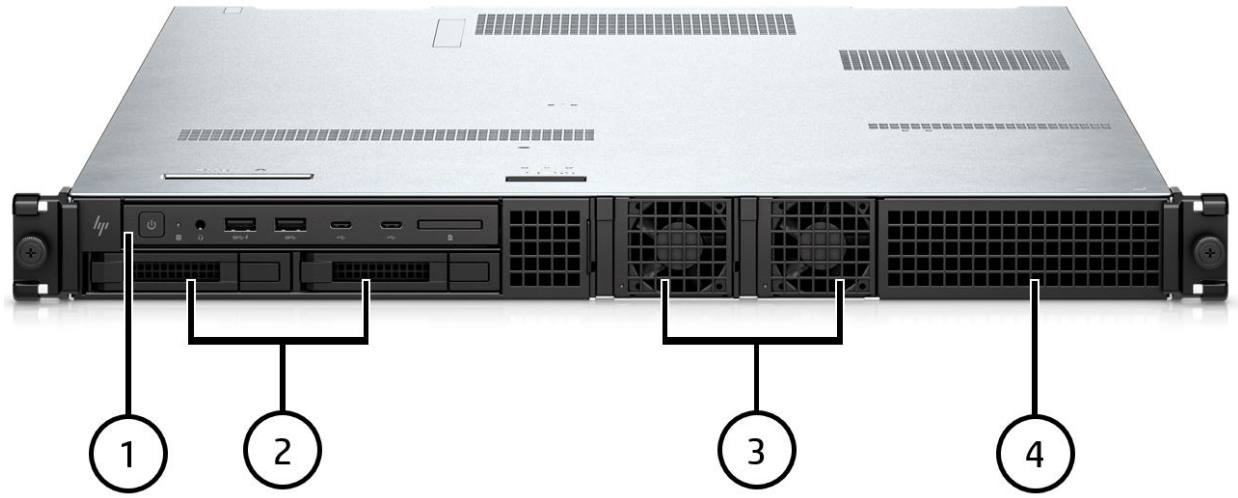
Overview

|HP Z4 Rack G5 Workstation



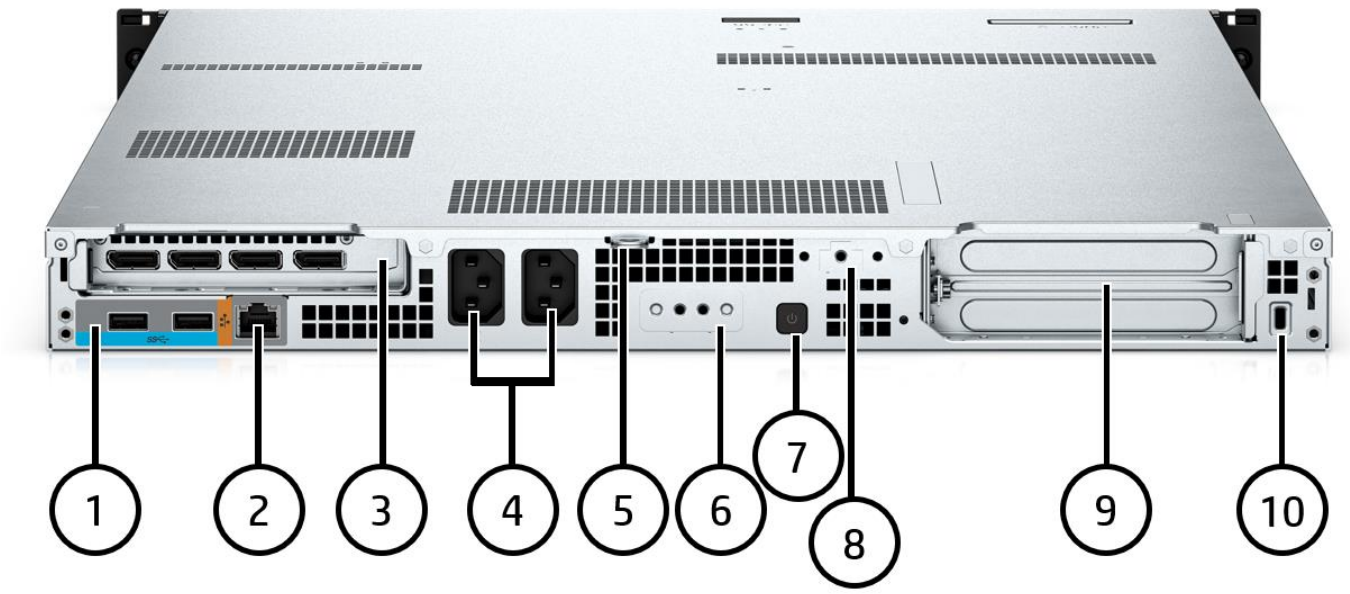
Front view

1. Front I/O Premium (optional – show above)[1]:
   Power Button
   Headphone/microphone combo
   2 x SuperSpeed USB Type-A 5 Gbps signalling rate [left-most Type-A port supports BC1.2 (Battery Charging)]
   2 x SuperSpeed USB Type-C™ 20 Gbps signalling rate (USB Power Delivery 3.0),

   Front I/O Entry:
   Power Button
   Headphone/microphone combo
   4 x SuperSpeed USB Type-A 5 Gbps signalling rate [left-most Type-A ports supports BC1.2 (Battery Charging)]
2. 2 x 2.5” external drive bays for front-accessible NVMe storage
3. 2 x external 675W PSU bays (system can be configured with a single PSU or with dual PSUs configured in either Redundant or Aggregate Mode)
4. 1 x 3.5” drive bay (can be configured 1 x 3.5” Enterprise HDD or with 2 x M.2 drives via the HP 3.5 in Drive Cage Adapter)

[1] Front I/O Premium requires both 675W PSUs to be configured

Overview



Rear View

1. 2 x SuperSpeed USB Type-A 5 Gbps signalling rate
2. 1 x 1GbE RJ-45 (Intel® AMT enabled)
3. Single Slot Riser (1 PCIe Gen5 x16) – **NOTE:** DisplayPorts do not come standard[1]
4. Primary (left) and secondary (right) power supply cable connectors
5. Padlock loop
6. Flex I/O Module (optional)
7. Rear Power Button
8. Z Desktop Power and Signal Interface (optional – configured for use with the HP Remote System Controller)
9. Dual Slot Riser (1 PCIe Gen5 x16 mechanical (x16/x8 electrical); 1 PCIe 5 x16 mechanical (x8 electrical)[2]
10. Kensington Lock Slot

[1] The ports in the Single Slot Riser are dependent on the PCIe card that is configured there

[2]The Dual Slot Riser is optional, but required for double wide graphics cards and configurations with more than one PCIe

Supported Components

Overview

Form Factor

1U Rackable Workstation

Operating Systems

Preinstalled:

- Windows 11 Pro for Workstations[1]
- Ubuntu Linux 22.04
- HP Linux®-ready (minimal OS ready for customer OS installation)[3,4]

License Only:

- Red Hat® Enterprise Linux® Desktop Workstation (includes paper license with 1 year support; no preinstalled OS)[4]

Supported:

- Windows 11, version 22H2, 21H2[1]
- Windows 10, version 22H2, 21H2[1]
- Red Hat® Enterprise Linux® Workstation 8 & 9[4]
- SUSE Linux® Enterprise Desktop 15[4]
- Ubuntu 20.04 & 22.04 LTS[3,4]

Web-supported only:

- Windows 11 Enterprise[1,5]
- Windows 10 Enterprise[1,5]

[1] 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]A certified preloaded version of Ubuntu® 20.04 LTS is available from HP for this platform.
[4]For detailed Linux® OS/hardware support information, see:
http://www.hp.com/support/linux_hardware_matrix
[5] Windows Enterprise sold separately and requires that customer have an enterprise license from Microsoft.

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

Name[1]	Cores	Threads	Frequency (GHz)			Cache (MB)	Max Memory Speed (MT/s)	TDP (W)
			Base Frequency	Max Turbo Frequency[2]	ITBM 3.0 Frequency[2]			
Intel® Xeon® W7-2595X	26	52	2.8	4.6	4.8	48.75	4800	250
Intel® Xeon® W7-2575X	22	44	3.0	4.6	4.8	45	4800	250
Intel® Xeon® W5-2565X	18	36	3.2	4.6	4.8	37.5	4800	240
Intel® Xeon® W5-2555X	14	28	3.3	4.6	4.8	33.75	4800	210
Intel® Xeon® W5-2545	12	24	3.5	4.5	4.7	30	4800	210
Intel® Xeon® W3-2535	10	20	3.5	4.4	4.6	26.25	4400[5]	185
Intel® Xeon® W3-2525	8	16	3.5	4.3	4.5	22.5	4400[5]	175
Intel® Xeon® W3-2435	8	16	3.1	4.5	4.5	22.5	4400	165
Intel® Xeon® W3-2425	6	12	3.0	4.4	4.4	15	4400	130
Intel® Xeon® W3-2423	6	12	2.1	4.2	4.2	15	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

Supported Components

Expansion Slots (see system board section for more details)	**Slot 1 (SSR[1]):** PCI Express Gen5 x16 from CPU **Slot 2 (DSR[2]):** PCI Express Gen5 x16 from CPU - operates as x8 if Slot 3 is loaded **Slot 3 (DSR):** PCI Express Gen5 x16 (wired as x8) from CPU **M.2 Slot 1:** PCI Express Gen4 x4 from CPU **M.2 Slot 2:** PCI Express Gen4 x4 from CPU [1] SSR = Single slot riser. Includes single 6+2 pin auxiliary power cable [2] DSR = Dual slot riser. DSR is optional but required for double wide graphics cards and configurations with more than one PCI card. DSR includes and additional dual 6+2 pin auxiliary power cable
Expansion Bays (see storage section for more details)	2 external 2.5” bays 1 external 3.5" bay (can be configured with 1 x 3.5” hard drive or 2 x 2.5” adapter for supporting 2 additional M.2 drives)
Front I/O	Front I/O Premium:[1] 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. [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. [left-most Type-A ports supports BC1.2 (Battery Charging)] [1] Front I/O Premium requires both 675W PSUs to be configured
Internal I/O	3 Internal USB ports and 1 SATA 3 port
Rear I/O	2x USB 3.1 G1 Type-A 1x 1GbE LAN port (supporting Intel AMT)
Optional I/O	Flex I/O Module (Serial Port v3, 10GbE single port, 2.5GbE LAN single port, 1 GbE Fiber LC NIC) Z Desktop Power and Signal Interface for supporting the HP Remote System Controller
Chassis Dimensions	
Base footprint without front bezel and rack brackets (H x W x D)	H: 1.685" (43mm) W: 17.25" (438mm) D: 25.8" (654mm)
With front bezel and rack brackets (H x W x D)	H: 1.685" (43mm) W: 18.96" (487mm) D: 25.8" (675mm)
Packaged Dimensions	H: 8.66” (220mm) W: 23.23” (590mm) D: 35.43” (900mm)
Palletization Profile	2 units per layer x 8 layers = 16 units per pallet 1200x1000x1890mm (included pallet)
Rack Dimensions	1U
Weight	Exact weights depend upon configuration (System weight only). Minimum: 9.52kg (21.6lb) Standard: 11.7kg (25.8lb) Maximum: 12.1kg (26.7lb)
Temperature	Operating: 5° to 35°C (40° to 95°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
Humidity	Operating: 8% to 85% relative humidity, non-condensing, 35° C maximum wet bulb

Supported Components

	Non-operating: 8% to 90% relative humidity, non-condensing, 35° C maximum wet bulb
Maximum Altitude (non-pressurized)	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: 12,192 m (40,000 feet) Maximum operating temperature is reduced as altitude increases. See Temperature for details.
Power Supply	The Z4 Rack G5 675W power supply efficiency report can be found at this link: https://www.clearesult.com/80plus/ ENTRY Contains one (1) PSU 675W power supply. ENTRY REDUNDANT Contains two (2) 675W PSUs operating in redundant mode for a maximum system power of 675W. **NOTE:** All power cords supplied by HP for Desktop Workstations are between 1.83m and 2.5m (dependent on country localization and platform)." HIGH-END Contains two (2) 675W PSUs operating in aggregate mode for a total system power of 1350W (2x675W).
Workstation ISV Certifications	See the latest list of certifications at http://www8.hp.com/us/en/campaigns/workstations/industries-and-partners.html
Chipset	Intel® W790 chipset
Memory	4 DIMM slots, supporting up to 256GB, 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-2500 Processors				
	Intel® Xeon® W7-2595X	Y	N		
	Intel® Xeon® W7-2575X	Y	N		
	Intel® Xeon® W5-2565X	Y	N		
	Intel® Xeon® W5-2555X	Y	N		
	Intel® Xeon® W5-2545	Y	N		
	Intel® Xeon® W3-2535	Y	N		
	Intel® Xeon® W3-2525	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]	Y	Y	W0R10AA
	2TB 7200RPM SATA 3.5in Enterprise HDD[1]	Y	Y	2Z274AA
	4TB 7200 RPM SATA 3.5in Enterprise HDD[1]	Y	Y	K4T76AA/AT
	8TB 7200RPM SATA 3.5in Enterprise HDD[1]	Y	Y	2Z273AA
	12TB 7200 RPM SATA-6G 3.5in Enterprise HDD[1]	Y	Y	5S461AA

PCIe Solid State Drives				
	Z Turbo 512GB PCIe-4x4 TLC SSD Module[5]	Y	Y	38T80AA
	Z Turbo 512GB 2280 PCIe-4x4 SED OPAL2 TLC M.2 SSD Module[5]	Y	Y	38T81AA
	Z Turbo 1TB 2280 PCIe-4x4 SED OPAL2 TLC M.2 SSD Module[5]	Y	Y	38T76AA
	Z Turbo 1TB PCIe-4x4 TLC SSD Module[5]	Y	Y	38T77AA
	Z Turbo 2TB 2280 PCIe-4x4 SED OPAL2 TLC M.2 SSD Module[5]	Y	Y	38T79AA
	Z Turbo 2TB PCIe-4x4 TLC SSD Module[5]	Y	Y	38T75AA
	Z Turbo 4TB 2280 PCIe-4x4 TLC M.2 SSD Module[5]	Y	Y	5S496AA/AT
	Z Turbo 4TB 2280 PCIe-4x4 SED OPAL2 TLC M.2 SSD Module[5]	Y	Y	5S497AA/AT
	HP Z Turbo Drive Dual Pro			
	HP Z Turbo Drive Dual Pro PCIe-4x4 NVMe Carrier[2]	Y	Y	56Q86AA
	Intel® Virtual RAID on CPU (Intel® VROC) for NVMe			
	Intel VROC NVMe SSD Premium Ctlr Module[4]	Y	Y	3FJ81AA
	Intel VROC NVMe SSD Standard Ctlr Module[3]	Y	Y	3FJ80AA

Note 1: Up to (1) 3.5-inch 7200 rpm SATA drive
Note 2: Kit includes Dual Pro carrier and heatsink. Requires separate purchase of ZTurbo PCIe 4x4 M.2 SSD modules.
Note 3: Enables RAID 0, 1 & 10
Note 4: Enables RAID 0, 1 & 10 plus RAID 5 with write hole closure options
Note 5: Does not include heatsink.
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.

Supported Components

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 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 DisplayPort to DVI Adapter	Y	Y	FH973AA	
Ultra-High-End Graphics	NVIDIA® RTX 6000 Ada 48GB [1]	Y	Y	79C23AA	1
	NVIDIA® RTX 6000 Ada 48 GB 4DP w/NVIDIA Omniverse Enterprise Graphics	N	Y	9X3E1AA	1
	NVIDIA® RTX A6000 48GB [1]	Y	Y	2S6U3AA/AT	1
	NVIDIA® RTX 5000 Ada 32GB [1]	Y	Y	8D6B6AA	1
	NVIDIA® RTX A5000 24GB [1]	Y	Y	20X23AA/AT	1
High-End Graphics	NVIDIA® RTX 4500 Ada 24GB [1]	Y	Y	8D6C1AA	1
	NVIDIA® RTX A4500 20GB [1]	Y	Y	5S458AA/AT	1
	NVIDIA® RTX 4000 Ada 20GB	Y	Y	8D6B7AA	1
	NVIDIA® RTX A4000 16GB [1,2]	Y	Y	20X24AA/AT	2
	AMD® Radeon™ Pro W7600 8GB	Y	Y	8D6B9AA	1
	AMD® Radeon™ Pro W7500 8GB	Y	Y	8D6C2AA	1
	AMD® Radeon™ Pro W6800 32GB [1]	Y	Y	340K7AA	1
Midrange Graphics	NVIDIA® RTX 2000 Ada 16GB	Y	Y	8D6B8AA	1
	NVIDIA® RTX A2000 12GB	Y	Y	5Z7D9AA/AT	1
	NVIDIA® RTX A1000 8 GB 4mDP Graphics[2]	Y	Y	9U276AA	2
	NVIDIA® T1000 8GB [2]	Y	Y	5Z7D8AA/AT	1
Entry	NVIDIA® RTX A400 4 GB 4mDP Graphics	Y	Y	9U277AA	
	NVIDIA® T400 4GB [2]	Y	Y	5Z7E0AA/AT	1

Note 1: Graphics card requires both 675W power supplies to be configured.
Note 2: Dual graphics configuration is tested and supported by HP, but not configurable from the factory. The customer will be responsible for purchasing a second graphics card aftermarket and integrating it themselves.

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		
32GB (1x32GB) 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		
64GB (1x64GB) DDR5 4800 DIMM ECC REG Memory	Y	N		
128GB (4x32GB) DDR5 4800 DIMM ECC REG Memory	Y	N		
128GB (2x64GB) DDR5 4800 DIMM ECC REG Memory	Y	N		
256GB (4x64GB) DDR5 4800 DIMM ECC REG Memory	Y	N		
128GB (1x128GB) DDR5 5600 DIMM ECC REG Memory	Y	N		

Supported Components

256GB (2x128GB) DDR5 5600 DIMM ECC REG Memory	Y	N	
512GB (4x128GB) DDR5 5600 DIMM ECC REG Memory	Y	N	
After Market Options			
16GB DDR5 (1x16GB) 4800 DIMM ECC REG Memory	Y	Y	340K1AA
32GB DDR5 (1x32GB) 4800 DIMM ECC REG Memory	Y	Y	340K2AA
64GB DDR5 (1x64GB) 4800 DIMM ECC REG Memory	Y	Y	340K3AA

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

Supported Components

Internal and Removable Storage		Factory Configured	Option Kit	Option Kit Part Number	Support Notes
	Z Turbo 512GB PCIe-4x4 TLC Z4 Rack Kit SSD	Y	Y	7K6A5AA	1
	Z Turbo 512GB PCIe-4x4 SED OPAL2 TLC Z4 Rack Kit SSD	Y	Y	7K6A6AA	1
	Z Turbo 1TB PCIe-4x4 SED OPAL2 TLC Z4 Rack Kit SSD	Y	Y	7K6A7AA	1
	Z Turbo 1TB PCIe-4x4 TLC Z4 Rack Kit SSD	Y	Y	7K6A8AA	1
	Z Turbo 2TB PCIe-4x4 TLC Z4 Rack Kit SSD	Y	Y	7K6A9AA	1
	Z Turbo 2TB PCIe-4x4 SED OPAL2 TLC Z4 Rack Kit SSD	Y	Y	7K6B0AA	1
	Z Turbo 4TB PCIe-4x4 TLC Z4 Rack Kit SSD	Y	Y	7K6B1AA	1
	Z Turbo 4TB PCIe-4x4 SED OPAL2 TLC Z4 Rack Kit SSD	Y	Y	7K6B2AA	1
	Note 1: Includes heatsink.				

Networking and Communications		Factory Configured	Option Kit	Option Kit Part Number	Support Notes
	HP 10GBase-T Flex Port	Y	Y	56Q71AA	
	HP 2.5GbE LAN Flex Port	Y	Y	169K0AA/AT	
	HP 1GbE Fiber LC Single Flex Port	Y	Y	20J15AA	
	Intel X550-T2 10GBASE-T Dual Port NIC	Y	Y	1QL46AA	
	Intel I225-T1 Single Port 2.5GbE PCIe NIC	Y	Y	406L9AA	
	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	Y	Y	436M8AA	1
	HP 10GbE SFP+ SR/SW LC Fiber Optic Transceiver	Y	Y	860T8AA	
	HP 25GbE SFP28 LC Fiber Optic Transceiver	Y	Y	860T9AA	
	Intel Ethernet I350-T4 4-Port 1Gb NIC	N	Y	W8X25AA	

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

Racking and Physical Security		Factory Configured	Option Kit	Option Kit Part Number	Support Notes
	HP Z4 Rack Rail Rack Kit	Y	Y	16G60AA/AT	
	HP Z4 Rack Front Bezel	Y	Y	16G58AA/AT	
	HP Z4 Rack Remote System Controller Support Bracket	Y	N	8D0Q8AA	1
	HP Rack Cable Management Arm	N	Y	35Z34AA	
	Note 1: This offering is a bracket to support the HP Remote System Controller.				

Input Devices		Factory Configured	Option Kit	Option Kit Part Number

Supported Components

HP 320K Wired Keyboard	Y	Y	9SR37AA/ET/UT
HP Wired 320M Mouse	Y	Y	9VA80AA/ET/UT

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

Other Hardware	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP Internal Serial Port and PS/2 Port	Y	Y	141K9AA/AT	
HP Z4 Rack Dual PCIe Slot Riser Kit	Y	Y	7K6C7AA	
HP Serial Port v3 Flex IO	Y	Y	5B895AA	
HP Z4 Rack 2.5 in Drive Carrier	Y	Y	7K6C3AA	1
HP Z4 Rack G5 2.5 in Dual Drive Cage Adapter	Y	Y	7K6C5AA	1
HP Z4 Rack G5 3.5 in Drive Cage Adapter	Y	Y	7K6C6AA	1
HP Internal USB Port Kit	N	Y	EM165AA	
HP Type-C SuperSpeed USB 20Gbps Front IO v2 Premium Module	Y	Y	38T92AA	
675W Z4 Rack EPA90 External Power Supply	Y	Y	8Y2L8AA	
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	Y	Y	8R881AA	

Note 1: These carriers and adapters do not include storage devices. When ordering storage devices CTO, the necessary carrier or adapter is included. When ordering these carriers or adapters aftermarket, storage devices must be purchased separately.

Software	Factory Configured	Option Kit	Support Notes
Data Science Stack	Y	N	1
WSL2/Ubuntu Data Science Stack	Y	N	1
Wolf Pro Security			2

Note 1: Only available with Ubuntu and NVIDIA® graphics.
Note 2: HP Wolf Pro Security Edition is available preloaded on select SKUs, and, depending on the HP product purchased, includes a license with a term length communicated to you at purchase and in your order confirmation email. 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 is effective upon 4 months after the date the HP Product was shipped by HP and will continue for the term communicated to you at purchase and in your order confirmation email (“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. Notwithstanding the foregoing, the license shall expire no later than one year after the fixed term of the subject license ends.

Supported Components

Operating Systems

Windows 11 Pro for Workstations [1,2]

Ubuntu 22.04 LTS [3]

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] 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

HP BIOS

Key features of the HP BIOS include:

- Deployment and manageability – HP BIOS provides several technologies that help integrate the HP Z4 Rack 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 Gen 7

- 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 Smart Health[21]
WSL/Ubuntu Data Science Stack
HP Privacy Settings
Touchpoint Customizer for Commercial
Kingsoft WPS Office
HP Services Scan[24]

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)

Supported Components

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 Platform Certificates
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]
HP Security Update Service

[1] HP Performance Advisor is ready and waiting to help you get the most out of your HP Workstation from day one—and every day after. Learn more or download at: https://www.hp.com/us-en/workstations/performanceadvisor.html

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

[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.

Supported Components

[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 license with a term length communicated to you at purchase and in your order confirmation email. 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 is effective upon 4 months after the date the HP Product was shipped by HP and will continue for the term communicated to you at purchase and in your order confirmation email ("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. Notwithstanding the foregoing, the license shall expire no later than one year after the fixed term of the subject license ends.
[22] HP Wolf Security for Business requires Windows 10 or 11 or 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] Kingsoft WPS office is only available in China.
[24] HP Services Scan is provided with Windows Update on select products and will check entitlement on each hardware device to determine if an HP TechPulse-enabled service has been purchased, and will download applicable software automatically. HP TechPulse is a telemetry and analytics platform that provides critical data around devices and applications. For full system requirements or to disable this feature, please visit http://www.hpdaas.com/requirements . Not applicable in China.

System Technical Specifications

System Board

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	4 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	
Memory Protection	ECC on data	
Maximum Memory	256GB	
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) Optional PCIe Slots • 1 PCI Express Gen5 slot x16 mechanical/ x16 electrical (full height, full length)[1] • 1 PCI Express Gen5 slot x16 mechanical/ x8 electrical (full height, full length) [1] Slot 2 operates as x8 electrically if slot 3 is populated M.2 Slots: • 2 PCI Express Gen4 slot x4. Other PCIe Connections • 2 external 2.5” bays support 2 additional NVMe SSDs drives • 1 external 3.5" bay (can be configured with 1 x 3.5” hard drive or 2 x 2.5” adapter for supporting 2 additional M.2 drives)	
Supported Drive Interfaces	**SATA**	Number of SATA ports: 1 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	Intel WGI219LM WGI219LM LOM provides Management capabilities: WOL, PXE 2.1, iSCSI, and AMT 16.10
	External SATA (eSATA)	No
	Serial	Available with optional Flex I/O module
	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	2x USB 3.1 Gen1 Type-A
	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	
Fan Headers	Yes	
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 v15.22. 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	

[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								
Z4 Rack G5 Example Configuration #1	**Processor Info**	Intel Xeon W3-2423 6C 4GHz						
	Memory Info	1x16GB DDR5 4800 (Registered DIMM)						
	Graphics Info	NVIDIA T400 4GB						
	Disks/Optical/Floppy	1x ZTurbo 512 GB TLC SSD						
	PSU	1x 675W						
	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)	67.225	66.464	67.534	66.684	67.223	66.461	
	Windows Busy Typ (S0)	163.043		160.88		163.036		
	Windows Busy Max (S0)	179.889		173.248		179.882		
	Sleep (S3)	3.658	3.547	3.662	3.549	3.654	3.542	
	Off (S5)	2.294	2.282	2.296	2.284	2.292	2.281	
	Zero Power Mode (EuP)	0.29		0.292		0.289		

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)	229.371	226.775	230.426	227.528	229.365	226.764
	Windows Busy Typ (S0)	556.302		548.923		556.278	
	Windows Busy Max (S0)	1613.781		291.122		613.757	
	Sleep (S3)	12.481	12.102	12.494	12.109	12.467	12.085
	Off (S5)	7.827	7.786	7.833	7.793	7.82	7.782
	Zero Power Mode (EuP)	0.989		0.996		0.986	

Z4 Rack G5 Example Configuration #2		
	Processor Info	Intel Xeon W5-2445 10C 4.3GHz
	Memory Info	2x16GB DDR5 4800 (Registered DIMM)
	Graphics Info	NVIDIA A2000 12GB
	Disks/Optical/Floppy	1x ZTurbo 512 GB TLC SSD; 1x 1TB 7200 SATA Enterprise 3.5” HDD
	PSU	1x 675W
	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)	73.476	72.395	73.668	72.597	73.473	72.389
	Windows Busy Typ (S0)	304.743		299.685		303.156	
	Windows Busy Max (S0)	322.705		314.841		321.876	
	Sleep (S3)	3.718	3.509	3.723	3.515	3.716	3.505
	Off (S5)	2.256	2.252	2.261	2.254	2.254	2.251
	Zero Power Mode (EuP)	0.293		0.294		0.292	

Heat Dissipation (Btu/hr)		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled

System Technical Specifications

	Windows Idle (S0)	250.700	247.012	251.355	247.701	250.689	246.991
	Windows Busy Typ (S0)	1039.783		1022.525		1034.368	
	Windows Busy Max (S0)	1101.069		1074.237		1098.241	
	Sleep (S3)	12.685	11.972	12.702	11.993	12.678	11.959
	Off (S5)	7.697	7.683	7.714	7.690	7.690	7.680
	Zero Power Mode (EuP)	0.999		1.003		0.996	

Z4 Rack G5 Example Configuration #3	**Processor Info**	Intel Xeon W5-2555X 12C 4.4GHz
	Memory Info	2x32GB DDR5 4800 (Registered DIMM)
	Graphics Info	NVIDIA A4000 16GB
	Disks/Optical/Floppy	1x ZTurbo 2TB TLC SSD; 1x 4TB 7200 SATA Enterprise 3.5” HDD
	PSU	2x 675W
	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)	83.416	81.931	83.647	82.004	83.412	81.928
	Windows Busy Typ (S0)	402.7		394.72		401.24	
	Windows Busy Max (S0)	454.3		424.337		452.64	
	Sleep (S3)	4.827	4.653	4.833	4.658	4.824	4.649
	Off (S5)	2.695	2.688	2.704	2.691	2.691	2.686
	Zero Power Mode (EuP)	0.561		0.564		0.560	

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)	284.615	c279.648	285.403	279.797	284.601	279.538
	Windows Busy Typ (S0)	1374.012		1346.785		1369.031	
	Windows Busy Max (S0)	1550.072		1447.838		1544.408	
	Sleep (S3)	16.469	15.876	16.490	15.893	16.459	16.469
	Off (S5)	9.195	9.171	9.226	9.182	9.181	9.195
	Zero Power Mode (EuP)	1.914		1.924		1.910	

Z4 Rack G5 Example Configuration #4	**Processor Info**	Intel Xeon W7-2495X 24C 4.6GHz	TBD
	Memory Info	4x16GB DDR5 4800 (Registered DIMM)	TBD
	Graphics Info	NVIDIA A6000 48G	TBD
	Disks/Optical/Floppy	2x ZTurbo 2TB TLC SSD; 1x 8TB 7200 SATA Enterprise 3.5” HDD	TBD
	PSU	2x 675W	TBD
	Other	N/A	TBD

Energy Consumption (Watts)		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows dle (S0)	103.967	100.076	104.268	100.384	103.960	100.058
	Windows Busy Typ (S0)	627.703		610.67		626.938	
	Windows Busy Max (S0)	594.57		577.2		593.86	
	Sleep (S3)	4.855	4.766	4.864	4.771	4.853	4.762

System Technical Specifications

	Off (S5)	2.717	2.706	2.722	2.708	2.716	2.704
	Zero Power Mode (EuP)	0.564		0.567		0.563	

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)	354.735	341.459	355.762	342.510	354.711	341.397
	Windows Busy Typ (S0)	2141.723		2083.606		2139.112	
	Windows Busy Max (S0)	2028.673		1969.406		2026.25	
	Sleep (S3)	16.562	16.261	16.595	16.278	16.558	16.247
	Off (S5)	9.270	9.232	9.287	9.239	9.266	9.226
	Zero Power Mode (EuP)	1.924		1.934		1.920	

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

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		
System Configuration (Entry level)	**Processor Info**	Intel Xeon W3-2423 6C 4GHz
	Memory Info	1x16GB DDR5 4800 (Registered DIMM)
	Graphics Info	NVIDIA T400 4GB

System Technical Specifications

	Disks/Optical	1x ZTurbo 512 GB TLC SSD; 1x 2TB 7200 SATA Enterprise 3.5” HDD	
	Power Supply	1x 675W	
Declared Noise Emissions (in accordance with ISO 7779 and ISO 9296)		**Sound Power** (LWAd, bels)	**Deskside Sound Pressure** (LpAm, decibels)
	Idle	5.1	36
	Hard drive Operating (random reads)	5.1	36

NOTE: Higher noise levels may be experienced with non-HP approved graphic card(s). Some consumer graphics cards have side blowing fans that may heat up thermal sensor(s) on the mother board causing fans to ramp.

System Technical Specifications

ENVIRONMENTAL DATA

Environmental Requirements	**Temperature**	Operating: 5° to 40°C (40° to 104°F)[1] Non-operating: -40° to 60°C (-40° to 140°F) [1]40°C has been validated for (add configuration information) 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
	Humidity	Operating: 8% to 85% relative humidity, non-condensing, 35° C maximum wet bulb Non-operating: 8% to 90% relative humidity, non-condensing, 35° C maximum wet bulb
	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: 12,192 m (40,000 feet) Maximum operating temperature is reduced as altitude increases. See Temperature for details.
	Shock (non-repetitive)	Operating: ½-sine: 40g, 2-3ms (~62 cm/sec) Non-operating: ½-sine: 160 cm/s, 2-3ms (~105g) square: 422 cm/s, 20g
	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.

Physical Security and Serviceability

Access Panel	Tool-less Includes system board and memory information.
Hard Drive	Screw-mounted
Expansion Cards	Expansion card cage removal/insertion into system is tool-less Expansion card access requires removal of screw-mounted retainer bracket
Processor Socket	Tool-less
Blue User Touch Points	Yes, on primary serviceable components.
Color-coordinated Cables and Connectors	Yes
Memory DIMM Connectors	Tool-less
System Board	Screw-mounted
Dual Color Power/Failure LED	Yes
HDD Activity LED	Yes **NOTE:** HDD Activity LED is not dual color
Configuration Record SW	Yes
Over-Temp Warning on Screen	Yes, at POST screen on reboot
Dual Function Front Power Switch	Yes, causes a fail-safe power off when held for 4 seconds
Padlock Support	Yes (optional): Locks top 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): Secures chassis from theft

System Technical Specifications

	3 mm x 7 mm slot at rear of system
Universal Chassis Clamp Lock Support	No
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.
Serial, USB, Audio, Network, Enable/Disable Port Control	Yes, enables or disables serial, USB, audio, and network ports
Removable Media Write/Boot Control	Yes, prevents ability to boot from removable media on supported devices (and can disable writes to media)
Power-On Password	Yes, prevents an unauthorized person from booting up the workstation
Setup Password	Yes, prevents an unauthorized person from changing the workstation configuration
3.3V Aux Power LED on System PCA	Yes
NIC LEDs (integrated) (Green & Amber)	Yes
CPUs and Heatsinks	A T-15 Torx or flat blade screwdriver is needed to remove the CPU heatsink before the CPU can be removed. CPU removal is tool-less
Power Supply Diagnostic LED	Yes Solid Green (OK); Blinking Green (Standby); Red (Fault); Off (No AC Power/PSU Failure)
Front Power Button	Yes, ACPI multi-function
Rear Power Button	Yes
System Locator LED	Yes, blue
Front Power LED	Yes, white (normal), red (fault)
Front Hard Drive Activity LED	Yes, white
Internal Speaker	Yes
System/Emergency ROM Flash Recovery	Recovers corrupted system BIOS.
Cooling Solutions	Air cooled forced convection heatsinks
Power Supply Fan	40 mm x 40 mm x 28 mm (non-serviceable)
Chassis Fans	40 mm x 40 mm x 56 mm (serviceable)
HP PC Hardware Diagnostics UEFI	HP PC Hardware Diagnostics (UEFI) enables hardware level testing outside the operating system on many components. The diagnostics can be invoked by pressing ESC then F2 upon the PC reboot and is available as a download from HP Support.
Access Panel Key Lock	No
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
Trusted Platform Module Chip	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/
Integrated Chassis Handles	No
Power Supply	Tool-less

System Technical Specifications

PCIe Card Retention	Yes, rear (all), middle (all), front (full-length cards with extender)
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)
- 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.
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.

System Technical Specifications

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
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/
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 configurations that include the Broadcom 5720-2P NIC card.

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
- 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)
- 25% 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)	113.1 W	115.3 W	N/A
Normal Operation (Long idle)	109.1 W	110.1 W	N/A
Sleep	8.3 W	8.4 W	N/A
Off	2.8 W	2.9 W	N/A

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)	386.80 BTU/hr	394.33 BTU/hr	N/A
Normal Operation (Long idle)	373.12 BTU/hr	376.54 BTU/hr	N/A
Sleep	28.39 BTU/hr	28.73 BTU/hr	N/A
Off	9.58 BTU/hr	9.92 BTU/hr	N/A

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

System Technical Specifications

Longevity and Upgrading

This product can be upgraded, possibly extending its useful life by several years.

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 91.9% recycle-able when properly disposed of at end of life.

Packaging Materials

External:	PAPER/Corrugated	3984 g
Internal:	PLASTIC/EPE (Expanded Polyethylene)	440 g
	PLASTIC/Polyethylene low density	52 g
	PAPER/Molded Pulp	1694 g

The plastic packaging material contains at least 0.0% recycled content.

The corrugated paper packaging materials contains at least 35.0% 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.

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

System Technical Specifications

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.
HP Remote System Controller	This product is fully compatible with the HP Remote System Controller. It can be configured CTO or added as an aftermarket option.

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**
	709P2AV	Intel Xeon W3-2423
	709P4AV	Intel Xeon W3-2435

Storage	**Product #**	**Offering**
	708L4AV	Z Turbo 1TB PCIe-4x4 2280 TLC M.2 Solid State Drive
	708F8AV	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.

	Capacity	1TB

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

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	
	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	
		Single Track	0.7 ms *

	Seek Time (typical reads, includes controller overhead, including settling)	**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.

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

Technical Specifications – Storage Drives

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 10.5” 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
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)
	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

Technical Specifications - Graphics

	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
	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

Technical Specifications - Graphics

	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™ 2000 Ada 16GB	**Form Factor**	Half Height Dual Slot (2.7" Height x 6.7" Length)
	Max Power Consumption	70W
	GPU Memory	16GB GDDR6 Memory Bandwidth: 224 GB/s Memory Width: 128-bit
	Connectors	4x Mini DisplayPort 1.4a
	Maximum Resolution	4x 4096 x 2160 @ 120 Hz 4x 5120 x 2880 @ 60 Hz 2x 7680 x 4320 @ 60 Hz
	Bus Type	PCI Express 4.0 x8
	Available Graphics Drivers	Windows 10 Windows 11
NVIDIA® RTX A2000 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® RTX™ A1000 8GB	**Form Factor**	Half Height Single Slot (2.7" Height x 6.4" Length)
	Max Power Consumption	50W
	GPU Memory	8GB GDDR6 Memory Bandwidth: 192 GB/s Memory Width: 128-bit
	Connectors	4x Mini DisplayPort 1.4a

Technical Specifications - Graphics

	Maximum Resolution	4x 4096 x 2160 @ 120 Hz 4x 5120 x 2880 @ 60 Hz 2x 7680 x 4320 @ 60 Hz
	Bus Type	PCI Exress 4.0 x8
	Available Graphics Drivers	Windows 10 Windows 11
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® 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
NVIDIA® RTX™ A400 4GB **Under Embargo until 4/16**	**Form Factor**	Half Height Single Slot (2.7" Height x 6.4" Length)
	Max Power Consumption	50W
	GPU Memory	4GB GDDR6 Memory Bandwidth: 96 GB/s Memory Width: 64-bit
	Connectors	4x Mini DisplayPort 1.4a
	Maximum Resolution	4x 4096 x 2160 @ 120 Hz 4x 5120 x 2880 @ 60 Hz 2x 7680 x 4320 @ 60 Hz
	Bus Type	PCI Exress 4.0 x8

Technical Specifications - Graphics

	Available Graphics Drivers	Windows 10 Windows 11
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
	Maximum Resolution	7680x4320 @ 120Hz
	Bus Type	PCI Express 3.0 x16
	Available Graphics Drivers	Windows 11 Windows 10 Linux® 64-bit

Technical Specifications - Networking and Communications

NETWORKING AND COMMUNICATIONS

Integrated Intel® I219LM PCIe GbE Controller (Intel® vPro® with Intel® AMT 16.01)	**Connector**	RJ-45
	Cabling	Twisted pair up to 100m
	Controller	Intel® I219LM GbE platform LAN connect networking controller
	Memory	3 KB Tx and 3KB Rx FIFO packet buffer memory
	Data Rates Supported	10/100/1000Mbps
	Compliance	IEEE 802.3x, 802.3az, 802.1as/1588, 802.1p, 802.1Q, 802.3, 802.3ab, 802.3i, 802.3u, 802.3z
	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 (Sx low power state)
	Power Requirements	0.5 Watts Max
	Boot ROM Support	Yes
	Network Transfer Mode	Full-duplex; Half-duplex
	Network Transfer Rate	0BASE-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	vPro®, WOL, auto MDI crossover, PXE, Muti-port teaming, RSS, ACPI, Advanced cable diagnostic, loopback modes, AMT 16.0 support, Circuit Breaker, VLAN, Multicast Listener Discovery (MLD), iSCSI

[1]Requires activation and a system with a corporate network connection, an Intel® AMT enabled chipset, and network hardware and software. For notebooks, Intel AMT may be unavailable or limited over a host OS-based VPN, when connecting wirelessly, on battery power, sleeping, hibernating, or powered off. Results dependent upon hardware, setup, and configuration. For more information, visit: https://www.intel.com/content/www/us/en/architecture-and-technology/intel-active-managementtechnology.
html

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)

Technical Specifications - Networking and Communications

	Management Capabilities	WOL, PXE, UEFI, 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

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

Allied 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

Technical Specifications - Networking and Communications

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
	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 - stores and accesses Ethernet fabric connection information and packet data
	Power Requirements	11.5 Watts (typical)

Technical Specifications - Networking and Communications

	Network Transfer Rate	1Gbps, 10Gbps, 25Gbps **NOTE:** Network Transfer Rate depends on transceiver model.*
	Management Capabilities	iSCSI, PXE
	Kit Contents	NVIDIA® Mellanox® ConnectX-6 DX Dual Port 10/25GbE SFP28 NIC
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
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-based interface for active state operation
	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
	Network Transfer Rate	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	5 Watts
	Network Transfer Mode	Multi-speed, full, and half-duplex

Technical Specifications - Networking and Communications

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

Date of change:	Version History:		Description of change:
September 5, 2023	From v1 to v2	Changed	Social and Environmental Responsibility section
September 25, 2023	From v2 to v3	Changed	SOFTWARE AND SECURITY section
November 1, 2023	From v3 to v4	Changed	Graphics, Software, System Board sections
December 1, 2023	From v4 to v5	Changed	Graphics, Other Hardware, Social and Environmental Responsibility sections
January 1, 2024	From v5 to v6	Changed	PCIe Solid State Drives section
February 1, 2024	From v6 to v7	Changed	STORAGE/HARD DRIVES, Graphics, Social and Environmental Responsibility sections
March 1, 2024	From v7 to v8	Changed	Rear View, Graphics and Declared Noise Emissions sections
April 1, 2024	From v8 to v9	Changed	Format
May 1, 2024	From v9 to v10	Changed	Graphics, Social and Environmental Responsibility sections
June 1, 2024	From v10 to v11	Changed	Storage section
June 12, 2024	From v11 to v12	Changed	Software section
August 1, 2024	From v12 to v13	Changed	Graphics section
August 23, 2024	From v13 to v14	Changed	NETWORKING AND COMMUNICATIONS section
August 29, 2024	From v14 to v15	Changed	NETWORKING AND COMMUNICATIONS section
September 2, 2024	From v15 to v16	Changed	NETWORKING AND COMMUNICATIONS section
January 14, 2025	From v16 to v17	Changed	Processors section
January 17, 2025	From v17 to v18	Changed	Memory and Graphics sections

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