YES
	<b>Height</b>	1 in; 2.54 cm

### Technical Specifications - Storage Drives

<b>Width</b>	<b>Media Diameter</b>	3.5 in; 8.9 cm
	<b>Physical Size</b>	4 in; 10.17 cm
<b>Interface</b>	Serial ATA (6.0Gb/s), NCQ enabled	
<b>Synchronous Transfer Rate (Maximum)</b>	Up to 600MB/s *	
<b>Buffer</b>	256MB	
<b>Cache</b>	Adaptive	
<b>Seek Time (typical reads, includes controller overhead, including settling)</b>	<b>Single Track</b>	0.7 ms *
	<b>Average</b>	8.5 ms *
	<b>Full Stroke</b>	15.7 ms *
<b>Rotational Speed</b>	7,200 rpm	
<b>Logical Blocks</b>	7,814,037,168	
<b>Operating Temperature</b>	41° to 131° F (5° to 55° C)	
<b>Performance</b>	<b>Sequential Read</b>	up to 226MB/s*
	<b>Sequential Write</b>	up to 226MB/s*

\*Actual performance may vary.

**NOTE:** For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 36GB of system disk (for Windows) is reserved for system recovery software.

#### 8TB 7200RPM SATA 3.5in Enterprise HDD

<b>Capacity</b>	8TB	
<b>Protocol</b>	SATA	
<b>Form Factor</b>	3.5"	
<b>Controller</b>	AHCI	
<b>Reliability</b>	2.0M hours	
<b>Rated Power On Hours</b>	8760/yr	
<b>Annualized Failure Rate (based on Rated POH)</b>	<0.62%	
<b>Rated for 24/7/365 operation</b>	YES	
<b>Height</b>	1 in; 2.54 cm	
<b>Width</b>	<b>Media Diameter</b>	3.5 in; 8.9 cm
	<b>Physical Size</b>	4 in; 10.17 cm
<b>Interface</b>	Serial ATA (6.0Gb/s), NCQ enabled	
<b>Synchronous Transfer Rate (Maximum)</b>	Up to 600MB/s *	
<b>Buffer</b>	256MB	
<b>Cache</b>	Adaptive	
<b>Seek Time (typical reads, includes controller overhead, including settling)</b>	<b>Single Track</b>	0.7 ms *
	<b>Average</b>	8.5 ms *
	<b>Full Stroke</b>	15.7 ms *
<b>Rotational Speed</b>	7,200 rpm	
<b>Logical Blocks</b>	15,628,053,168	
<b>Operating Temperature</b>	41° to 140° F (5° to 60° C)	
<b>Performance</b>	<b>Sequential Read</b>	up to 226MB/s*
	<b>Sequential Write</b>	up to 226MB/s*

\*Actual performance may vary.

### Technical Specifications - Storage Drives

**NOTE:** For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 36GB of system disk (for Windows) is reserved for system recovery software.

<b>12TB 7200 RPM SATA-6G 3.5in Enterprise HDD</b>	<b>Capacity</b>	12TB	
	<b>Protocol</b>	SATA	
	<b>Form Factor</b>	3.5"	
	<b>Controller</b>	AHCI	
	<b>Reliability</b>	2.0M hours	
	<b>Rated Power On Hours</b>	8760/yr	
	<b>Annualized Failure Rate (based on Rated POH)</b>	<0.62%	
	<b>Rated for 24/7/365 operation</b>	YES	
	<b>Height</b>	1 in; 2.54 cm	
	<b>Width</b>	<b>Media Diameter</b>	3.5 in; 8.9 cm
		<b>Physical Size</b>	4 in; 10.17 cm
	<b>Interface</b>	Serial ATA (6.0Gb/s), NCQ enabled	
	<b>Synchronous Transfer Rate (Maximum)</b>	Up to 600MB/s *	
	<b>Buffer</b>	256MB	
	<b>Cache</b>	Adaptive	
	<b>Seek Time</b> (typical reads, includes controller overhead, including settling)	<b>Single Track</b>	0.7 ms *
		<b>Average</b>	8.5 ms *
		<b>Full Stroke</b>	15.7 ms *
	<b>Rotational Speed</b>	7,200 rpm	
	<b>Logical Blocks</b>	23,437,770,752	
	<b>Operating Temperature</b>	41° to 140° F (5° to 60° C)	
	<b>Performance</b>	<b>Sequential Read</b>	up to 226MB/s*
		<b>Sequential Write</b>	up to 226MB/s*

\*Actual performance may vary.

**NOTE:** For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 36GB of system disk (for Windows) is reserved for system recovery software.

### Technical Specifications - Graphics

#### GRAPHICS

<b>NVIDIA® RTX™ 6000 Ada 48GB</b>	<b>Form Factor</b>	Full-Height Dual Slot (4.4" Height x 10.5" Length) Weight: 1230 grams / 2.71 lbs (with extender)
	<b>Max Power Consumption</b>	Power: 300 Watts Cooling: Active
	<b>GPU Memory</b>	48GB GDDR6 memory ECC Memory Bandwidth: Up to 960 GB/s Memory Width: 384 bits
	<b>Connectors</b>	4x DisplayPort 1.4a Quadro Sync II connector Stereo Sync Requires CEM 5.0 16-pin auxiliary power adapter
	<b>Maximum Resolution</b>	7680x4320 @ 120Hz
	<b>Bus Type Available Graphics Drivers</b>	PCI Express 4.0 x16 Windows 11 Windows 10 Linux® 64-bit

<b>NVIDIA® RTX™ A6000 48GB</b>	<b>Form Factor</b>	Full-Height Dual Slot (4.4" Height x 10.5" Length) Weight: 1230 grams / 2.71 lbs (with extender)
	<b>Max Power Consumption</b>	Power: 300 Watts Cooling: Active
	<b>GPU Memory</b>	48GB GDDR6 memory ECC optional Memory Bandwidth: Up to 768 GB/s Memory Width: 384 bit
	<b>Connectors</b>	4x DisplayPort 1.4a Quadro Sync II connector NVLink® Stereo Sync Requires 8-pin auxiliary power
	<b>Maximum Resolution</b>	7680x4320 @ 120Hz
	<b>Bus Type Available Graphics Drivers</b>	PCI Express 4.0 x16 Windows 11 Windows 10 Linux® 64-bit

<b>NVIDIA® RTX™ 5000 Ada 32GB</b>	<b>Form Factor</b>	Full-Height Dual Slot (4.4" Height x 13.85" Length) Weight: 1130 grams / 2.49 lbs (excluding extender)
	<b>Max Power Consumption</b>	Power: 250 Watts Cooling: Active
	<b>GPU Memory</b>	32GB GDDR6 memory ECC Memory Bandwidth: Up to 576 GB/s Memory Width: 256 bits
	<b>Connectors</b>	4x DisplayPort 1.4a Quadro Sync II connector Stereo Sync Requires CEM 5.0 16-pin auxiliary power adapter
	<b>Maximum Resolution</b>	7680x4320 @ 120Hz



### Technical Specifications - Graphics

<b>Bus Type</b>	PCI Express 4.0 x16
<b>Available Graphics Drivers</b>	Windows 11 Windows 10 Linux® 64-bit

<b>NVIDIA® RTX™ A5000 24GB</b>	<b>Form Factor</b>	Full-Height Dual Slot (4.4" Height x 11" Length) Weight: 1049 grams + 80 grams extender
	<b>Max Power Consumption</b>	Power: 230W Cooling: Active
	<b>GPU Memory</b>	24GB GDDR6 memory ECC optional Memory Bandwidth: Up to 768 GB/s Memory Width: 384 bit
	<b>Connectors</b>	4x DisplayPort 1.4a Quadro Sync II connector NVLink® Stereo Sync Requires 8-pin auxiliary power
	<b>Maximum Resolution</b>	7680x4320 @ 120Hz
	<b>Bus Type</b> <b>Available Graphics Drivers</b>	PCI Express 4.0 x16 Windows 11 Windows 10 Linux® 64-bit

<b>AMD® Radeon™ Pro W7900 48GB</b>	<b>Form Factor</b>	Full-Height Triple Slot (4.4" Height x 10.5" Length)
	<b>Max Power Consumption</b>	Power: 295W Cooling: Active
	<b>GPU Memory</b>	48GB GDDR6 memory Memory Bandwidth: Up to 864 GB/s Memory Width: 384 bit
	<b>Connectors</b>	3x DisplayPort 2.1 1x Enhanced Mini DisplayPort 2.1 Requires 2x 8-pin auxiliary power connectors
	<b>Maximum Resolution</b>	12288x6912 @ 120Hz
	<b>Bus Type</b> <b>Available Graphics Drivers</b>	PCI Express 4.0 x16 Windows 11 Windows 10 Linux® 64-bit

<b>NVIDIA® RTX 4500 Ada 24GB</b>	<b>Form Factor</b>	Full-Height Dual Slot (4.4" Height x 10.5" Length)
	<b>Max Power Consumption</b>	210W
	<b>GPU Memory</b>	24GB GDDR6 Memory Bandwidth: 432 GB/s Memory Width: 192-bit
	<b>Connectors</b>	4x DisplayPort 1.4a Requires: 1x 16-pin CEM 5 power connector (adapter may be needed)

### Technical Specifications - Graphics

<b>Maximum Resolution</b>	4x @ 4096 x 2160 @ 120Hz 4x @ 5120 x 2880 @ 60Hz 2x @ 7680 x 4320 @ 60Hz
<b>Bus Type</b>	PCI Express 4.0 x16
<b>Available Graphics Drivers</b>	Windows 10 Windows 11

<b>NVIDIA® RTX™ A4500 20GB</b>	<b>Form Factor</b>	Full-Height Dual Slot (4.4" Height x 10.5" Length) Weight: 1049 grams + 80 grams extender
	<b>Max Power Consumption</b>	Power: 200W Cooling: Active
	<b>GPU Memory</b>	20GB GDDR6 memory Memory Bandwidth: Up to 640 GB/s Memory Width: 320 bit
	<b>Connectors</b>	4x DisplayPort 1.4a Quadro Sync II connector NVLink® Stereo Sync Requires 8-pin auxiliary power
	<b>Maximum Resolution</b>	7680x4320 @ 120Hz
	<b>Bus Type Available Graphics Drivers</b>	PCI Express 4.0 x16 Windows 11 Windows 10 Linux® 64-bit

<b>NVIDIA® RTX™ 4000 Ada 20GB</b>	<b>Form Factor</b>	Full-Height Single Slot (4.4" Height x 9.5" Length)
	<b>Max Power Consumption</b>	Power: 130W Cooling: Active
	<b>GPU Memory</b>	20GB GDDR6 memory Memory Bandwidth: Up to 360 GB/s Memory Width: 256 bit
	<b>Connectors</b>	4x DisplayPort 1.4a Requires 6-pin auxiliary power
	<b>Maximum Resolution</b>	7680x4320 @ 120Hz
	<b>Bus Type Available Graphics Drivers</b>	PCI Express 4.0 x16 Windows 11 Windows 10 Linux® 64-bit

<b>NVIDIA® RTX™ A4000 16GB</b>	<b>Form Factor</b>	Full-Height Single Slot (4.4" Height x 9.5" Length) Weight: 500 grams
	<b>Max Power Consumption</b>	Power: 140W Cooling: Active
	<b>GPU Memory</b>	16GB GDDR6 memory Memory Bandwidth: Up to 448 GB/s Memory Width: 256 bit

### Technical Specifications - Graphics

<b>Connectors</b>	4x DisplayPort 1.4a Quadro Sync II connector Stereo Sync Requires 6-pin auxiliary power
<b>Maximum Resolution</b>	7680x4320 @ 120Hz
<b>Bus Type</b>	PCI Express 4.0 x16
<b>Available Graphics Drivers</b>	Windows 11 Windows 10 Linux® 64-bit

<b>NVIDIA® Long-Life RTX™ A4000E 16GB</b>	<b>Form Factor</b>	Full-Height Single Slot (4.4" Height x 9.5" Length) Weight: 500 grams
	<b>Max Power Consumption</b>	Power: 140W Cooling: Active
	<b>GPU Memory</b>	16GB GDDR6 memory Memory Bandwidth: Up to 448 GB/s Memory Width: 256 bit
	<b>Connectors</b>	4x DisplayPort 1.4a Quadro Sync II connector Stereo Sync Requires 6-pin auxiliary power
	<b>Maximum Resolution</b>	7680x4320 @ 120Hz
	<b>Bus Type</b>	PCI Express 4.0 x16
	<b>Available Graphics Drivers</b>	Windows 11 Windows 10 Linux® 64-bit

<b>AMD® Radeon™ Pro W6800 32GB</b>	<b>Form Factor</b>	Full-Height Dual Slot (4.4" Height x 10.5" Length) Weight: 850 grams
	<b>Max Power Consumption</b>	Power: 261W Cooling: Active
	<b>GPU Memory</b>	32GB GDDR6 memory Memory Bandwidth: Up to 512 GB/s Memory Width: 256 bit
	<b>Connectors</b>	6x mini-DisplayPort 1.4 Requires 8-pin+6-pin auxiliary power
	<b>Maximum Resolution</b>	7680x4320 @ 60Hz
	<b>Bus Type</b>	PCI Express 4.0 x16
	<b>Available Graphics Drivers</b>	Windows 11 Windows 10 Linux® 64-bit

<b>NVIDIA® RTX™ 2000 Ada 16GB</b>	<b>Form Factor</b>	Half Height Dual Slot (2.7" Height x 6.7" Length)
	<b>Max Power Consumption</b>	70W

### Technical Specifications - Graphics

<b>GPU Memory</b>	16GB GDDR6 Memory Bandwidth: 224 GB/s Memory Width: 128-bit
<b>Connectors</b>	4x Mini DisplayPort 1.4a
<b>Maximum Resolution</b>	4x 4096 x 2160 @ 120 Hz 4x 5120 x 2880 @ 60 Hz 2x 7680 x 4320 @ 60 Hz
<b>Bus Type</b>	PCI Express 4.0 x8
<b>Available Graphics Drivers</b>	Windows 10 Windows 11

#### NVIDIA® RTX™ A2000 12GB

<b>Form Factor</b>	Half-Height Dual Slot (2.713" Height x 6.6" Length) Weight: 306 grams
<b>Max Power Consumption</b>	Power: 70W Cooling: Active
<b>GPU Memory</b>	12GB GDDR6 memory Memory Bandwidth: Up to 288 GB/s Memory Width: 192 bit
<b>Connectors</b>	4x mini-DisplayPort 1.4a
<b>Maximum Resolution</b>	7680x4320 @ 120Hz
<b>Bus Type</b>	PCI Express 4.0 x16
<b>Available Graphics Drivers</b>	Windows 11 Windows 10 Linux® 64-bit

#### NVIDIA® Long-Life RTX A2000E 12GB

<b>Form Factor</b>	Half-Height Dual Slot (2.713" Height x 6.6" Length) Weight: 306 grams
<b>Max Power Consumption</b>	Power: 70W Cooling: Active
<b>GPU Memory</b>	12GB GDDR6 memory Memory Bandwidth: Up to 288 GB/s Memory Width: 192 bit
<b>Connectors</b>	4x mini-DisplayPort 1.4a
<b>Maximum Resolution</b>	7680x4320 @ 120Hz
<b>Bus Type</b>	PCI Express 4.0 x16
<b>Available Graphics Drivers</b>	Windows 11 Windows 10 Linux® 64-bit

#### NVIDIA® T1000 8GB

<b>Form Factor</b>	Half-Height Single Slot (2.713" Height x 6.137" Length) Weight: 132.6 grams
<b>Max Power Consumption</b>	Power: 50W Cooling: Active
<b>GPU Memory</b>	8GB GDDR6 memory Memory Bandwidth: Up to 160 GB/s Memory Width: 128 bit

### Technical Specifications - Graphics

<b>Connectors</b>	4x mini-DisplayPort 1.4a
<b>Maximum Resolution</b>	7680x4320 @ 120Hz
<b>Bus Type</b>	PCI Express 3.0 x16
<b>Available Graphics Drivers</b>	Windows 11 Windows 10 Linux® 64-bit

#### NVIDIA® Long-Life T1000E 8GB

<b>Form Factor</b>	Half-Height Single Slot (2.713" Height x 6.137" Length) Weight: 132.6 grams
<b>Max Power Consumption</b>	Power: 50W Cooling: Active
<b>GPU Memory</b>	8GB GDDR6 memory Memory Bandwidth: Up to 160 GB/s Memory Width: 128 bit
<b>Connectors</b>	4x mini-DisplayPort 1.4a
<b>Maximum Resolution</b>	7680x4320 @ 120Hz
<b>Bus Type</b>	PCI Express 3.0 x16
<b>Available Graphics Drivers</b>	Windows 11 Windows 10 Linux® 64-bit

#### NVIDIA® T1000 4GB

<b>Form Factor</b>	Half-Height Single Slot (2.713" Height x 6.137" Length) Weight: 132.6 grams
<b>Max Power Consumption</b>	Power: 50W Cooling: Active
<b>GPU Memory</b>	4GB GDDR6 memory Memory Bandwidth: Up to 160 GB/s Memory Width: 128 bit
<b>Connectors</b>	4x mini-DisplayPort 1.4a
<b>Maximum Resolution</b>	7680x4320 @ 120Hz
<b>Bus Type</b>	PCI Express 3.0 x16
<b>Available Graphics Drivers</b>	Windows 11 Windows 10 Linux® 64-bit

#### AMD® Radeon™ Pro W7600 8GB

<b>Form Factor</b>	Full-Height Single Slot (4.38" Height x 9.5" Length)
<b>Max Power Consumption</b>	130W
<b>GPU Memory</b>	8GB GDDR6 Memory Bandwidth: 288 GB/s Memory Width: 128-bit
<b>Connectors</b>	4x DP 2.1 Requires: 1x 6-pin PCIe Aux Power
<b>Maximum Resolution</b>	4x @ 3840x2160 (4K) 4x @ 5120x2880 (5K) 2x @ 7680x4320 (8K)
<b>Bus Type</b>	PCI Express 4.0 x8

### Technical Specifications - Graphics

**Available Graphics Drivers** Windows 10  
Windows 11

#### AMD® Radeon™ Pro W7500 8GB

**Form Factor** Full-Height Single Slot (4.38" Height x 8.5" Length)

**Max Power Consumption** 70W

**GPU Memory** 8 GB GDDR6  
Memory Bandwidth: 173 GB/s  
Memory Width: 128-bit

**Connectors** 4x DP 2.1

**Maximum Resolution** 4x @ 3840x2160 (4K)  
4x @ 5120x2880 (5K)  
2x @ 7680x4320 (8K)

**Bus Type** PCI Express 4.0 x8

**Available Graphics Drivers** Windows 10  
Windows 11

#### AMD® Radeon™ Pro W6600 8GB

**Form Factor** Full-Height Single Slot (4.38" Height x 9.50" Length)  
Weight: 132.6 grams

**Max Power Consumption** Power: 122W  
Cooling: Active

**GPU Memory** 8GB GDDR6 memory  
Memory Bandwidth: Up to 224 GB/s  
Memory Width: 128 bit

**Connectors** 4x DisplayPort 1.4  
Requires 6-pin auxiliary power

**Maximum Resolution** 7680x4320 @ 60Hz

**Bus Type** PCI Express 4.0 x16 (x8 electrical)

**Available Graphics Drivers** Windows 11  
Windows 10  
Linux® 64-bit

#### AMD® Radeon™ RX 6700XT 12GB

**Form Factor** Full-Height Dual Slot (4.30" Height x 10.0" Length)  
Weight: 684 grams

**Max Power Consumption** Power: 238W  
Cooling: Active

**GPU Memory** 12GB GDDR6 memory  
Memory Bandwidth: Up to 384 GB/s  
Memory Width: 192 bit

**Connectors** 4x DisplayPort 1.4  
1x HDMI  
Requires 8-pin+6-pin auxiliary power

**Maximum Resolution** 7680x4320 @ 60Hz

**Bus Type** PCI Express 4.0 x16

**Available Graphics Drivers** Windows 11  
Windows 10  
Linux® 64-bit

### Technical Specifications - Graphics

<b>NVIDIA® T400 4GB</b>	<b>Form Factor</b>	Half-Height Single Slot (2.713” Height x 6.137” Length) Weight: 123.5 grams
	<b>Max Power Consumption</b>	Power: 30W Cooling: Active
	<b>GPU Memory</b>	4GB GDDR6 memory Memory Bandwidth: Up to 80 GB/s Memory Width: 64 bit
	<b>Connectors</b>	3x mini-DisplayPort 1.4a
	<b>Maximum Resolution</b>	7680x4320 @ 120Hz
	<b>Bus Type</b>	PCI Express 3.0 x16
	<b>Available Graphics Drivers</b>	Windows 11 Windows 10 Linux® 64-bit

<b>AMD® Radeon™ RX 6400 4GB</b>	<b>Form Factor</b>	Half-Height Single Slot (4.4” Height x 10.5” Length) Weight: 155 grams
	<b>Max Power Consumption</b>	Power: 50W Cooling: Active
	<b>GPU Memory</b>	4GB GDDR6 memory Memory Bandwidth: Memory Width:
	<b>Connectors</b>	1x DisplayPort 1.4a 1x HDMI
	<b>Maximum Resolution</b>	7680x4320 @ 60Hz
	<b>Bus Type</b>	PCI Express 4.0 x4
	<b>Available Graphics Drivers</b>	Windows 11 Windows 10 Linux® 64-bit

<b>Intel® Arc Pro A40 6GB</b>	<b>Form Factor</b>	Half-Height Single Slot (2.7” Height x 6.6” Length) Weight: 220 grams
	<b>Max Power Consumption</b>	Power: 50W Cooling: Active
	<b>GPU Memory</b>	6GB GDDR6 memory Memory Bandwidth: 192GB Memory Width: 96 bit
	<b>Connectors</b>	4x mini- DisplayPort 1.4
	<b>Maximum Resolution</b>	7680x4320 @ 60Hz
	<b>Bus Type</b>	PCI Express 4.0 x8
	<b>Available Graphics Drivers</b>	Windows 11 Windows 10

Notes for all graphics cards:

### Technical Specifications - Graphics

- Some graphics and GPU compute cards can consume a great deal of power, thus combinations of cards with other components may exceed a particular power supply's output capability.
- Some graphics and GPU compute cards require supplemental power cables.
- Not all chassis/PSU configurations have enough supplemental power cables of the correct type for all graphics configurations.

Refer to the Power Supply section within Overview for more information.

### OPTICAL AND REMOVABLE STORAGE

<b>HP 9.5mm Slim Blu-Ray Writer</b>	<b>Description</b>	9.5mm height, tray-load
	<b>Mounting Orientation</b>	Either horizontal or vertical
	<b>Interface Type</b>	SATA/ATAPI
	<b>Dimensions (WxHxD)</b>	128 x 9.5 x 127mm
	<b>Supported Media Types</b>	BD-ROM BD-R BD-RE DVD+R DVD+RW DVD+R DL DVD-R DL DVD-R DVD-RW CD-R CD-RW
	<b>Disc Capacity</b>	<b>DVD-ROM</b> 8.5 GB DL or 4.7 GB standard <b>Blu-ray</b> 25 GB (single-layer) 50 GB (dual-layer) 100/128 GB (BDXL)
		<b>Full Stroke DVD</b> < 230 ms (seek)
		<b>Full Stroke CD</b> < 220 ms (seek)
		<b>Blu-ray</b> < 230 ms (seek) (Full Stroke Blu-ray)
		<b>Startup Time</b> (Time to drive ready from tray loading) BD-ROM (SL/DL) 25S / 28S BD-R (SL/DL) 25S / 28S BD-RE (SL/DL) 25S / 28S DVD-ROM (SL/DL) 18S / 18S DVD-R (SL/DL) 25S / 25S DVD-RW 25S DVD+R (SL/DL) 25S / 25S DVD+RW 25S CD-ROM 15S
<b>Maximum Data Transfer Rates</b>	<b>CD ROM Read</b> CD-ROM, CD-R Up to 24X CD-RW Up to 24X	
	<b>DVD ROM Read</b> DVD+RW Up to 8X DVD-RW Up to 8X DVD+R DL Up to 8X DVD-R DL Up to 8X DVD-ROM Up to 8X	



### Technical Specifications - Graphics

		DVD-ROM DL Up to 8X DVD+R Up to 8X DVD-R Up to 8X
	<b>Blu-ray</b>	BD-ROM Up to 6X BD-ROM DL Up to 6X BD-R Up to 6X BD-R DL Up to 6X BD-R Up to 6X BD-RE SL/DL Up to 6X
<b>Power</b>	<b>Source</b>	SATA DC power receptacle
	<b>DC Power Requirements</b>	5 VDC ± 5%-100 mV ripple p-p
	<b>DC Current</b>	5 VDC -900 mA typical, 2000mA maximum
<b>Operating Environmental</b> (all conditions non-condensing)	<b>Temperature</b>	41° to 122° F (5° to 50° C)
	<b>Relative Humidity</b>	10% to 80%
	<b>Maximum Wet Bulb Temperature</b>	84° F (29° C)
<b>Operating Systems Supported</b>	Windows 11, Windows 10, Windows 7 Professional 64-bit, Red Hat® Enterprise Linux® (RHEL) 8, 9 Desktop/Workstation, SUSE Linux® Enterprise Desktop 15, Ubuntu 20.04, 22.04 LTS	
	No driver is required for this device. Native support is provided by the operating system.	
<b>Kit Contents</b>	9.5mm Slim BDXL Blu-Ray Writer, 5.25" 3DD Bay adapter/carrier, slim SATA data/power cable, installation guide As Blu-ray is a new format containing new technologies, certain disc, digital connection, compatibility and/or performance issues may arise, and do not constitute defects in the product. Flawless playback on all systems is not guaranteed. In order for some Blu-ray titles to play, they may require a DVI or HDMI digital connection and your display may require HDCP support. HD-DVD movies cannot be played on this workstation.	
	<b>NOTE:</b> HD-DVD disks cannot be played on the DVD-ROM drive. No support for DVD-RAM. Actual speeds may vary. Don't copy copyright-protected materials. Double Layer discs can store more data than single layer discs. Discs burned with this drive may not be compatible with many existing single-layer DVD drives and players. Flawless playback on all systems is not guaranteed.	

#### HP 9.5mm Slim DVD Writer

<b>Description</b>	9.5mm height, tray-load
<b>Mounting Orientation</b>	Either horizontal or vertical
<b>Interface Type</b>	SATA/ATAPI
<b>Dimensions (WxHxD)</b>	128 x 9.5 x 127mm
<b>Supported Media Types</b>	DVD+R DVD+RW DVD+R DL DVD-R DL DVD-R DVD-RW

### Technical Specifications - Graphics

	CD-R CD-RW	
<b>Disc Capacity</b>	<b>DVD-ROM</b>	8.5 GB DL or 4.7 GB standard
	<b>Full Stroke DVD</b>	< 200 ms (seek)
	<b>Full Stroke CD</b>	< 200 ms (seek)
<b>Maximum Data Transfer Rates</b>	<b>CD ROM Read</b>	CD-ROM, CD-R Up to 24X CD-RW Up to 24X
	<b>DVD ROM Read</b>	DVD+RW Up to 8X DVD-RW Up to 8X DVD+R DL Up to 8X DVD-R DL Up to 8X DVD-ROM Up to 8X DVD-ROM DL Up to 8X DVD+R Up to 8X DVD-R Up to 8X
<b>Power</b>	<b>Source</b>	SATA DC power receptacle
	<b>DC Power Requirements</b>	5 VDC ± 5%-100 mV ripple p-p
	<b>DC Current</b>	5 VDC -< 800 mA typical, <1600 mA maximum
<b>Operating Environmental</b> (all conditions non-condensing)	<b>Temperature</b>	41° to 122° F (5° to 50° C)
	<b>Relative Humidity</b>	10% to 80%
	<b>Maximum Wet Bulb Temperature</b>	84° F (29° C)
<b>Operating Systems Supported</b>	Windows 11, Windows 10, Windows 7 Professional 64-bit, Windows Vista Business 64*, Windows 2000. Red Hat® Enterprise Linux® (RHEL) 8, 9 Desktop/Workstation SUSE Linux® Enterprise Desktop 15 Ubuntu 20.04, 22.04 LTS	
	* No driver is required for this device. Native support is provided by the operating system	
<b>Kit Contents</b>	HP SATA DVD Writer drive, installation guide.	
	<b>NOTE:</b> Actual speeds may vary. No support for DVD-RAM (DVD Writer). Does not permit copying of commercially available DVD movies or other copyright protected materials. Intended for creation and storage of your original material and other lawful uses. Double Layer discs can store more data than single layer discs. However, double-layer discs burned with this drive may not be compatible with many existing single-layer DVD drives and players.	

### Technical Specifications - Optical and Removable Storage

<b>HP 9.5mm Slim DVD-ROM</b>	<b>Description</b>	9.5mm height, tray-load	
	<b>Mounting Orientation</b>	Either horizontal or vertical	
	<b>Interface Type</b>	SATA/ATAPI	
	<b>Dimensions (WxHxD)</b>	128 x 9.5 x 127mm	
	<b>Disc Capacity</b>	<b>DVD-ROM</b> Single layer: Up to 4.7 GB Double layer: Up to 8.5 GB	
	<b>Access Times</b>	<b>DVD-ROM Single Layer</b>	< 110 ms (typical)
		<b>CD-ROM Mode 1</b>	< 110 ms (typical)
		<b>Full Stroke DVD</b>	< 230 ms (typical)
		<b>Full Stroke CD</b>	< 220 ms (typical)
	<b>Power</b>	<b>Source</b>	SATA DC power receptacle
		<b>DC Power Requirements</b>	5 VDC ± 5%-100 mV ripple p-p
		<b>DC Current</b>	5 VDC -< 800 mA typical, <1600 mA maximum
	<b>Operating Environmental</b> (all conditions non-condensing)	<b>Temperature</b>	41° to 122° F (5° to 50° C)
		<b>Relative Humidity</b>	10% to 80%
<b>Maximum Wet Bulb Temperature</b>		84° F (29° C)	
<b>Operating Systems Supported</b>	Windows 11, Windows 10, Windows 8.1, Windows 7 Professional 64-bit Red Hat® Enterprise Linux® (RHEL) 8, 9 Desktop/Workstation SUSE Linux® Enterprise Desktop 15 Ubuntu 20.04, 22.04 LTS		

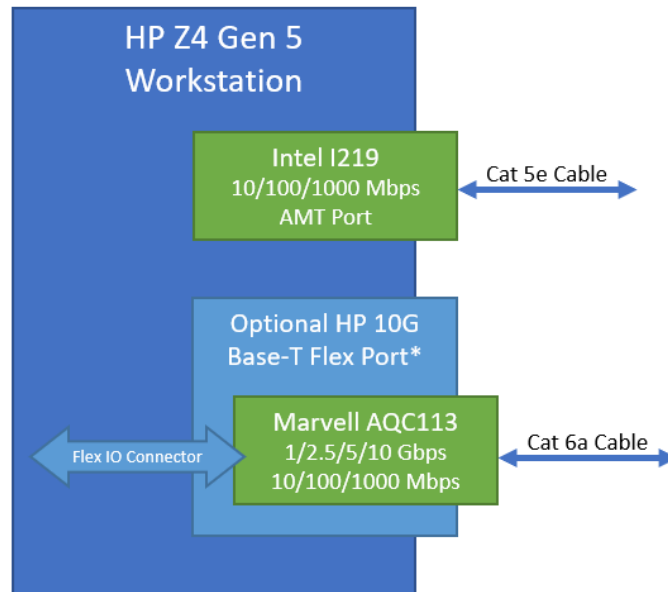
No driver is required for this device. Native support is provided by the operating system.

**Kit Contents** 9.5mm Slim DVD-ROM Drive, 5.25" DD Bay adapter/carrier, slim SATA data/power cable, installation guide

**NOTE:** Actual speeds may vary. No support for DVD-RAM (DVD Writer). Does not permit copying of commercially available DVD movies or other copyright protected materials. Intended for creation and storage of your original material and other lawful uses. Double Layer discs can store more data than single layer discs. However, double-layer discs burned with this drive may not be compatible with many existing single-layer DVD drives and players.

### Technical Specifications - Networking and Communications

#### NETWORKING AND COMMUNICATIONS



\*One Flex IO slot per system, various Flex IO modules available for ethernet, wireless, or USB connectivity

#### I219 (integrated)

<b>Connector</b>	RJ-45
<b>Cabling</b>	Up to 100m with Cat 5e or better
<b>Controller</b>	Intel I219LM
<b>Memory</b>	N/A
<b>Data Rates Supported</b>	10/100/1000Mbps
<b>Compliance</b>	IEEE 802.3az, 802.3u, 802.1as/1588, 802.1Q, 802.1p
<b>Bus Architecture</b>	PCIe
<b>Data Transfer Mode</b>	BASE-T
<b>Power Requirements</b>	N/A
<b>Network Transfer Mode</b>	BASE-T
<b>Network Transfer Rate</b>	10/100/1000Mbps
<b>Management Capabilities</b>	Intel AMT, Wake-on-LAN, PXE, UEFI
<b>Kit Contents</b>	Integrated into system

#### HP 10GBase-T Flex Port

<b>Connector</b>	RJ-45 (Single Port)
<b>Cabling</b>	Twisted Pair Cabling, up to 100 meters
<b>Controller</b>	Marvell AQC113C
<b>Memory</b>	128KB Tx Buffer, 192KB Rx Buffer on-chip
<b>Data Rates Supported</b>	10/100/1000 Mbps and 2.5/5/10 Gbps
<b>Compliance</b>	802.3 - --018, 802.1AS-2011
<b>Bus Architecture</b>	PCI Express and SMBus
<b>Data Transfer Mode</b>	PCIe-based interface for active state operation (S0 state) and SMBus for host and management traffic
<b>Power Requirement</b>	Requires 0.7V VDD, 1V, and 2V for analog, 3.3V for VDDIO

### Technical Specifications - Networking and Communications

<b>Boot ROM Support</b>	Yes
<b>Network Transfer Mode</b>	Full-duplex
<b>Network Transfer Rate</b>	10GBASE-T 5GBASE-T 2.5GBASE-T 1000BASE-T 100BASE-TX 10BASE-Te
<b>Management Capabilities</b>	WOL, PXE, UEFI,
<b>Kit Contents</b>	HP 10GBase-T Flex Port NIC Module

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<b>HP 2.5GbE LAN Flex Port</b>	<b>Connector</b>	RJ45 (Single Port)
	<b>Cabling</b>	Copper twisted pair, Cat5e up to 100 meters
	<b>Controller</b>	Intel® I225-V
	<b>Memory</b>	4 Tx and 4 Rx Queues, Jumbo Frames up to 9KB and without TSN
	<b>Data Rates Supported</b>	10/100/1000Mbps and 2.5Gbps BASE-T
	<b>Compliance</b>	IEEE 802.3, 802.3u (auto-negotiation), 802.3ab, 1588, 802.1AS-Rev, 802.1Qav, 802.1Qbu, 802.1Qbv, 802.3br, 802.3az
	<b>Bus Architecture</b>	PCIe G2x1
	<b>Data Transfer Mode</b>	PCIe-based interface for active state operation (S0 state) and SMBus for host and management traffic (Sx low power state)
	<b>Power Requirements</b>	2.2 Watts
	<b>Network Transfer Mode</b>	Automatic link configuration for speed duplex and flow control
	<b>Network Transfer Rate</b>	2500BASE-T 1000BASE-T 100BASE-TX (Half-duplex supported) 10BASE-Te (Half-duplex supported)
	<b>Management Capabilities</b>	WOL, PXE, UEFI, Intel vPro® support with appropriate Intel Chipset, Error Correcting Memory in packet buffers, UDP/TCP/IP Checksum Offload, SCTP receive and transmit integrity offload
	<b>Kit Contents</b>	HP 2.5GbE LAN Flex Port Networking Interface Card

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<b>HP 1GbE Fiber LC Single Flex Port</b>	<b>Connector</b>	LC (Little Connector) Fiber (Single Port)
	<b>Cabling</b>	LC Fiber Cabling
	<b>Controller</b>	AT-29M2
	<b>Data Rates Supported</b>	1GBASE-SX
	<b>Bus Architecture</b>	USB 3.1G1
	<b>Power Requirements</b>	Up to 3.3 Watts
	<b>Network Transfer Mode</b>	1GBASE-SX
	<b>Network Transfer Rate</b>	1GBASE-SX
	<b>Management Capabilities</b>	Wake on LAN, Digital Diagnostic Monitoring
	<b>Kit Contents</b>	HP 1GbE Fiber LC Single Flex Port NIC

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<b>HP Flex 1GbE Single Port NIC</b>	<b>Connector</b>	RJ45 (Single Port)
	<b>Cabling</b>	1GbE over Category 5e (or better) up to 100m
	<b>Controller</b>	Realtek RTL8153

### Technical Specifications - Networking and Communications

<b>Data Rates Supported</b>	10/100/1000 Mbps
<b>Bus Architecture</b>	USB3.1G1, USB2
<b>Power Requirements</b>	Requires 3.3V (integrated regulators for core Vdc)
<b>Network Transfer Mode</b>	Full-duplex; Half-duplex
<b>Network Transfer Rate</b>	10BASE-T (half-duplex) 10 Mbps 10BASE-T (full-duplex) 20 Mbps 100BASE-TX (half-duplex) 100 Mbps 100BASE-TX (full-duplex) 200 Mbps 1000BASE-T (full-duplex) 2000 Mbps
<b>Management Capabilities</b>	Wake on LAN, PXE, UEFI
<b>Kit Contents</b>	HP 1GbE Single Flex Port

<b>Intel® X550 10GBASE-T Dual Port NIC</b>	<b>Connector</b>	2 x RJ-45
	<b>Cabling</b>	Cat5 (or higher) for 100Mbps Cat5e (or higher) for 1Gbps, 2.5Gbps, or 5Gbps Cat6 (or higher) for 10Gbps up to 55m Cat6a (or higher) for 10Gbps up to 100m
	<b>Controller</b>	Intel X550-AT2
	<b>Memory</b>	Jumbo Frames up to 15.5KB, 64 Tx and 64Rx Queues per port, 160KB/port of programmable memory transmit buffers
	<b>Data Rates Supported</b>	100Mbps (BASE-TX), 1Gbps (BASE-T, 2.5Gbps, 5Gbps, 10Gbps)
	<b>Compliance</b>	802.1q (VLAN), 802.1Qbb, 802.1p, 802.1Qaz
	<b>Bus Architecture</b>	PCIe 3x4
	<b>Data Transfer Mode</b>	PCIe Gen 3 x4 based interface
	<b>Power Requirements</b>	3.9W at 100Mbps 5.5W at 1Gbps 11.2W at 10Gbps
	<b>Boot ROM Support</b>	Yes
	<b>Network Transfer Mode</b>	Auto negotiation between 1GbE, 2.5GbE, 5GbE and 10GbE
	<b>Management Capabilities</b>	DMI 2.0 Support, Windows Management Instrumentation (WMI) and SNMP, PXE 2.0 through boot ROM, Multi-mode I/O Virtualization, VxLAN, VMDq, VLAN support with VLAN tag insertion
	<b>Kit Contents</b>	Intel® X550 10GBASE-T Dual Port NIC

<b>Intel® I225-T1 Single Port 2.5GbE PCIe NIC</b>	<b>Connector</b>	RJ-45 (Single Port)
	<b>Cabling</b>	Cat5e (or better) up to 100m
	<b>Controller</b>	Intel® Ethernet I225 Controller
	<b>Memory</b>	Jumbo Frames up to 9.5KB, 4 Tx and Rx Queues,
	<b>Data Rates Supported</b>	2.5GbE, 1GbE, 100MbE, 10MbE
	<b>Compliance</b>	IEEE 802.3 auto negotiation, 802.3x, 802.3z
	<b>Bus Architecture</b>	PCIe Gen 3.1x1
	<b>Data Transfer Mode</b>	PCIe-based interface for active state operation
	<b>Power Requirements</b>	1.9 Watts (typical)
	<b>Management Capabilities</b>	WOL, PXE 2.1, Power Management Protocol Offload (proxying), MAC Power Management, Active State Power Management,
	<b>Kit Contents</b>	Intel® I225-T1 1-Port 2.5GbE NIC with standard height bracket attached

### Technical Specifications - Networking and Communications

and Low-profile bracket included  
Product Literature

<b>Intel® Ethernet I350-T4V2 4-Port 1Gb NIC</b>	<b>Connector</b>	4x RJ-45 (Quad Port)
	<b>Cabling</b>	Cat3 (or higher) for 10Mbps Cat5 (or higher) for 100Mbps Cat5e (or higher) for 1Gbps up to 100m
	<b>Controller</b>	Intel® I350
	<b>Memory</b>	Jumbo Frames up to 9.5KB, 8 Tx/Rx Queue pairs per port, Main Internal memory is Error Code Correcting
	<b>Data Rates Supported</b>	10Mbps, 100Mbps, 1Gbps
	<b>Compliance</b>	IEEE 802.3 auto negotiation, 802.3, 802.3u, 802.3ab, 802.3x, 802.3z, IEEE1588 protocol and 802.1AS implementation, 802.3az EEE
	<b>Bus Architecture</b>	PCI Express 2.1 x4
	<b>Data Transfer Mode</b>	PCIe-based interface for active state operation
	<b>Power Requirements</b>	5W
	<b>Network Transfer Mode</b>	Multi-speed, full, and half-duplex
	<b>Network Transfer Rate</b>	10BASE-T 100BASE-Tx 1000BASE-T
	<b>Management Capabilities</b>	WOL, PXE 2.1, UEFI, Power Management Protocol Offload (proxying), MAC Power Management, Active State Power Management, VLAN, ACPI
	<b>Kit Contents</b>	Intel® Ethernet I350-T4V2 4-Port 1Gb NIC with full-height bracket installed Low-profile bracket included

<b>Intel® AX210 Wi-Fi 6 + Bluetooth® 5.2 wireless card Flex Port NIC with Internal Antenna</b>	<b>Connector</b>	Wireless
	<b>Cabling</b>	N/A
	<b>Controller</b>	Intel® AX210
	<b>Data Rates Supported</b>	Wi-Fi 6 (2.4GHz/5GHz)
	<b>Compliance</b>	Wi-Fi Alliance* Wi-Fi Alliance CERTIFIED 6, WiFi CERTIFIED a/b/g/n/ac, WMM, WMM-Power Save, WPA2, WPA3, Wi-Fi Direct, and Wi-Fi Agile Multiband IEEE WLAN Standard 802.11-2016, 802.11a, b, d, e, g, h, l, k, n, r, u, v, w, ac, and ax, Bluetooth® 5.2
	<b>Bus Architecture</b>	PCIe G3x1 for WLAN, USB3.1G1 for BT
	<b>Management Capabilities</b>	Authentication Protocols: 802.1X EAP-TLS, EAP-TTLS/MSCSHAPv2, PEAPv0 - MSCSHAPv2 (EAP-SIM, EAP-AKA, EAP-AKA') Encryption: 128-bit AES-CCMP, 256-bit AES-GCMP UEFI
<b>Kit Contents</b>	Intel® AX210 Wi-Fi 6 + Bluetooth® 5.2 Flex Port NIC Installation Instructions	

\* Wireless access point and Internet service required and sold separately. Availability of public wireless access points limited. Wi-Fi 6 (802.11ax) is backwards compatible with prior 802.11 specs.

<b>Intel® AX210 Wi-Fi 6E non-vPro + Bluetooth® 5.2 wireless card with External Antenna WLAN</b>	<b>Connector</b>	Wireless
	<b>Cabling</b>	N/A
	<b>Controller</b>	Intel® AX210
	<b>Data Rates Supported</b>	Wi-Fi 6e (2.4GHz/5GHz/6GHz)

### Technical Specifications - Networking and Communications

<b>Compliance</b>	Wi-Fi Alliance* Wi-Fi Alliance CERTIFIED 6, WiFi CERTIFIED a/b/g/n/ac, WMM, WMM-Power Save, WPA2, WPA3, Wi-Fi Direct, and Wi-Fi Agile Multiband IEEE WLAN Standard 802.11-2016, 802.11a, b, d, e, g, h, l, k, n, r, u, v, w, ac, and ax, Bluetooth® 5.2
<b>Bus Architecture</b>	PCIe G3x1 for WLAN, USB3.1G1 for BT
<b>Management Capabilities</b>	Authentication Protocols: 802.1X EAP-TLS, EAP-TTLS/MSCHAPv2, PEAPv0 - MSCHAPv2 (EAP-SIM, EAP-AKA, EAP-AKA') Encryption: 128-bit AES-CCMP, 256-bit AES-GCMP UEFI
<b>Kit Contents</b>	Intel® AX210 Wi-Fi 6 + Bluetooth® 5.2 PCIe NIC External Dipole Antenna Installation Instructions

\*Wi-Fi 6E requires a Wi-Fi 6E router, sold separately to function in the 6GHz band. Availability of public wireless access points limited. Wi-Fi 6E is backwards compatible with prior 802.11 specs. And available in countries where Wi-Fi 6E is supported.

<b>Allies Telesis AT-2914SX/LC 1GB LC Fiber NIC</b>	<b>Connector</b>	LC Fiber (Single Port)
	<b>Cabling</b>	50/125 μm (core/cladding) multimode fiber optic cable up to 500m 62.5/125 μm (core/cladding) multimode fiber optic cable up to 220m
	<b>Memory</b>	Jumbo Frames up to 9.6KB
	<b>Data Rates Supported</b>	1000SX (1GbE Fiber at 850nm Wavelength)
	<b>Compliance</b>	IEEE 802.1p (Quality of Service), IEEE 802.1Q (VLANs), IEEE 802.2 (LLC), IEEE 802.3ac (MAC), IEEE 802.3x (Flow control auto-negotiation), IEEE 802.3z (1000 Base-X), IEEE 802.3ad (Link aggregation) RoHS, UL, FCC/EN55022 Class A, TUV, EN55024, CE, C-TICK, VCCI
	<b>Bus Architecture</b>	PCIe x1
	<b>Data Transfer Mode</b>	PCIe-based interface
	<b>Power Requirements</b>	1.5 Watts (typical)
	<b>Network Transfer Rate</b>	1000SX only (1GbE Fiber at 850nm Wavelength)
	<b>Management Capabilities</b>	UEFI, Smart Load Balancing and failover, Link aggregation (IEEE802.3ad), Generic trunking (FEC/GEC) / IEEE 802.3ad-draft static, VLAN Support
<b>Kit Contents</b>	Allied Telesis AT-2914SX/LC 1GB LC Fiber NIC with low-profile bracket attached and standard height bracket included	

<b>Allied Telesis AT-2911T/2-901 Dual Port 1GbE NIC</b>	<b>Connector</b>	2 x RJ-45 (Dual Port)
	<b>Cabling</b>	Cat3 (or higher) for 10Mbps Cat5 (or higher) for 100Mbps Cat5e (or higher) for 1Gbps up to 100m
	<b>Memory</b>	17 Rx and 16 Tx queues
	<b>Data Rates Supported</b>	10/100/1000 Mbps
	<b>Compliance</b>	IEEE 802.1p (Quality of Service), IEEE 802.1Q (VLANs), IEEE 802.2 (LLC), IEEE 802.3ac (MAC), IEEE 802.3x (Flow control auto-negotiation), IEEE 802.3z (1000 Base-X), IEEE 802.3ad (Link aggregation), IEEE 802.3ab (10/100/1000T) RoHS, UL, FCC/EN55022 Class A, TUV, EN55024, CE, C-TICK, VCCI
	<b>Bus Architecture</b>	PCIe 2x1



### Technical Specifications - Networking and Communications

<b>Data Transfer Mode</b>	PCIe-based interface
<b>Power Requirements</b>	2.4 Watts (typical)
<b>Management Capabilities</b>	VLAN support, Link aggregation LACP, Link aggregation smart switch, Failover, Smart Load Balancing (SLB), iSCSI boot support, Windows Management Instrumentation (WMI), PXE 2.1, SNMP
<b>Kit Contents</b>	Allied Telesis AT-2911T/2-901 Dual Port 1GbE NIC with low-profile bracket attached and standard bracket included

#### NVIDIA® Mellanox® ConnectX-6 DX Dual Port 10/25GbE SFP28 NIC

<b>Connector</b>	2 x SFP28 Transceiver Cage (Dual Port)*
<b>Cabling</b>	Depends on transceiver pairing. Typically OM4 or higher MMF LC fiber optic cabling with LC SFP28 Transceivers.
<b>Controller</b>	ConnectX6-DX
<b>Memory</b>	256Mbit SPI Quad Flash Device
<b>Data Rates Supported</b>	1/10/25GbE
<b>Compliance</b>	<ul style="list-style-type: none"> <li>– IEEE 802.3by 25 Gigabit Ethernet</li> <li>– IEEE 802.3ae 10 Gigabit Ethernet</li> <li>– IEEE 802.3ap based auto-negotiation and KR startup</li> <li>– IEEE 802.3ad, 802.1AX Link Aggregation</li> <li>– IEEE 802.1Q, 802.1P VLAN tags and priority</li> <li>– IEEE 802.1Qau (QCN)</li> <li>– Congestion Notification</li> <li>– IEEE 802.1Qaz (ETS)</li> <li>– IEEE 802.1Qbb (PFC)</li> <li>– IEEE 802.1Qbg</li> <li>– IEEE 1588v2</li> <li>– Jumbo frame support (9.6KB)</li> <li>– Safety: CB/cTUVus/CE</li> <li>– EMC: CE/FCC/VCCI/RCM</li> <li>– RoHS Compliant</li> <li>– KCC</li> <li>– CAN ICES-3 (B)</li> <li>– NM EN 55035/55032 (Morocco)</li> <li>– UKCA</li> </ul>
<b>Bus Architecture</b>	PCIe Gen 4 x8
<b>Data Transfer Mode</b>	PCI Express - -tores and accesses Ethernet fabric connection information and packet data
<b>Power Requirements</b>	11.5 Watts (typical)
<b>Network Transfer Rate</b>	1Gbps, 10Gbps, 25Gbps

**NOTE:** Network Transfer Rate depends on transceiver model.\*

**Kit Contents** NVIDIA® Mellanox® ConnectX-6 DX Dual Port 10/25GbE SFP28 NIC

Date of change:	Version History:		Description of change:
March 1, 2023	From v1 to v2	Changed	Optical and Removable Storage, Networking and Communications sections and Changed Format
March 30, 2023	From v2 to v3	Changed	Image page 1
April 1, 2023	From v3 to v4	Changed	Format
April 6, 2023	From v4 to v5	Changed	PCIe Solid State Drives section
May 1, 2023	From v5 to v6	Changed	Power Supply section

### Technical Specifications - Networking and Communications

June 1, 2023	From v6 to v7	Changed	Graphics, Storage, Networking and Communications, Social and Environmental Responsibility, Overview sections
July 1, 2023	From v7 to v8	Added	HP Remote System Controller section
		Changed	Optical and Removable Storage, Networking and Communications sections
July 12, 2023	From v8 to v9	Changed	Power Supply section
August 1, 2023	From v9 to v10	Changed	Storage Drives, Social and Environmental Responsibility sections
August 1, 2023	From v10 to v11	Changed	ENVIRONMENTAL DATA section
September 1, 2023	From v11 to v12	Changed	Overview, Graphics, NETWORKING AND COMMUNICATIONS sections
September 21, 2023	From v12 to v13	Changed	SOFTWARE COMPONENTS AND APPLICATIONS WITH WINDOWS section
September 25, 2023	From v13 to v14	Changed	SOFTWARE AND SECURITY section
October 1, 2023	From v14 to v15	Changed	Graphics, Input Devices sections
November 1, 2023	From v15 to v16	Changed	PCIe Solid State Drives, Memory, Multimedia and Audio Devices, Input Devices, Social and Environmental Responsibility sections
November 8, 2023	From v16 to v17	Changed	Graphics section
December 1, 2023	From v17 to v18	Changed	Graphics, Other Hardware, Social and Environmental Responsibility sections
January 1, 2024	From v18 to v19	Changed	PCIe Solid State Drives section
February 1, 2024	From v19 to v20	Changed	STORAGE/HARD DRIVES, Graphics, Social and Environmental Responsibility sections
March 1, 2024	From v20 to v21	Changed	Graphics section
April 1, 2024	From v21 to v22	Changed	Graphics, HP Remote System Controller, Certification and Compliance sections
May 1, 2024	From v22 to v23	Changed	Graphics, Social and Environmental Responsibility sections

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