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[2]:
   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[1]

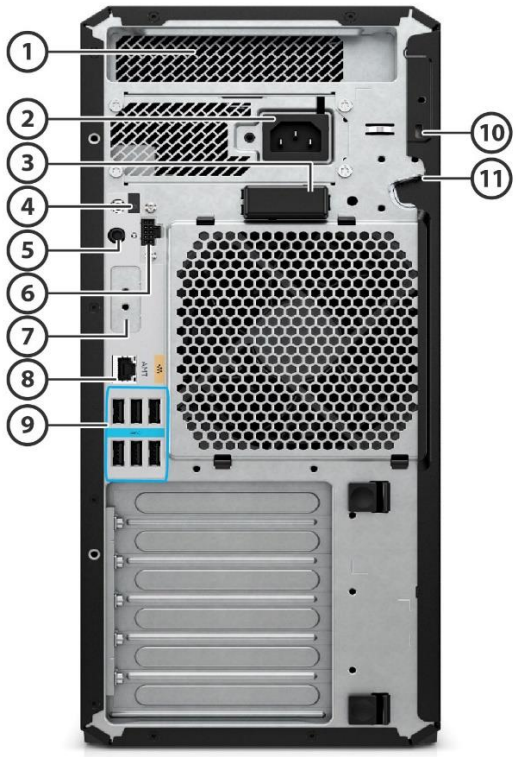
[1]Only 1 external 5.25" drive configurable from factory
[2]Premium Front IO is shown on photography

Overview

Internal View

1. 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[2]
- Windows 11 Pro for Workstations (preinstalled with Windows 10 Pro for Workstations Downgrade)[,2,3]
- Ubuntu Linux 22.04[4]
- HP Linux®-ready (minimal OS ready for customer OS installation)[5]

License Only:

- Red Hat® Enterprise Linux® Desktop Workstation (includes paper license with 1 year support; no preinstalled OS)[6]

Supported:

- Windows 11, version 22H2, 21H2[2]
- Windows 10, version 22H2, 21H2[2]
- Red Hat® Enterprise Linux® Workstation 8 & 9[6]
- SUSE Linux® Enterprise Desktop 15[6]

- Ubuntu 20.04 & 22.04 LTS[5]

Web-supported only:

- Windows 11 Enterprise[2,1]
- Windows 10 Enterprise[2,1]

[1] Windows Enterprise sold separately and requires that customer have an enterprise license from Microsoft.
[2] 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.
[3]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.
[4] 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.
[5]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.
[6]For detailed Linux® OS/hardware support information, see:
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[1]	Cores	Threads	Frequency (GHz)				Cache (MB)	Max Memory Speed(MT/s)		TDP (W)
			Base Frequency	All-Core Frequency	Max Turbo Frequency[2]	ITBM 3.0 Frequency[2]		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[3]
- Xeon W-2400 processors all support Hyper-Threading
- Xeon W-2400 processors do not offer integrated graphics

[1] 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.

[2] 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.

[3] 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

Color	Black
Convertibility	No
Expansion Slots (see system board section for more details)	•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
Expansion Bays (see storage section for more details)	1 internal 3.5" bays 2 external 5.25" bays
Front I/O	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)]
Internal I/O [5]	3 Internal USB ports and 5 SATA ports.
Rear I/O	Audio In/Out, 6x SuperSpeed USB Type-A 5Gbps signaling rate, 1 RJ-45 Integrated LAN port (1GbE AMT) Optional: Flex I/O Module
Optional I/O	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
On-board RAID Support	SATA RAID 0 Striped Array SATA RAID 1 Mirrored Array SATA RAID 10 Striped/Mirrored SATA RAID 5 Parity Array
Chassis Dimensions (H x W x D)	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)
Packaged Dimensions	H: 22.5" (572 mm) W: 12.4" (314 mm) D: 22.2" (563 mm)
Palletization Profile	6 units x 3 layers = 18 units per pallet 1200x1000x1836mm (pallet included)
Rack Dimensions	4U
Weight	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.)
Temperature	Operating: 5° to 40°C (40° to 104°F)[1] 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

Overview

	[1]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)[6]	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
	Intel® Xeon® W-2400 Processors				
	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[1,2]	Y	Y	W0R10AA
	2TB 7200RPM SATA 3.5in Enterprise HDD[1,2]	Y	Y	2Z274AA
	4TB 7200 RPM SATA 3.5in Enterprise HDD[1,2]	Y	Y	K4T76AA/AT
	8TB 7200RPM SATA 3.5in Enterprise HDD[1,2]	Y	Y	2Z273AA
	12TB 7200 RPM SATA-6G 3.5in Enterprise HDD[1,2]	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
	HP Z Turbo Drive Dual Pro			
	HP Z Turbo Drive Dual Pro PCIe-4x4 NVMe Carrier[3]	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	
HP Z Turbo Drive Quad Pro			
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	
Intel® Virtual RAID on CPU (Intel® VROC) for NVMe			
Intel VROC NVMe SSD Premium Ctlr Module[5]	N	Y	3FJ81AA
Intel VROC NVMe SSD Standard Ctlr Module[4]	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
Graphics Cable Adapters	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	
Ultra High-End Graphics	NVIDIA® RTX 6000 Ada 48GB [1,3]	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 [1,3]	Y	Y	2S6U3AA/AT	2
	NVIDIA® RTX 5000 Ada 32GB [1]	Y	Y	8D6B6AA	2

Supported Components

	NVIDIA® RTX A5000 24GB [1]	Y	Y	20X23AA/AT	2
	NVIDIA® Quadro® Sync II	N	Y	1WT20AA	
	AMD® Radeon™ Pro W7900 48GB [1]	Y	Y	8F699AA	1
High-End Graphics	NVIDIA® RTX 4500 Ada 24GB [1]	Y	Y	8D6C1AA	2
	NVIDIA® RTX A4500 20GB [1]	Y	Y	5S458AA/AT	2
	NVIDIA® RTX 4000 Ada 20GB	Y	Y	8D6B7AA	2
	NVIDIA® RTX A4000 16GB[1]	Y	Y	20X24AA/AT	2
	NVIDIA® Long-Life RTX A4000E 16GB[1,]	Y	Y	6H7J7AA	2
	AMD® Radeon™ Pro W6800 32GB [1,3]	Y	Y	340K7AA	2
Midrange Graphics	NVIDIA® RTX A2000 12GB [1]	Y	Y	5Z7D9AA/AT	2
	NVIDIA® Long-Life RTX A2000E 12GB [1]	Y	N		2
	NVIDIA® T1000 8GB [2]	Y	Y	5Z7D8AA/AT	2
	NVIDIA® Long-Life T1000E 8GB [2]	Y	Y	6V9V4AA/AT	2
	NVIDIA® T1000 4GB [2]	Y	Y	20X22AA/AT	2
	AMD Radeon Pro W7600 8GB [1]	Y	Y	8D6B9AA	1
	AMD Radeon Pro W7500 8GB [2]	Y	Y	8D6C2AA	1
	AMD® Radeon™ Pro W6600 8GB [1]	Y	Y	340K5AA	2
	AMD® Radeon™ RX 6700XT 12GB [1]	Y	N		1
Entry	NVIDIA® T400 4GB [2]	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[1,4]	Y	N	
HP DX175 Removable HDD Frame/Carrier[2]	Y	Y	1ZX71AA
HP DX175 Removable HDD Spare Carrier[2]	N	Y	1ZX72AA
HP CRU Secure High Performance Storage Module with 2TB M.2 SSD[3]	Y	Y	56Q87AA
HP CRU Secure High Performance Storage Module with 1TB M.2 SSD[3]	Y	Y	56Q88AA
HP CRU Secure High Performance Storage Module with 512GB M.2 SSD[3]	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 [1]	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 Anyware Remote System Controller	Factory Configured	Option Kit	Option Kit Part Number
HP Anyware Remote System Controller	Y	Y	7K6D7AA
HP Anyware Remote System Controller Main Board Adapter	Y	Y	7K6D8AA
HP Anyware Integrated Remote System Controller	Y	Y	7K6D9AA
HP Anyware 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.

Supported Components

Other Hardware	Factory Configured	Option Kit	Option Kit Part Number
HP Z4 Fan and Front Card Guide Kit[5]	Y	Y	56Q79AA
HP Z4 Memory Cooling Solution[4]	Y	Y	56Q81AA
HP Z4 PCIe Retainer with Fans[5]	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[1]	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[2]	N	Y	74Y88AA
HP Optical Bay HDD Mounting Bracket[3]	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[1,2]
Windows 11 Pro for Workstations (preinstalled with Windows 10 Pro for Workstations Downgrade)[1,2,3]
Ubuntu 22.04 LTS[4]

Supported Components

HP Linux®-ready

[1] Windows Enterprise sold separately and requires that customer have an enterprise license from Microsoft.
[2] 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.
[3]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.
[4] 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® 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

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.

SOFTWARE COMPONENTS AND APPLICATIONS WITH WINDOWS

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

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

Client Security Software
HP Client Security Suite Gen7[4] including: (including Credential Manager, HP Password Manager[6], HP Spare Key)
HP Power On Authentication
Microsoft Defender[7]

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

[1] 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

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

Supported Components

[3] HP Manageability Integration Kit can be downloaded from https://ftp.ext.hp.com/pub/caps-softpaq/cmit/HPMIK.html

[4] HP Client Security Manager Gen7 requires Windows and is available on the select HP PCs.

[5] 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.

[6] 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.

[7] Microsoft Defender Opt in and internet connection required for updates.

[8] HP Sure Start Gen 7 is available on select HP PCs and workstations. See product specifications for availability.

[9] HP Sure Run Gen5 is available on select Windows 11 based HP Pro, Elite and Workstation PCs with select Intel® or AMD processors

[10] 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

[11] HP Sure Click requires Windows 10 Pro or higher or Enterprise. See https://bit.ly/2PrLT6A_SureClick for complete details.
[12] 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.
[13] HP BIOSphere Gen6 features may vary depending on the platform and configurations.
[14] HP Support Assistant requires Windows and Internet access.
[16] 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.
[17] 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.
[18] 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 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.
[20] 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.
[21] 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.
[22] 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
[23] 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 Board

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

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 Panel/Speaker Header	Yes	
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)	

[1]Maximum memory capacities assume 64-bit operating systems, such as Genuine Windows® 11 Professional 64 bit, Red Hat Linux 64-bit.

[2]M.2 storage supports compatible devices up to 80mm

System Technical Specifications

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

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)	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		
Example Configuration #2	**Processor Info**	1x Intel Xeon w3-2435 8C 3.1GHz 4800 165W						
	Memory Info	32GB DDR5 (2x16GB) RegRAM						
	Graphics Info	1xNVIDIA Quadro A2000						
	Disks/Optical/Floppy	1x 1TB SATA HDD + 1xInternal 4TB M.2 + 1xDVDRW SATA						
	PSU	775W						
	Other	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)	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	
Example Configuration #3	**Processor Info**	1x Intel Xeon w5-2455X 12C 3.2GHz 4800 200W					
	Memory Info	64GB DDR5 (4x16GB) RegRAM					
	Graphics Info	1xNvidia Quadro A4000					
	Disks/Optical/Floppy	2x 1TB SATA HDD + 1xInternal 4TB M.2 + 1xDVDRW SATA					
	PSU	1125W					
	Other	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	

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

Energy Consumption (Watts)		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows dle (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

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

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

System Technical Specifications

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

Environmental Requirements	**Temperature**	Operating: 5° to 40° C (40° to 104° F) Non-operating: -40° to 60° C (-40° to 140° F)
	Humidity	Operating: 8% to 85% RH, non-condensing Non-operating: 8% to 90% RH, non-condensing
	Maximum Altitude	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: 9,144 m (30,000 feet)
	Dynamic	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 **NOTE:** Values represent individual shock events and do not indicate repetitive shock events Vibration Operating random: 0.5g (rms), 5-300 Hz, up to 0.0025g²/Hz Non-operating random: 2.0g (rms), 5-500 Hz, up to 0.0150 g²/Hz **NOTE:** Values do not indicate continuous vibration.
	Cooling	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

Access Panel	Tool-less Includes system board and memory information
Optical Drive	Tool-less, Optical Drive requires a 5.25” bay carrier
Hard Drives	Tool-less
Expansion Cards	Tool-less
Processor Socket	Screw-in processor coolers
Blue User Touch Points	Yes, on tool-less internal chassis mechanisms
Color-coordinated Cables and Connectors	Yes
Memory	Tool-less
System Board	Screw-in
Dual Color Power and HD LED on Front of Computer	Yes
Dual Function Front Power Switch	Yes, causes a fail-safe power off when held for 4 seconds
Padlock Support	Yes (optional): Locks side cover and secures chassis from theft 7.0 mm (0.2756 in) diameter padlock loop at rear of system
Cable Lock Support	Yes, Kensington Cable Lock (optional): Locks side cover and secures chassis from theft 3 mm x 7 mm slot at rear of system
Universal Chassis Clamp Lock Support	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
Chassis Interlock Sensor	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.
Solenoid Lock and Hood Sensor	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
Rear Port Control Cover	No
Serial, USB, Audio, Network, Enable/Disable Port Control	Yes
Power-On Password	Yes
Setup Password	Yes, prevents an unauthorized person from changing the workstation configuration.
3.3V Aux Power LED on System PCA	None
NIC LEDs (integrated) (Green & Amber)	Yes
CPUs and Heatsinks	A torx driver (T30) is needed to remove the processor heatsink. CPU attached to heatsink via tool-less clip
Power Supply Diagnostic LED	Yes
Front Power Button	Yes
Front Power LED	Yes
Front Hard Drive Activity LED	Yes
Front ODD Activity LED	Yes, on device

System Technical Specifications

Internal Speaker	Yes
System/Emergency ROM Flash Recovery	Yes
Cooling Solutions	Air cooled forced convection
Power Supply Fans	80 mm x 80 mm x 25 mm (non-serviceable)
CPU Heatsink Fan	108 mm x 108 mm x 25 mm
Chassis Fan	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
Memory Heatsink Fan	Dual 60 mm x 60 mm x 25 mm Blindmate (optional based on configuration)
Access Panel Key Lock	Yes, side panel barrel keylock (optional from the factory only)
ACPI-Ready Hardware	Advanced Configuration and Power Management Interface (ACPI). • Allows the system to wake from a low power mode. • 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.
Integrated Chassis Handles	Yes, front handle and dedicated rear recess
Power Supply	Requires T15 Torx or flat blade screwdriver
PCI Card Retention	Yes, rear (all), middle (all), front (full-length cards with extender, using Fan and Front Card Guide Kit)
Flash ROM	Yes
Diagnostic Power Switch LED on board	Yes
Clear Password Jumper	Yes
Clear CMOS Button	Yes
CMOS Battery Holder	Yes
DIMM Connectors	Yes

Service, Support, and Warranty

On-site Warranty and Service[1]: Three-years, limited warranty and service offering delivers on-site, next business-day[2] service for parts and labor and includes free telephone support[3] 8am – 5pm. Global coverage[2] 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

Environmental Sustainability questions concerning:

- Ecolabels (EPEAT, TCO, etc.)
- ENERGY STAR, California Energy Commission (CEC)

System Technical Specifications

- 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

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)
- 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
-

Please contact techregshelp@hp.com

BIOS

PCIe 5.0 Support	Full BIOS support for PCI Express through industry standard interfaces. Supported speeds and slot information vary.
ATA/ATAPI	AT Attachment 6 with Packet Interface (ATA/ATAPI-6), Revision 3b
WMI Support	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.
BIOS Power On	Users can define a specific date and time for the system to power on.
ROM Based Computer Setup Utility (F10)	Review and customize system configuration settings controlled by the BIOS.
System/Emergency ROM Flash Recovery with Video	Recovers system BIOS in corrupted Flash ROM.
Replicated Setup	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).
SMBIOS	System Management BIOS Reference Specification, Version 3.2
Boot Control	Disables the ability to boot from removable media on supported devices.
Memory Change Alert	Alerts management console if memory is removed or changed.
Thermal Alert	Monitors the temperature state within the chassis. Three modes: • NORMAL – normal temperature ranges. • ALERTED – excessive temperatures are detected. Raises a flag so action can be taken to avoid shutdown or provide for a smoother system shutdown. • SHUTDOWN – excessive temperatures are encountered. Automatically shuts down the computer without warning before hardware component damage occurs.
Remote ROM Flash	Provides secure, fail-safe ROM image management from a central network console.
ACPI (Advanced Configuration and Power Management Interface)	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.
Ownership Tag	A user-defined string stored in non-volatile memory that is displayed in the BIOS splash screen.

System Technical Specifications

Remote Wakeup/Remote Shutdown	System administrators can power on, restart, and power off a client computer from a remote location.
Instantly Available PC (Suspend to RAM – ACPI sleep state S3)	Allows for very low power consumption with quick resume time.
Remote System Installation via F12 (PXE 2.1) (Remote Boot from Server)	Allows a new or existing system to boot over the network and download software, including the operating system.
ROM revision levels	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.
System board revision level	Allows management SW to read revision level of the system board. Revision level is digitally encoded into the HW and cannot be modified.
Start-up Diagnostics (Power-on Self-Test)	Assesses system health at boot time with selectable levels of testing.
Auto Setup when new hardware installed	System automatically detects addition of new hardware.
Keyboard-less Operation	The system can be booted without a keyboard.
Localized ROM Setup	Common BIOS image supports System Configuration Utility (F10 Setup) menus in 15 languages with local keyboard mappings.
Asset Tag	The user or MIS to set a unique tag string in non-volatile memory.
Per-slot Control	Allows I/O slot parameters (option ROM enable/disable, bifurcation, speed) to be configured individually.
Adaptive Cooling	Control parameters are set according to detected hardware configuration for optimal acoustics.
Pre-boot Diagnostics	(Pre-video) critical errors are reported via beeps and blinks on the power LED.
UEFI Specification Revision	2.7
ACPI	Advanced Configuration and Power Management Interface, Version 6.0
CD Boot	“El Torito” Bootable CD-ROM Format Specification Version 1.0
EHCI	Enhanced Host Controller Interface for Universal Serial Bus, Revision 1.0
PCI Express	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
SATA	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
SPD	JEDEC JESD300-5
TPM	Trusted Computing Group TPM Specification Version 2.0 (Infineon SLB 9672). Common Criteria EAL4+ certified. FIPS 140-2 Certification TCG TPM Certified products list: http://www.trustedcomputinggroup.org/certification/tpm-certified-products/
UHCI	Universal Host Controller Interface Design Guide, Revision 1.1
USB	Universal Serial Bus Revision 1.1 Specification Universal Serial Bus Revision 2.0 Specification 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 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, 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 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.

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

System Technical Specifications

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
- 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

External:	PAPER/Corrugated	1127 g
	PAPER/ Corrugated	332 g
	PAPER/Molded Pulp	508 g
Internal:	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.

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):

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

System Technical Specifications

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

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

- DASH 1.2 (via Intel® LAN on motherboard)

Intel® Active Management Technology (AMT)

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
- 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.

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

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

Z Turbo 512GB 2280 PCIe-4x4 SED OPAL2 TLC M.2 SSD	**Capacity**	512GB	
	Protocol	PCIe	
	Form Factor	M.2	
	Controller	NVMe	
	NAND Type	3D TLC	
	Endurance	300TBW (TB Written)	
	Reliability	1.5M hours	
	Rated for 24/7/365 operation	No	
	Interface	PCI Express 4.0 x4 electrical	
	Operating Temperature	32° to 158° F (0° to 70° C)	
	Performance	**Sequential Read**	up to 6400MB/s*
		Sequential Write	up to 3400MB/s*
		Random Read	up to 600K IOPS*
		Random Write	up to 600K IOPS*
	Self-Encrypting Drive Support	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 1TB 2280 PCIe-4x4 SED OPAL2 TLC M.2 SSD Module	**Capacity**	1TB
	Protocol	PCIe
	Form Factor	M.2
	Controller	NVMe
	NAND Type	3D TLC
	Endurance	400TBW (TB Written)
	Reliability	1.5M hours

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

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

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

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

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

Z Turbo 4TB 2280 PCIe-4x4 SED OPAL2 TLC M.2 SSD	**Capacity**	4TB	
	Protocol	PCIe	
	Form Factor	M.2	
	Controller	NVMe	
	NAND Type	3D TLC	
	Endurance	600TBW (TB Written)	
	Reliability	1.5M hours	
	Rated for 24/7/365 operation	No	
	Interface	PCI Express 4.0 x4 electrical	
	Operating Temperature	32° to 158° F (0° to 70° C)	
	Performance	**Sequential Read**	up to 6500MB/s*
		Sequential Write	up to 5000MB/s*
		Random Read	up to 700K IOPS*
		Random Write	up to 700K IOPS*
	Self-Encrypting Drive Support	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 512GB PCIe-4x4 TLC Z4/Z6 Kit SSD	**Capacity**	512GB	
	Protocol	PCIe	
	Form Factor	M.2	
	Controller	NVMe	
	NAND Type	3D TLC	
	Endurance	300TBW (TB Written)	
	Reliability	1.5M hours	
	Rated for 24/7/365 operation	No	
	Interface	PCI Express 4.0 x4 electrical	
	Operating Temperature	32° to 158° F (0° to 70° C)	
	Performance	**Sequential Read**	up to 6400MB/s*
		Sequential Write	up to 3400MB/s*

		Random Read	up to 600K IOPS*
		Random Write	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.

Z Turbo 512GB 2280 PCIe-4x4 SED OPAL2 TLC M.2 Z4/Z6 Kit SSD	**Capacity**	512GB	
	Protocol	PCIe	
	Form Factor	M.2	
	Controller	NVMe	
	NAND Type	3D TLC	
	Endurance	300TBW (TB Written)	
	Reliability	1.5M hours	
	Rated for 24/7/365 operation	No	
	Interface	PCI Express 4.0 x4 electrical	
	Operating Temperature	32° to 158° F (0° to 70° C)	
	Performance	**Sequential Read**	up to 6400MB/s*
		Sequential Write	up to 3400MB/s*
		Random Read	up to 600K IOPS*
		Random Write	up to 600K IOPS*
	Self-Encrypting Drive Support	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 1TB PCIe-4x4 TLC Z4/Z6 Kit SSD	**Capacity**	1TB	
	Protocol	PCIe	
	Form Factor	M.2	
	Controller	NVMe	
	NAND Type	3D TLC	
	Endurance	400TBW (TB Written)	
	Reliability	1.5M hours	
	Rated for 24/7/365 operation	No	
	Interface	PCI Express 4.0 x4 electrical	
	Operating Temperature	32° to 158° F (0° to 70° C)	
	Performance	**Sequential Read**	up to 6500MB/s*
		Sequential Write	up to 5000MB/s*
		Random Read	up to 800K IOPS*
		Random Write	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.

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

	Controller	NVMe	
	NAND Type	3D TLC	
	Endurance	400TBW (TB Written)	
	Reliability	1.5M hours	
	Rated for 24/7/365 operation	No	
	Interface	PCI Express 4.0 x4 electrical	
	Operating Temperature	32° to 158° F (0° to 70° C)	
	Performance	**Sequential Read**	up to 6500MB/s*
		Sequential Write	up to 5000MB/s*
		Random Read	up to 800K IOPS*
		Random Write	up to 800K IOPS*
	Self-Encrypting Drive Support	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	**Capacity**	2TB	
	Protocol	PCIe	
	Form Factor	M.2	
	Controller	NVMe	
	NAND Type	3D TLC	
	Endurance	500TBW (TB Written)	
	Reliability	1.5M hours	
	Rated for 24/7/365 operation	No	
	Interface	PCI Express 4.0 x4 electrical	
	Operating Temperature	32° to 158° F (0° to 70° C)	
	Performance	**Sequential Read**	up to 6500MB/s*
		Sequential Write	up to 5000MB/s*
		Random Read	up to 800K IOPS*
		Random Write	up to 800K IOPS*
	Self-Encrypting Drive Support	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	**Capacity**	4TB	
	Protocol	PCIe	
	Form Factor	M.2	
	Controller	NVMe	
	NAND Type	3D TLC	
	Endurance	600TBW (TB Written)	
	Reliability	1.5M hours	
	Rated for 24/7/365 operation	No	

		Interface	PCI Express 4.0 x4 electrical
		Operating Temperature	32° to 158° F (0° to 70° C)
		Performance	**Sequential Read** up to 6500MB/s*
			Sequential Write up to 5000MB/s*
			Random Read up to 700K IOPS*
			Random Write up to 700K IOPS*
		Self-Encrypting Drive Support	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**	**Capacity**	512GB
		Protocol	PCIe
		Form Factor	M.2
		Controller	NVMe
		NAND Type	3D TLC
		Endurance	300TBW (TB Written)
		Reliability	1.5M hours
		Rated for 24/7/365 operation	No
		Interface	PCI Express 4.0 x4 electrical
		Operating Temperature	32° to 158° F (0° to 70° C)
		Performance	**Sequential Read** up to 6400MB/s*
			Sequential Write up to 3400MB/s*
			Random Read up to 600K IOPS*
			Random Write 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	**Capacity**	1TB
		Protocol	PCIe
		Form Factor	M.2
		Controller	NVMe
		NAND Type	3D TLC
		Endurance	400TBW (TB Written)
		Reliability	1.5M hours
		Rated for 24/7/365 operation	No
		Interface	PCI Express 4.0 x4 electrical
		Operating Temperature	32° to 158° F (0° to 70° C)
		Performance	**Sequential Read** up to 6500MB/s*
			Sequential Write up to 5000MB/s*
			Random Read up to 800K IOPS*
			Random Write 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.

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

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

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

	Reliability	1.5M hours	
	Rated for 24/7/365 operation	No	
	Interface	PCI Express 4.0 x4 electrical	
	Operating Temperature	32° to 158° F (0° to 70° C)	
	Performance	**Sequential Read**	up to 6400MB/s*
		Sequential Write	up to 3400MB/s*
		Random Read	up to 600K IOPS*
		Random Write	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 Quad Pro 1TB SSD	**Capacity**	1TB	
	Protocol	PCIe	
	Form Factor	M.2	
	Controller	NVMe	
	NAND Type	3D TLC	
	Endurance	400TBW (TB Written)	
	Reliability	1.5M hours	
	Rated for 24/7/365 operation	No	
	Interface	PCI Express 4.0 x4 electrical	
	Operating Temperature	32° to 158° F (0° to 70° C)	
	Performance	**Sequential Read**	up to 6500MB/s*
		Sequential Write	up to 5000MB/s*
		Random Read	up to 800K IOPS*
		Random Write	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.

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

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

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

	Operating Temperature	41° to 131° F (5° to 55° C)	
	Performance	**Sequential Read**	up to 226MB/s*
		Sequential Write	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.

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

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

Technical Specifications - Storage Drives

	Width	**Media Diameter**	3.5 in; 8.9 cm
		Physical Size	4 in; 10.17 cm
	Interface	Serial ATA (6.0Gb/s), NCQ enabled	
	Synchronous Transfer Rate (Maximum)	Up to 600MB/s *	
	Buffer	256MB	
	Cache	Adaptive	
	Seek Time (typical reads, includes controller overhead, including settling)	**Single Track**	0.7 ms *
		Average	8.5 ms *
		Full Stroke	15.7 ms *
	Rotational Speed	7,200 rpm	
	Logical Blocks	7,814,037,168	
	Operating Temperature	41° to 131° F (5° to 55° C)	
	Performance	**Sequential Read**	up to 226MB/s*
		Sequential Write	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	**Capacity**	8TB	
	Protocol	SATA	
	Form Factor	3.5”	
	Controller	AHCI	
	Reliability	2.0M hours	
	Rated Power On Hours	8760/yr	
	Annualized Failure Rate (based on Rated POH)	<0.62%	
	Rated for 24/7/365 operation	YES	
	Height	1 in; 2.54 cm	
	Width	**Media Diameter**	3.5 in; 8.9 cm
		Physical Size	4 in; 10.17 cm
	Interface	Serial ATA (6.0Gb/s), NCQ enabled	
	Synchronous Transfer Rate (Maximum)	Up to 600MB/s *	
	Buffer	256MB	
	Cache	Adaptive	
	Seek Time (typical reads, includes controller overhead, including settling)	**Single Track**	0.7 ms *
		Average	8.5 ms *
		Full Stroke	15.7 ms *
	Rotational Speed	7,200 rpm	
	Logical Blocks	15,628,053,168	
	Operating Temperature	41° to 140° F (5° to 60° C)	
	Performance	**Sequential Read**	up to 226MB/s*
		Sequential Write	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.

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

NVIDIA® RTX™ 6000 Ada 48GB	**Form Factor**	Full-Height Dual Slot (4.4” Height x 10.5” Length) Weight: 1230 grams / 2.71 lbs (with extender)
	Max Power Consumption	Power: 300 Watts Cooling: Active
	GPU Memory	48GB GDDR6 memory ECC Memory Bandwidth: Up to 960 GB/s Memory Width: 384 bits
	Connectors	4x DisplayPort 1.4a Quadro Sync II connector Stereo Sync Requires CEM 5.0 16-pin auxiliary power adapter
	Maximum Resolution	7680x4320 @ 120Hz
	Bus Type	PCI Express 4.0 x16
	Available Graphics Drivers	Windows 11 Windows 10 Linux® 64-bit
NVIDIA® RTX™ A6000 48GB	**Form Factor**	Full-Height Dual Slot (4.4” Height x 10.5” Length) Weight: 1230 grams / 2.71 lbs (with extender)
	Max Power Consumption	Power: 300 Watts Cooling: Active
	GPU Memory	48GB GDDR6 memory ECC optional Memory Bandwidth: Up to 768 GB/s Memory Width: 384 bit
	Connectors	4x DisplayPort 1.4a Quadro Sync II connector NVLink® Stereo Sync Requires 8-pin auxiliary power
	Maximum Resolution	7680x4320 @ 120Hz
	Bus Type	PCI Express 4.0 x16
	Available Graphics Drivers	Windows 11 Windows 10 Linux® 64-bit
NVIDIA® RTX™ 5000 Ada 32GB	**Form Factor**	Full-Height Dual Slot (4.4” Height x 13.85” Length) Weight: 1130 grams / 2.49 lbs (excluding extender)
	Max Power Consumption	Power: 250 Watts Cooling: Active
	GPU Memory	32GB GDDR6 memory ECC Memory Bandwidth: Up to 576 GB/s Memory Width: 256 bits
	Connectors	4x DisplayPort 1.4a Quadro Sync II connector Stereo Sync Requires CEM 5.0 16-pin auxiliary power adapter
	Maximum Resolution	7680x4320 @ 120Hz

Technical Specifications - Graphics

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

NVIDIA® RTX™ A5000 24GB	**Form Factor**	Full-Height Dual Slot (4.4” Height x 11” Length) Weight: 1049 grams + 80 grams extender
	Max Power Consumption	Power: 230W Cooling: Active
	GPU Memory	24GB GDDR6 memory ECC optional Memory Bandwidth: Up to 768 GB/s Memory Width: 384 bit
	Connectors	4x DisplayPort 1.4a Quadro Sync II connector NVLink® Stereo Sync Requires 8-pin auxiliary power
	Maximum Resolution	7680x4320 @ 120Hz
	Bus Type	PCI Express 4.0 x16
	Available Graphics Drivers	Windows 11 Windows 10 Linux® 64-bit
AMD® Radeon™ Pro W7900 48GB	**Form Factor**	Full-Height Triple Slot (4.4” Height x 10.5” Length)
	Max Power Consumption	Power: 295W Cooling: Active
	GPU Memory	48GB GDDR6 memory Memory Bandwidth: Up to 864 GB/s Memory Width: 384 bit
	Connectors	3x DisplayPort 2.1 1x Enhanced Mini DisplayPort 2.1 Requires 2x 8-pin auxiliary power connectors
	Maximum Resolution	12288x6912 @ 120Hz
	Bus Type	PCI Express 4.0 x16
	Available Graphics Drivers	Windows 11 Windows 10 Linux® 64-bit

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

Technical Specifications - Graphics

	Maximum Resolution	4x @ 4096 x 2160 @ 120Hz 4x @ 5120 x 2880 @ 60Hz 2x @ 7680 x 4320 @ 60Hz
	Bus Type	PCI Exress 4.0 x16
	Available Graphics Drivers	Windows 10 Windows 11
NVIDIA® RTX™ A4500 20GB	**Form Factor**	Full-Height Dual Slot (4.4” Height x 10.5” Length) Weight: 1049 grams + 80 grams extender
	Max Power Consumption	Power: 200W Cooling: Active
	GPU Memory	20GB GDDR6 memory Memory Bandwidth: Up to 640 GB/s Memory Width: 320 bit
	Connectors	4x DisplayPort 1.4a Quadro Sync II connector NVLink® Stereo Sync Requires 8-pin auxiliary power
	Maximum Resolution	7680x4320 @ 120Hz
	Bus Type	PCI Express 4.0 x16
	Available Graphics Drivers	Windows 11 Windows 10 Linux® 64-bit
NVIDIA® RTX™ 4000 Ada 20GB	**Form Factor**	Full-Height Single Slot (4.4” Height x 9.5” Length)
	Max Power Consumption	Power: 130W Cooling: Active
	GPU Memory	20GB GDDR6 memory Memory Bandwidth: Up to 360 GB/s Memory Width: 256 bit
	Connectors	4x DisplayPort 1.4a Requires 6-pin auxiliary power
	Maximum Resolution	7680x4320 @ 120Hz
	Bus Type	PCI Express 4.0 x16
	Available Graphics Drivers	Windows 11 Windows 10 Linux® 64-bit
NVIDIA® RTX™ A4000 16GB	**Form Factor**	Full-Height Single Slot (4.4” Height x 9.5” Length) Weight: 500 grams
	Max Power Consumption	Power: 140W Cooling: Active
	GPU Memory	16GB GDDR6 memory Memory Bandwidth: Up to 448 GB/s Memory Width: 256 bit

Technical Specifications - Graphics

	Connectors	4x DisplayPort 1.4a Quadro Sync II connector Stereo Sync Requires 6-pin auxiliary power
	Maximum Resolution	7680x4320 @ 120Hz
	Bus Type	PCI Express 4.0 x16
	Available Graphics Drivers	Windows 11 Windows 10 Linux® 64-bit
NVIDIA® Long-Life RTX™ A4000E 16GB	**Form Factor**	Full-Height Single Slot (4.4” Height x 9.5” Length) Weight: 500 grams
	Max Power Consumption	Power: 140W Cooling: Active
	GPU Memory	16GB GDDR6 memory Memory Bandwidth: Up to 448 GB/s Memory Width: 256 bit
	Connectors	4x DisplayPort 1.4a Quadro Sync II connector Stereo Sync Requires 6-pin auxiliary power
	Maximum Resolution	7680x4320 @ 120Hz
	Bus Type	PCI Express 4.0 x16
	Available Graphics Drivers	Windows 11 Windows 10 Linux® 64-bit
AMD® Radeon™ Pro W6800 32GB	**Form Factor**	Full-Height Dual Slot (4.4” Height x 10.5” Length) Weight: 850 grams
	Max Power Consumption	Power: 261W Cooling: Active
	GPU Memory	32GB GDDR6 memory Memory Bandwidth: Up to 512 GB/s Memory Width: 256 bit
	Connectors	6x mini-DisplayPort 1.4 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
NVIDIA® RTX™ A2000 12GB	**Form Factor**	Half-Height Dual Slot (2.713” Height x 6.6” Length) Weight: 306 grams

Technical Specifications - Graphics

	Max Power Consumption	Power: 70W Cooling: Active
	GPU Memory	12GB GDDR6 memory Memory Bandwidth: Up to 288 GB/s Memory Width: 192 bit
	Connectors	4x mini-DisplayPort 1.4a
	Maximum Resolution	7680x4320 @ 120Hz
	Bus Type	PCI Express 4.0 x16
	Available Graphics Drivers	Windows 11 Windows 10 Linux® 64-bit
NVIDIA® Long-Life RTX A2000E 12GB	**Form Factor**	Half-Height Dual Slot (2.713" Height x 6.6" Length) Weight: 306 grams
	Max Power Consumption	Power: 70W Cooling: Active
	GPU Memory	12GB GDDR6 memory Memory Bandwidth: Up to 288 GB/s Memory Width: 192 bit
	Connectors	4x mini-DisplayPort 1.4a
	Maximum Resolution	7680x4320 @ 120Hz
	Bus Type	PCI Express 4.0 x16
	Available Graphics Drivers	Windows 11 Windows 10 Linux® 64-bit
NVIDIA® T1000 8GB	**Form Factor**	Half-Height Single Slot (2.713" Height x 6.137" Length) Weight: 132.6 grams
	Max Power Consumption	Power: 50W Cooling: Active
	GPU Memory	8GB GDDR6 memory Memory Bandwidth: Up to 160 GB/s Memory Width: 128 bit
	Connectors	4x mini-DisplayPort 1.4a
	Maximum Resolution	7680x4320 @ 120Hz
	Bus Type	PCI Express 3.0 x16
	Available Graphics Drivers	Windows 11 Windows 10 Linux® 64-bit
NVIDIA® Long-Life T1000E 8GB	**Form Factor**	Half-Height Single Slot (2.713" Height x 6.137" Length) Weight: 132.6 grams
	Max Power Consumption	Power: 50W Cooling: Active

Technical Specifications - Graphics

	GPU Memory	8GB GDDR6 memory Memory Bandwidth: Up to 160 GB/s Memory Width: 128 bit
	Connectors	4x mini-DisplayPort 1.4a
	Maximum Resolution	7680x4320 @ 120Hz
	Bus Type	PCI Express 3.0 x16
	Available Graphics Drivers	Windows 11 Windows 10 Linux® 64-bit
NVIDIA® T1000 4GB	**Form Factor**	Half-Height Single Slot (2.713" Height x 6.137" Length) Weight: 132.6 grams
	Max Power Consumption	Power: 50W Cooling: Active
	GPU Memory	4GB GDDR6 memory Memory Bandwidth: Up to 160 GB/s Memory Width: 128 bit
	Connectors	4x mini-DisplayPort 1.4a
	Maximum Resolution	7680x4320 @ 120Hz
	Bus Type	PCI Express 3.0 x16
	Available Graphics Drivers	Windows 11 Windows 10 Linux® 64-bit
AMD® Radeon™ Pro W7600 8GB	**Form Factor**	Full-Height Single Slot (4.38" Height x 9.5" Length)
	Max Power Consumption	130W
	GPU Memory	8GB GDDR6 Memory Bandwidth: 288 GB/s Memory Width: 128-bit
	Connectors	4x DP 2.1 Requires: 1x 6-pin PCIe Aux Power
	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 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

Technical Specifications - Graphics

	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
NVIDIA® T400 4GB	**Form Factor**	Half-Height Single Slot (2.713" Height x 6.137" Length) Weight: 123.5 grams
	Max Power Consumption	Power: 30W Cooling: Active
	GPU Memory	4GB GDDR6 memory Memory Bandwidth: Up to 80 GB/s Memory Width: 64 bit
	Connectors	3x mini-DisplayPort 1.4a

Technical Specifications - Graphics

	Maximum Resolution	7680x4320 @ 120Hz
	Bus Type	PCI Express 3.0 x16
	Available Graphics Drivers	Windows 11 Windows 10 Linux® 64-bit
AMD® Radeon™ RX 6400 4GB	**Form Factor**	Half-Height Single Slot (4.4" Height x 10.5" Length) Weight: 155 grams
	Max Power Consumption	Power: 50W Cooling: Active
	GPU Memory	4GB GDDR6 memory Memory Bandwidth: Memory Width:
	Connectors	1x DisplayPort 1.4a 1x HDMI
	Maximum Resolution	7680x4320 @ 60Hz
	Bus Type	PCI Express 4.0 x4
	Available Graphics Drivers	Windows 11 Windows 10 Linux® 64-bit
Intel® Arc Pro A40 6GB	**Form Factor**	Half-Height Single Slot (2.7" Height x 6.6" Length) Weight: 220 grams
	Max Power Consumption	Power: 50W Cooling: Active
	GPU Memory	6GB GDDR6 memory Memory Bandwidth: 192GB Memory Width: 96 bit
	Connectors	4x mini- DisplayPort 1.4
	Maximum Resolution	7680x4320 @ 60Hz
	Bus Type	PCI Express 4.0 x8
	Available Graphics Drivers	Windows 11 Windows 10

Notes for all graphics cards:

- 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

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

Technical Specifications - Graphics

Power	**Source**	SATA DC power receptacle
	DC Power Requirements	5 VDC ± 5%-100 mV ripple p-p
	DC Current	5 VDC -900 mA typical, 2000mA maximum
Operating Environmental (all conditions non-condensing)	**Temperature**	41° to 122° F (5° to 50° C)
	Relative Humidity	10% to 80%
	Maximum Wet Bulb Temperature	84° F (29° C)
Operating Systems Supported	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.	
Kit Contents	9.5mm Slim BDXL Blu-Ray Writer, 5.25" ”DD 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.	

NOTE: 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	**Description**	9.5mm height, tray-load
	Mounting Orientation	Either horizontal or vertical
	Interface Type	SATA/ATAPI
	Dimensions (WxHxD)	128 x 9.5 x 127mm
	Supported Media Types	DVD+R DVD+RW DVD+R DL DVD-R DL DVD-R DVD-RW CD-R CD-RW
	Disc Capacity	**DVD-ROM** 8.5 GB DL or 4.7 GB standard
		Full Stroke DVD < 200 ms (seek)
		Full Stroke CD < 200 ms (seek)
	Maximum Data Transfer Rates	**CD ROM Read** CD-ROM, CD-R Up to 24X CD-RW Up to 24X
		DVD ROM Read 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
Power	**Source**	SATA DC power receptacle
	DC Power Requirements	5 VDC ± 5%-100 mV ripple p-p
	DC Current	5 VDC -< 800 mA typical, <1600 mA maximum
Operating Environmental (all conditions non-condensing)	**Temperature**	41° to 122° F (5° to 50° C)
	Relative Humidity	10% to 80%
	Maximum Wet Bulb Temperature	84° F (29° C)
Operating Systems Supported	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	
Kit Contents	HP SATA DVD Writer drive, 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.

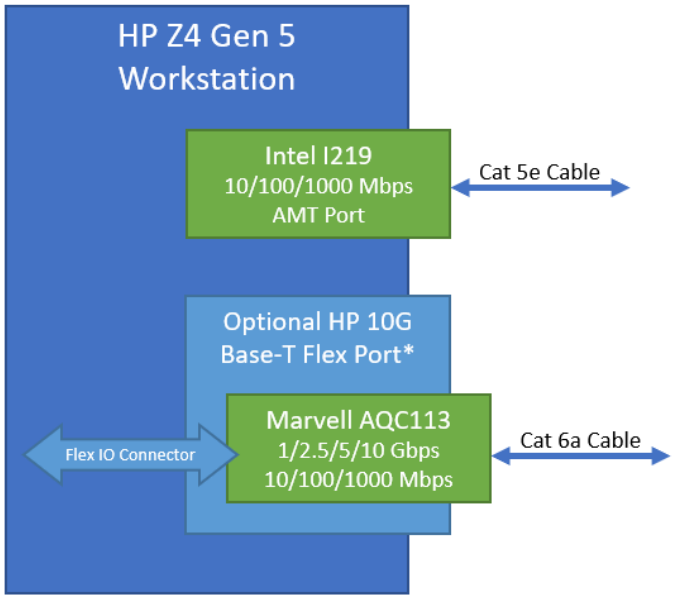
Technical Specifications - Optical and Removable Storage

HP 9.5mm Slim DVD-ROM	**Description**	9.5mm height, tray-load	
	Mounting Orientation	Either horizontal or vertical	
	Interface Type	SATA/ATAPI	
	Dimensions (WxHxD)	128 x 9.5 x 127mm	
	Disc Capacity	**DVD-ROM**	Single layer: Up to 4.7 GB Double layer: Up to 8.5 GB
	Access Times	**DVD-ROM Single Layer**	< 110 ms (typical)
		CD-ROM Mode 1	< 110 ms (typical)
		Full Stroke DVD	< 230 ms (typical)
		Full Stroke CD	< 220 ms (typical)
	Power	**Source**	SATA DC power receptacle
		DC Power Requirements	5 VDC ± 5%-100 mV ripple p-p
		DC Current	5 VDC -< 800 mA typical, <1600 mA maximum
	Operating Environmental (all conditions non-condensing)	**Temperature**	41° to 122° F (5° to 50° C)
		Relative Humidity	10% to 80%
		Maximum Wet Bulb Temperature	84° F (29° C)
	Operating Systems Supported	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



I219 (integrated)	**Connector**	RJ-45
	Cabling	Up to 100m with Cat 5e or better
	Controller	Intel I219LM
	Memory	N/A
	Data Rates Supported	10/100/1000Mbps
	Compliance	IEEE 802.3az, 802.3u, 802.1as/1588, 802.1Q, 802.1p
	Bus Architecture	PCIe
	Data Transfer Mode	BASE-T
	Power Requirements	N/A
	Network Transfer Mode	BASE-T
	Network Transfer Rate	10/100/1000Mbps
	Management Capabilities	Intel AMT, Wake-on-LAN, PXE, UEFI
	Kit Contents	Integrated into system

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

Technical Specifications - Networking and Communications

	Boot ROM Support	Yes
	Network Transfer Mode	Full-duplex
	Network Transfer Rate	10GBASE-T 5GBASE-T 2.5GBASE-T 1000BASE-T 100BASE-TX 10BASE-Te
	Management Capabilities	WOL, PXE, UEFI,
	Kit Contents	HP 10GBase-T Flex Port NIC Module
HP 2.5GbE LAN Flex Port	**Connector**	RJ45 (Single Port)
	Cabling	Copper twisted pair, Cat5e up to 100 meters
	Controller	Intel® I225-V
	Memory	4 Tx and 4 Rx Queues, Jumbo Frames up to 9KB and without TSN
	Data Rates Supported	10/100/1000Mbps and 2.5Gbps BASE-T
	Compliance	IEEE 802.3, 802.3u (auto-negotiation), 802.3ab, 1588, 802.1AS-Rev, 802.1Qav, 802.1Qbu, 802.1Qbv, 802.3br, 802.3az
	Bus Architecture	PCIe G2x1
	Data Transfer Mode	PCIe-based interface for active state operation (S0 state) and SMBus for host and management traffic (Sx low power state)
	Power Requirements	2.2 Watts
	Network Transfer Mode	Automatic link configuration for speed duplex and flow control
	Network Transfer Rate	2500BASE-T 1000BASE-T 100BASE-TX (Half-duplex supported) 10BASE-Te (Half-duplex supported)
	Management Capabilities	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
	Kit Contents	HP 2.5GbE LAN Flex Port Networking Interface Card
HP 1GbE Fiber LC Single Flex Port	**Connector**	LC (Little Connector) Fiber (Single Port)
	Cabling	LC Fiber Cabling
	Controller	AT-29M2
	Data Rates Supported	1GBASE-SX
	Bus Architecture	USB 3.1G1
	Power Requirements	Up to 3.3 Watts
	Network Transfer Mode	1GBASE-SX
	Network Transfer Rate	1GBASE-SX
	Management Capabilities	Wake on LAN, Digital Diagnostic Monitoring
	Kit Contents	HP 1GbE Fiber LC Single Flex Port NIC
HP Flex 1GbE Single Port NIC	**Connector**	RJ45 (Single Port)
	Cabling	1GbE over Category 5e (or better) up to 100m
	Controller	Realtek RTL8153

Technical Specifications - Networking and Communications

	Data Rates Supported	10/100/1000 Mbps
	Bus Architecture	USB3.1G1, USB2
	Power Requirements	Requires 3.3V (integrated regulators for core Vdc)
	Network Transfer Mode	Full-duplex; Half-duplex
	Network Transfer Rate	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
	Management Capabilities	Wake on LAN, PXE, UEFI
	Kit Contents	HP 1GbE Single Flex Port
Intel® X550 10GBASE-T Dual Port NIC	**Connector**	2 x RJ-45
	Cabling	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
	Controller	Intel X550-AT2
	Memory	Jumbo Frames up to 15.5KB, 64 Tx and 64Rx Queues per port, 160KB/port of programmable memory transmit buffers
	Data Rates Supported	100Mbps (BASE-TX), 1Gbps (BASE-T, 2.5Gbps, 5Gbps, 10Gbps
	Compliance	802.1q (VLAN), 802.1Qbb, 802.1p, 802.1Qaz
	Bus Architecture	PCIe 3x4
	Data Transfer Mode	PCIe Gen 3 x4 based interface
	Power Requirements	3.9W at 100Mbps 5.5W at 1Gbps 11.2W at 10Gbps
	Boot ROM Support	Yes
	Network Transfer Mode	Auto negotiation between 1GbE, 2.5GbE, 5GbE and 10GbE
	Management Capabilities	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
	Kit Contents	Intel® X550 10GBASE-T Dual Port NIC
Intel® I225-T1 Single Port 2.5GbE PCIe NIC	**Connector**	RJ-45 (Single Port)
	Cabling	Cat5e (or better) up to 100m
	Controller	Intel® Ethernet I225 Controller
	Memory	Jumbo Frames up to 9.5KB, 4 Tx and Rx Queues,
	Data Rates Supported	2.5GbE, 1GbE, 100MbE, 10MbE
	Compliance	IEEE 802.3 auto negotiation, 802.3x, 802.3z
	Bus Architecture	PCIe Gen 3.1x1
	Data Transfer Mode	PCIe-based interface for active state operation
	Power Requirements	1.9 Watts (typical)
	Management Capabilities	WOL, PXE 2.1, Power Management Protocol Offload (proxying), MAC Power Management, Active State Power Management,
	Kit Contents	Intel® I225-T1 1-Port 2.5GbE NIC with standard height bracket attached

		and Low-profile bracket included Product Literature
Intel® Ethernet I350-T4V2 4-Port 1Gb NIC	**Connector**	4x RJ-45 (Quad Port)
	Cabling	Cat3 (or higher) for 10Mbps Cat5 (or higher) for 100Mbps Cat5e (or higher) for 1Gbps up to 100m
	Controller	Intel® I350
	Memory	Jumbo Frames up to 9.5KB, 8 Tx/Rx Queue pairs per port, Main Internal memory is Error Code Correcting
	Data Rates Supported	10Mbps, 100Mbps, 1Gbps
	Compliance	IEEE 802.3 auto negotiation, 802.3, 802.3u, 802.3ab, 802.3x, 802.3z, IEEE1588 protocol and 802.1AS implementation, 802.3az EEE
	Bus Architecture	PCI Express 2.1 x4
	Data Transfer Mode	PCIe-based interface for active state operation
	Power Requirements	5W
	Network Transfer Mode	Multi-speed, full, and half-duplex
	Network Transfer Rate	10BASE-T 100BASE-Tx 1000BASE-T
	Management Capabilities	WOL, PXE 2.1, UEFI, Power Management Protocol Offload (proxying), MAC Power Management, Active State Power Management, VLAN, ACPI
	Kit Contents	Intel® Ethernet I350-T4V2 4-Port 1Gb NIC with full-height bracket installed Low-profile bracket included
Intel® AX210 Wi-Fi 6 + Bluetooth® 5.2 wireless card Flex Port NIC with Internal Antenna	**Connector**	Wireless
	Cabling	N/A
	Controller	Intel® AX210
	Data Rates Supported	Wi-Fi 6 (2.4GHz/5GHz)
	Compliance	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, I, k, n, r, u, v, w, ac, and ax, Bluetooth® 5.2
	Bus Architecture	PCIe G3x1 for WLAN, USB3.1G1 for BT
	Management Capabilities	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
	Kit Contents	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.	
Intel® AX210 Wi-Fi 6E non-vPro + Bluetooth® 5.2 wireless card with External Antenna WLAN	**Connector**	Wireless
	Cabling	N/A
	Controller	Intel® AX210
	Data Rates Supported	Wi-Fi 6e (2.4GHz/5GHz/6GHz)

Technical Specifications - Networking and Communications

	Compliance	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, I, k, n, r, u, v, w, ac, and ax, Bluetooth® 5.2
	Bus Architecture	PCIe G3x1 for WLAN, USB3.1G1 for BT
	Management Capabilities	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
	Kit Contents	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.

Allies Telesis AT-2914SX/LC 1GB LC Fiber NIC	**Connector**	LC Fiber (Single Port)
	Cabling	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
	Memory	Jumbo Frames up to 9.6KB
	Data Rates Supported	1000SX (1GbE Fiber at 850nm Wavelength)
	Compliance	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
	Bus Architecture	PCIe x1
	Data Transfer Mode	PCIe-based interface
	Power Requirements	1.5 Watts (typical)
	Network Transfer Rate	1000SX only (1GbE Fiber at 850nm Wavelength)
	Management Capabilities	UEFI, Smart Load Balancing and failover, Link aggregation (IEEE802.3ad), Generic trunking (FEC/GEC) / IEEE 802.3ad-draft static, VLAN Support
	Kit Contents	Allied Telesis AT-2914SX/LC 1GB LC Fiber NIC with low-profile bracket attached and standard height bracket included

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Allied Telesis AT-2911T/2-901 Dual Port 1GbE NIC	**Connector**	2 x RJ-45 (Dual Port)
	Cabling	Cat3 (or higher) for 10Mbps Cat5 (or higher) for 100Mbps Cat5e (or higher) for 1Gbps up to 100m
	Memory	17 Rx and 16 Tx queues
	Data Rates Supported	10/100/1000 Mbps
	Compliance	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
	Bus Architecture	PCIe 2x1

Technical Specifications - Networking and Communications

	Data Transfer Mode	PCIe-based interface
	Power Requirements	2.4 Watts (typical)
	Management Capabilities	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
	Kit Contents	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	**Connector**	2 x SFP28 Transceiver Cage (Dual Port)*
	Cabling	Depends on transceiver pairing. Typically OM4 or higher MMF LC fiber optic cabling with LC SFP28 Transceivers.
	Controller	ConnectX6-DX
	Memory	256Mbit SPI Quad Flash Device
	Data Rates Supported	1/10/25GbE
	Compliance	– IEEE 802.3by 25 Gigabit Ethernet – IEEE 802.3ae 10 Gigabit Ethernet – IEEE 802.3ap based auto-negotiation and KR startup – IEEE 802.3ad, 802.1AX Link Aggregation – IEEE 802.1Q, 802.1P VLAN tags and priority – IEEE 802.1Qau (QCN) – Congestion Notification – IEEE 802.1Qaz (ETS) – IEEE 802.1Qbb (PFC) – IEEE 802.1Qbg – IEEE 1588v2 – Jumbo frame support (9.6KB) – Safety: CB/cTUVus/CE – EMC: CE/FCC/VCCI/RCM – RoHS Compliant – KCC – CAN ICES-3 (B) – NM EN 55035/55032 (Morocco) – UKCA
	Bus Architecture	PCIe Gen 4 x8
	Data Transfer Mode	PCI Express - –tores and accesses Ethernet fabric connection information and packet data
	Power Requirements	11.5 Watts (typical)
	Network Transfer Rate	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 Anyware 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