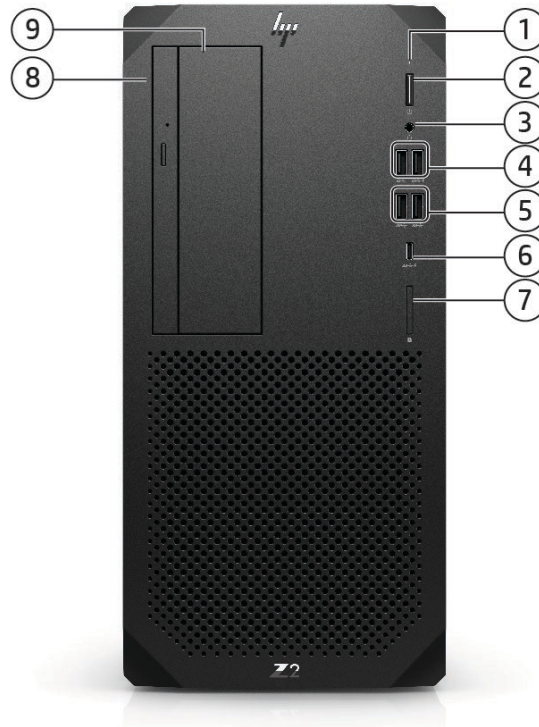


Overview

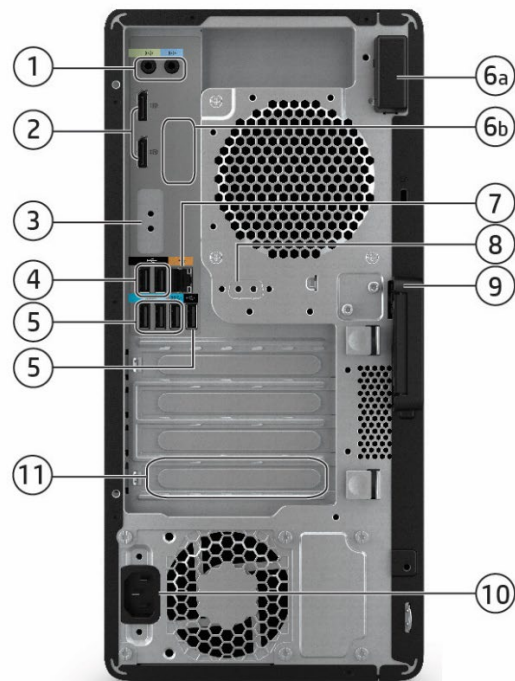
HP Z2 G9 Tower Workstation Desktop PC



front

- | | |
|--|---|
| 1. HDD Activity LED | 6. (1) USB-C® 20Gbps port (optional, charge supports up to 5V/3A) |
| 2. Power button | 7. SD card reader 4.0 (optional) |
| 3. Universal audio jack (with CTIA & OMTP headset support) | 8. Slim ODD bay |
| 4. (2) USB-A 10Gbps ports (1 charge port supports up to 5V/2.1A) | 9. External 5.25" bay |
| 5. (2) USB-A 10Gbps rate ports | |

Overview



rear

- | | |
|---|--|
| 1. (1) Audio Line-in jack
(1) Audio Line-out jack | 6. (1) WLAN Antenna (optional)
a. Internal
b. External |
| 2. (2) DisplayPort 1.4 ports | |
| 3. Flex I/O module: choose one from the following:
(1) DisplayPort 1.4, (1) HDMI 2.0b, (1) VGA, (1) Dual USB-A 5Gbps port, (1) USB-C® 10Gbps port (Power Delivery 15W, Alt Mode DisplayPort), (1) 2 nd 1 GbE LAN, (1) Thunderbolt 3 with USB-C® / USB4 40Gbps * (cabled to PCIe AIC**) (1) 1Gbps Fiber LC NIC | 7. (1) 1Gb LAN |
| 4. (2) Hi-Speed USB-A 480Mbps port | 8. 2nd serial port (optional) |
| 5. (2) USB-A 10Gbps ports
(1) USB-A 5Gbps port
(1) Hi-Speed USB-A 480Mbps port | 9. Hood lock (optional) |
| | 10. Power connector |

*Maximum speed requires DisplayPort™ and PCIe aggregation.

**Thunderbolt support only in PCI-E slot4.

Note: Onboard Display support DP1.4/HBR2. Flex I/O module Display support DP1.4/HBR3. Resolution all support up to 5120x3200 24bpp @60Hz.

Form Factor

Tower

Overview

Operating Systems

Preinstalled:

- Windows 11 Pro - HP recommends Windows 11 Pro²
- Windows 11 Home - HP recommends Windows 11 Pro²
- Linux®-ready⁵
- Ubuntu®^{4,5}
 - Intel 12th generation processors will support and preinstall Ubuntu 20.02 and 20.04.
 - Intel 13th generation processors support and preinstall Ubuntu 22.04 LTS

Web-supported only:

- Windows 10 Enterprise 64²

Supported Version:

- HP tested Windows 10, versions 20H2, 21H1, 21H2 and 22H2 on this platform. For testing information on newer versions of Windows 10, please see: <https://support.hp.com/document/c05195282>.
- Red Hat® Enterprise Linux® Workstation 8⁶
- SUSE Linux® Enterprise Desktop 15⁶
- Ubuntu®^{4,5}
 - Intel 12th generation processors will support and preinstall Ubuntu 20.02 and 20.04.
 - Intel 13th generation processors support and preinstall Ubuntu 22.04 LTS

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>.

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

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

⁶ For detailed OS/hardware support information for Linux, see: http://www.hp.com/support/linux_hardware_matrix

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

Overview

versions tested is available on the HP support website. <https://support.hp.com/us-en/document/c05195282>

Processors Overview^{1,3,4,5}

Intel 14th Generation Processors:

Intel® Core™ i5-14400 with Intel UHD Graphics (1.8 GHz E-core base frequency, 2.5 GHz P-core base frequency, up to 3.5 GHz E-core Max Turbo frequency, up to 4.7 GHz P-core Max Turbo frequency, 20 MB L3 cache, 6 P-cores and 4 E-cores, 16 threads)

Intel® Core™ i5-14500 with Intel UHD Graphics (1.9 GHz E-core base frequency, 2.6 GHz P-core base frequency, up to 3.7 GHz E-core Max Turbo frequency, up to 5.0 GHz P-core Max Turbo frequency, 24 MB L3 cache, 6 P-cores and 8 E-cores, 20 threads)

Intel® Core™ i5-14600 with Intel UHD Graphics (2.0 GHz E-core base frequency, 2.7 GHz P-core base frequency, up to 3.9 GHz E-core Max Turbo frequency, up to 5.2 GHz P-core Max Turbo frequency, 24 MB L3 cache, 6 P-cores and 8 E-cores, 20 threads)

Intel® Core™ i5-14600K with Intel UHD Graphics (2.6 GHz E-core base frequency, 3.5 GHz P-core base frequency, up to 4.2 GHz E-Core Max Turbo frequency, up to 5.3 GHz P-core Max Turbo frequency, 24 MB L3 cache, 6 P-cores and 8 E-cores, 20 threads)

Intel® Core™ i7-14700 with Intel UHD Graphics (1.5 GHz E-core base frequency, 2.1 GHz P-core base frequency, up to 4.2 GHz E-core Max Turbo frequency, up to 5.3 GHz P-core Max Turbo frequency, 33 MB L3 cache, 8 P-cores and 12 E-cores, 28 threads)

Intel® Core™ i7-14700K (3.4GHz P-Core base frequency, 2.5GHz E-Core base frequency, up to 4.3GHz E-Core Max Turbo frequency, up to 5.5 GHz P-core Max Turbo frequency, 33MB L3 cache, 8 P-cores and 12 E-cores, 28 threads)

Intel® Core™ i9-14900 (2GHz P-Core base frequency, 1.5GHz E-Core base frequency, up to 4.3GHz E-Core Max Turbo frequency, up to 5.4 GHz P-core Max Turbo frequency, 36MB L3 cache, 8 P-cores and 16 E-cores, 32 threads)

Intel® Core™ i9-14900K (3.2GHz P-Core base frequency, 2.4GHz E-Core base frequency, up to 4.4GHz E-Core Max Turbo frequency, up to 5.6 GHz P-core Max Turbo frequency, 36MB L3 cache, 8 P-cores and 16 E-cores, 32 threads)

Intel 13th Generation Processors:

Intel® Core™ i5-13400 (1.8 GHz E-core base frequency, 2.5 GHz P-core base frequency, up to 3.3 GHz E-core Max Turbo frequency, up to 4.6 GHz P-core Max Turbo frequency, 20 MB L3 cache, 6 P-cores and 4 E-cores, 16 threads)

Intel® Core™ i5-13500 (1.8 GHz E-core base frequency, 2.5 GHz P-core base frequency, up to 3.5 GHz E-core Max Turbo frequency, up to 4.8 GHz P-core Max Turbo frequency, 24 MB L3 cache, 6 P-cores and 8 E-cores, 20 threads)

Intel® Core™ i5-13600 (2.0 GHz E-core base frequency, 2.7 GHz P-core base frequency, up to 3.7 GHz E-core Max Turbo frequency, up to 5.0 GHz P-core Max Turbo frequency, 24 MB L3 cache, 6 P-cores and 8 E-cores, 20 threads)

Intel® Core™ i5-13600K (2.6 GHz E-core base frequency, 3.5 GHz P-core base frequency, up to 3.9 GHz E-core Max Turbo frequency, up to 5.1 GHz P-core Max Turbo frequency, 24 MB L3 cache, 6 P-cores and 8 E-cores, 20 threads)

Intel® Core™ i7-13700 (1.5 GHz E-core base frequency, 2.1 GHz P-core base frequency, up to 4.1 GHz E-core Max Turbo frequency, up to 5.1 GHz P-core Max Turbo frequency, 30 MB L3 cache, 8 P-cores and 8 E-cores, 24 threads)

Overview

Intel® Core™ i7-13700K (2.5 GHz E-core base frequency, 3.4 GHz P-core base frequency, up to 4.2 GHz E-core Max Turbo frequency, up to 5.3 GHz P-core Max Turbo frequency, 30 MB L3 cache, 8 P-cores and 8 E-cores, 24 threads)

Intel® Core™ i9-13900 (1.5 GHz E-core base frequency, 2.0 GHz P-core base frequency, up to 4.2 GHz E-core Max Turbo frequency, up to 5.2 GHz P-core Max Turbo frequency, 36 MB L3 cache, 8 P-cores and 16 E-cores, 32 threads)

Intel® Core™ i9-13900K (2.2 GHz E-core base frequency, 3.0 GHz P-core base frequency, up to 4.3 GHz E-core Max Turbo frequency, up to 5.4 GHz P-core Max Turbo frequency, 36 MB L3 cache, 8 P-cores and 16 E-cores, 32 threads)

Intel 12th Generation Processors:

Intel® Core™ i9-12900 with Intel® UHD Graphics (1.8 GHz E-core base frequency, 2.4 GHz P-core base frequency, up to 3.8 GHz E-core Max Turbo frequency, up to 5.0 GHz P-core Max Turbo frequency, up to 5.1 GHz with Intel® Turbo Boost Technology, 30 MB L3 cache, 8 P-cores and 8 E-cores, 24 threads)

Intel® Core™ i7-12700 with Intel® UHD Graphics (1.6 GHz E-core base frequency, 2.1 GHz P-core base frequency, up to 3.6 GHz E-core Max Turbo frequency, up to 4.8 GHz P-core Max Turbo frequency, up to 4.9 GHz with Intel® Turbo Boost Technology, 25 MB L3 cache, 8 P-cores and 4 E-cores, 20 threads)

Intel® Core™ i5-12500 with Intel® UHD Graphics (3.0 GHz P-core base frequency, up to 4.6 GHz P-core Max Turbo frequency, 18 MB L3 cache, 6 P-cores, 12 threads)

Intel® Core™ i3-12100 with Intel® UHD Graphics (3.3 GHz P-core base frequency, up to 4.3 GHz P-core Max Turbo frequency, 12 MB L3 cache, 4 P-cores, 8 threads)

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.

³ Intel Turbo Boost performance varies depending on hardware, software and overall system configuration. See <http://www.intel.com/technology/turboboost> for more information.

⁴ 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>

⁵ Memory will run at 4400 speed (MT/s) in 2DPC within 1DIMM population; memory will run at 4000 speed (MT/s) in 2DPC within 2DIMM of 1 Rank population and memory will run at 3600 speed (MT/s) in 2DPC within 2DIMM of 2 Rank population

Color	Black
Convertibility	No
Expansion Slots (see system board section for more details)	Slot 1: PCIe Gen5 x16 Slot 2: PCIe Gen3 x1 - with x4 open end Connector Slot 3: PCIe Gen3 x4 - with x16 Connector

Overview

	Slot 4: PCIe Gen3 x4 with open end connector
Expansion Bays (see storage section for more details)	(2) Internal 3.5" bays (1) External 5.25" bay (1) Internal 2.5" bay (for SSD only) (1) Dedicated 9.5mm slim optical disk drive bay
Front I/O	(2) USB-A 10Gbps ports (1 charge port supports up to 5V/2.1A), (2) USB-A 10Gbps ports, (1) USB-C 20Gbps eport (charge supports up to 5V/3A, optional), (1) SD card reader (optional), (1) universal audio jack
Internal I/O [5]	(1) Hi-Speed USB 480Mbps header for SD card reader (1) serial port available with header (1) serial and PS/2 available with header
Rear I/O	(2) DisplayPort 1.4 ports, (1) Audio Line out, (1) Audio Line in, (1) 1GbE LAN, (3) Hi-Speed USB 480Mbps ports, (2) USB-A 10Gbps ports, (1) USB-A 5Gbps port, (1) serial (optional), (1) Flex I/O port (VGA, HDMI 2.0b, DisplayPort 1.4, USB-C® 10Gbps port (Power Delivery 15W, Alt Mode Display Port)), (1) Dual USB-A 5Gbps port, (1) 2nd 1GbE LAN, (1) Thunderbolt 3 with USB4 USB-C® 40Gbps (cabled to PCIe AIC)*, (1) 1Gbps Fiber LC NIC
Optional I/O	Flex IO* - choose one of the following options: (1) DisplayPort™ 1.4 port, (1) HDMI 2.0b, (1) VGA, (1) 2nd 1GbE LAN, (1) 1Gbps Fiber LC NIC, (1) Dual USB-A 5Gbps port, (1) USB-C® 10Gbps port (15W USB Power Delivery, Alt Mode DisplayPort™), (1) Thunderbolt™ 3 with USB4 USB-C® 40Gbps port (cabled to PCIe® AIC**);

Front - (1) USB-C® 20Gbps port (charging), (1) SD card reader;

Front - choose one of the following options: (1) USB-C® 20Gbps (charging), (1) SD 4.0 card reader
Rear -(1) serial;

*About Thunderbolt compatibility, please refer to the FAQ of Thunderbolt community.

<https://www.thunderbolttechnology.net/tech/faq>

**Flex IO port and PCIe slot 4 will be occupied when Thunderbolt is installed.

Interfaces Supported	SD card reader (optional)
On-board RAID Support	SATA and NVME RAID 0 Striped Array SATA RAID and NVME RAID 1 Mirror Array
Chassis Dimensions (H x W x D)	H: 14" [356mm] W: 6.7" [169mm] D: 15.2" [385mm]

Overview

Packaged Dimensions	H: 20.39" (518mm) W: 11.61" (295mm) D: 19.29" (490mm)
Rack Dimensions	4U
Weight	Exact weights depend upon configuration (System weight only). Starting at 6.2kg (13.7lbs.)
Temperature	Operating: 5° to 35° C (40° to 95° 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 Non-operating: -40° to 60° C (-40° to 140° F) Maximum rate of change: 10°C/hr
Humidity	Operating: 8% to 85% RH, non- condensing, 35° C maximum wet bulb Non-operating: 8% to 90% relative humidity, non-condensing, 35° C maximum wet bulb
Maximum Altitude (non-pressurized)⁶	Operating (with Rotational Hard Drives): 3,048 m (10,000 feet) Operating (with only Solid-State Drives): 5,000 m (16,404 feet) Non-operating: 12,192 m (40,000 feet) Maximum operating temperature is reduced as altitude increases. See Temperature for details.
Power Supply	700W wide-ranging, active Power Factor Correction, 92% Efficiency with two 6+2 graphics power connectors. 500W wide-ranging, active Power Factor Correction, 90% Efficiency. 450W wide-ranging, active Power Factor Correction, 90% Efficiency. 350W wide-ranging, active Power Factor Correction, 92% Efficiency. NOTE: The Power Supply Efficiency Report for the 700W 92% Efficiency, 500W 90% Efficiency, 450W 90% Efficiency and 350W 92% Efficiency Power Supply may be found at the following links: 700W PSU: https://www.pluginloadsolutions.com/80PlusPowerSuppliesDetail.aspx?id=0&type=2 500W PSU: LiteOn 500W PSU Efficiency Report Delta 500W PSU Efficiency Report 450W PSU: https://www.pluginloadsolutions.com/80PlusPowerSuppliesDetail.aspx?id=0&type=2 350W PSU: AcBel 350W PSU (SFF) Efficiency Report AcBel 350W PSU (Custom) Efficiency Report Delta 350W PSU Efficiency Report
Backup Devices	For a complete listing of compatible DAT tape drives, LTO tape drives and RDX Removable Disk Backup System offerings, please visit http://www.hp.com/go/connect

Overview

Chipset	Intel® W680 chipset
Memory	4 DIMM slots supporting up to 192GB non-ECC or up to 128 GB ECC, DDR5 unbuffered DIMM memory. Max memory speed will run at 4400 MT/s based on system configuration. See Supported Components / Memory Section for details.

Supported Components

SATA Hard Drives

	Factory Configure d	Option Kit Option Kit	Option Kit Part Number
1TB SATA 7200 rpm 6Gb/s 3.5" HDD (Enterprise Class)	Y	Y	W0R10AA
2TB SATA 7200 rpm 6Gb/s 3.5" HDD (Enterprise Class)	Y	Y	2Z274AA
4TB SATA 7200 rpm 6Gb/s 3.5" HDD (Enterprise Class)	Y	Y	K4T76AA
8TB SATA 7200 rpm 6Gb/s 3.5" HDD (Enterprise Class)	Y	Y	2Z273AA
12TB SATA 7200 rpm 6Gb/s 3.5" HDD (Enterprise Class)	Y	Y	5S461AA

NOTE: For internal bay install, HDD option kits require separate purchase of 6Z9U6AA HP Z2 Tower HDD Cable Kit. For external bay install, HDD options kits require separate purchase of 6Z9U6AA HP Z2 Tower HDD Cable Kit & NQ099AA HP Optical Bay HDD Mounting Bracket.

PCIe Solid State Drives

HP ZTurbo 512GB PCIe-Gen 4x4 TLC Z2 SSDKit	Y	Y	201G0AA/AT
HP ZTurbo 512GB PCIe-Gen 4x4 SED Z2 SSDKit	Y	Y	201F9AA
HP ZTurbo 1TB PCIe-Gen 4x4 TLC Z2 SSDKit	Y	Y	201F5AA/AT
HP ZTurbo 2TB PCIe-Gen 4x4 TLC Z2 SSDKit	Y	Y	201F8AA
Z Turbo 1TB 2280 PCIe-Gen4x4 Self Encrypted OPAL2 TLC M.2 Z2 SSD	Y	Y	223A3AA/AT
Z Turbo 2TB 2280 PCIe-Gen4x4 Self Encrypted OPAL2 TLC M.2 Z2 SSD	Y	Y	223A4AA/AT
256GB 2280 PCIe-4x4 NVMe Value M.2 Z2 SSD Module	Y	Y	4M9Z1AA
512GB 2280 PCIe-4x4 NVMe Value M.2 Z2 SSD Module	Y	Y	4M9Z2AA
1TB 2280 PCIe-4x4 NVMe Value M.2 Z2 SSD Module	Y	Y	4M9Z3AA
Z Turbo 4TB 2280 PCIe-4x4 TLC M.2 Z2 Kit SSD	Y	Y	5S492AA
Z Turbo 2TB PCIe-4x4 TLC SSD Module	Y	Y	38T75AA
Z Turbo 1TB 2280 PCIe-4x4 SED OPAL2 TLC M.2 SSD Module	Y	Y	38T76AA
Z Turbo 1TB PCIe-4x4 TLC SSD Module	Y	Y	38T77AA
Z Turbo 2TB 2280 PCIe-4x4 SED OPAL2 TLC M.2 SSD Module	Y	Y	38T79AA
Z Turbo 512GB PCIe-4x4 TLC SSD Module		N	
Z Turbo 512GB 2280 PCIe-4x4 SED OPAL2 TLC M.2 SSD Module		N	
Z Turbo 4TB 2280 PCIe-4x4 TLC M.2 SSD Module	Y	Y	5S496AA
Z Turbo 4TB 2280 PCIe-4x4 SED OPAL2 TLC M.2 SSD Module	Y	Y	5S497AA

Supported Components

Z Turbo 4TB 2280 PCIe-4x4 SED OPAL2 TLC M.2 Z2 Kit
SSD Y Y 5S498AA

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.

NOTE: PCIe M.2 SSD Kit SKUs include a heatsink. PCIe M.2 SSD Module SKUs do not include a heatsink.

Graphics

		Factory Configured	Option Kit	Option Kit Part Number	Supporte d # of cards	Support Notes
Graphics Cable Adapters	HP DisplayPort To HDMI True 4k Adapter	Y	Y	2JA63AA		
	HP Single miniDP-to-DP Adapter Cable	Y	Y	2MY05AA		
	HP DisplayPort To DVI-D Adapter	Y	Y	FH973AA		
	HP DisplayPort To DVI Adapter (Bulk 90)	Y	N			
	HP DisplayPort To VGA Adapter	Y	Y	AS615AA/A T		
	HP DisplayPort to VGA Adapter Bulk Qty.90)	Y	N			
	HP DisplayPort To VGA Adapter	Y	Y	F7W97AA		
	HP USB-C to DisplayPort Adapter	Y	Y	8Y8Y1AA		
	HP USB-C to HDMI Adapter	Y	Y	4SH07AA		
	HP USB-C to VGA Adapter	Y	Y	4SH06AA		
Entry 3D	NVIDIA® T400E 4 GB 4mDP Graphics	Y	Y	A4HP3AA	2	1
	AMD Radeon RX 6400 4 GB DH DP+HDMI Graphics	N	Y	6Q3U4AA/A T	1	1
	NVIDIA® T1000 4 GB Graphics	Y	N			
Mid-range 3D	NVIDIA® T1000 8 GB Graphics	Y	Y	5Z7D8AA/A T	2	1
	NVIDIA Long-Life T1000E 8 GB 4mDP Graphics	Y	Y	6V9V4AA/A T	2	1
	NVIDIA RTX A1000 8 GB 4mDP Graphics	Y	N		2	1
	NVIDIA RTX™ A2000 12GB Graphics*	Y	N			

Supported Components

NVIDIA RTX 2000 Ada 16 GB 4mDP Graphics	Y	Y	8D6B8AA	2	
NVIDIA RTX™ A4000 16GB*	Y	N		2	
NVIDIA® RTX™ 4000 Ada 20 GB 4DP Graphics*	Y	Y	8D6B7AA	2	
NVIDIA® RTX PRO 4000 Blackwell 24GB	Y	Y	B11F3AA	1	2
NVIDIA® RTX™ A4500 20GB GDDR6 4DP Graphics	Y	Y		1	
NVIDIA Long-Life RTX A2000E 12 GB 4mDP Graphics	Y	N		1	
AMD Radeon Pro W7900 48 GB 3DP+1mDP Graphics	Y	Y	8F699AA	1	
AMD Radeon Pro W7600 8 GB Graphics*	Y		8D6B9AA	1	
AMD Radeon Pro W7500 8 GB Graphics	Y	Y	8D6C2AA	1	
NVIDIA RTX 4500 Ada 24 GB 4DP Graphics	Y	Y	8D6C1AA	1	
NVIDIA RTX 5000 Ada 32 GB 4DP Graphics	Y	Y	8D6B6AA	1	

NOTE: Other 3rd Party graphics cards available. Please inquire with your sales specialist or channel partner.

NOTE: Z2 G9 Tower with 700W PSU can support up to a 250W professional graphics card from HP, either factory-configured or added via after-market option, and can support up to 320W total graphics power when graphics is factory-configured.

Note 1: When dual graphics is configured the 450W and 500W base units will require the AMO HP Z2 TWR Dual Front Fan Kit part number 4N007AA; One storage device configuration for higher than 75W graphics cards (T1000 and up)

* Requires 700W chassis.

Note 2: NVIDIA driver support for Ubuntu on the Blackwell series is currently unavailable.

Memory

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP 8GB (1x8GB) DDR5-4800 nECC UDIMM	Y	Y	4M9X9AA	
HP 16GB (1x16GB) DDR5-4800 nECC UDIMM	Y	Y	4M9Y0AA	
HP 16GB (1x16GB) DDR5-4800 ECC UDIMM	Y	Y	4M9Y1AA	1
HP 32GB (1x32GB) DDR5-4800 nECC UDIMM	Y	Y	4M9Y2AA	

Supported Components

HP 32GB (1x32GB) DDR5-4800 ECC UDIMM	Y	Y	4M9Y3AA	1
HP 48GB (1x48GB) DDR5-5600 UDIMM NECC	Y	Y	8F070AA	

NOTE 1: ECC memory is supported

GENERAL NOTE: Two channels of DDR5 memory are supported. To realize full performance at least one DIMM must be inserted into each channel.

Though the memory modules can run up to 4800MHz, the current platform will support maximum memory speed of 4400MHz.

The system speed will be determined by a number of key factors:

Module Configuration	Description of configuration	Max Memory Speed (Actual Memory speed is dependent on CPU)
Single DIMM per channel	Configurations that contain only one or two DIMM modules with DIMMs only in the black slots	4400MHz
Two single ranked DIMMs in a channel	Configurations with 3 or 4 single ranked DIMMs (8GB and 16GB) installed in a system. Memory speed may also vary depending on vendor module mix.	4000MHz
Two dual ranked DIMMs in a channel	Configurations with 3 or 4 dual ranked DIMMs (32GB) installed in a system	3600MHz

When more than one memory slot is populated, symmetric configurations are required for 2 DIMMs per channel. Mix of different part numbers or mix of single and dual ranks within a channel is not allowed.

Optical and Removable Storage

	Factory Configured	Option Kit	Option Kit Part Number
HP CRU Secure High Performance Storage Module with 4TB M.2 SSD ³	Y	N	-
HP DX175 Removable HDD Frame/Carrier ¹	N	Y	1ZX71AA
HP Z2 TWR SuperMulti DVD-Writer 9.5mm Slim ODD	Y	Y	4L5K0AA
HP Z2 TWR DVD-ROM 9.5mm Slim ODD	Y	Y	4L5K1AA
HP CRU QX328 5.25 in Front Removable <u>M.2</u> Frame/Carrier ²	Y	Y	4N011AA
HP CRU Secure High Performance Storage Module with 2TB M.2 SSD	Y	Y	56Q87AA
HP CRU Secure High Performance Storage Module with 1TB M.2 SSD	Y	Y	56Q88AA

Supported Components

HP CRU Secure High Performance Storage Module with 512GB M.2 SSD	Y	Y	56Q89AA
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NOTES:

¹ Only supports 4TB or lower capacity HDDs.

² 4N011AA HP CRU QX328 5.25in Front Removeable Frame/Carrier requires a separate purchase of HP CRU SHIPS Storage Module(s).

HP CRU Secure High Performance Storage (SHIPS) Module Kit contains select M.2 SSD for install into a factory configured or after market option front removeable storage carrier (HP CRU QX328 Frame/Carrier).

³ Some double-sided M.2 SSDs may throttle during heavy use, resulting in lower read and write speeds. This behavior is by design in order to protect the SSD from over-heating.

Duplication of copyrighted material is strictly prohibited. Actual speeds may vary. Double Layer media compatibility will widely vary with some home DVD players and DVD-ROM drives. Note that DVD-RAM cannot read or write to 2.6GB Single Sided/5.2 Double Sided-Version 1.0 Media.

Networking and Communications

	Factory Configure	Option Kit	Option Kit Part Number
Integrated Intel® I219LM PCIe GbE Controller (Intel® vPro® with Intel® AMT 16.0)	Y	N	
HP 1GbE LAN Flex Port 2020	Y	Y	141J6AA/AT
HP Flex 1GbE Fiber LC Single Port	Y	Y	20J15AA
NVIDIA Mellanox ConnectX-6 DX Dual Port 10/25GbE SFP28 NIC ^{1,4}	Y	Y	436M8AA
Intel E810-CQDA2 1x100GbE/2x50GbE QSFP28 PCIe Network Adapter ^{1,4}	Y	Y	C20MMAA
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
Intel® X550-T2 dual-port 10GbE NIC	Y	Y	1QL46AA
Intel® Ethernet Network Adapter I225-T1	Y	Y	406L9AA
Intel® Wi-Fi 6E AX211 BT 5.3 wireless card M.2 non-vPro ^{1,2,*,**,*}	Y	N	
Allied Telesis AT-2911T/2-901 Dual Port 1GbE NIC	Y	Y	6E3Y9AA/AT
Intel® Wi-Fi 7 BE200 BT 5.4 wireless card M.2 non-vPro ^{1,3,*,**,*}	Y	N	

Supported Components

Intel® i225-T1 single-port 2.5 GbE NIC

Y

¹Intel AX211 or BE200 with Internal antenna support Wi-Fi 6

²Intel AX211 with external antenna support Wi-Fi 6E

³Intel BE200 with external antenna support Wi-Fi 6E/7

⁴Current HP transceiver offerings are rated for single speed only. The HP 25GbE SFP28 LC Fiber Optic Transceiver officially only supports 25Gbps. The HP 10GbE SFP+ SR/SW LC Fiber Optic Transceiver officially only supports 10G. Please select the appropriate transceiver to match the speed of the network or infrastructure that the system will be connected to.

*Intel I350-T4 4-port GbE NIC is an After Market Option only.

**Wi-Fi 6E (802.11ax) requires a Wi-Fi 6E router, sold separately, to function in the 6GHz band.

Availability of public wireless access points limited. Wi-Fi 6E is backwards compatible with prior 802.11 specs. And available in countries where Wi-Fi 6E is supported.

***Intel AX211 and BE200 must be configured at time of purchase. Not available as an After Market Option.

****Wi-Fi 7 (802.11BE) functionality requires Windows 11 24H2, select Intel® 14th processor, and a Wi-Fi 7 router, sold separately. Wi-Fi 7 is backwards compatible with prior 802.11 specs. Available in countries where Wi-Fi 7 is supported.

NOTES:

The integrated network connection is required to support Intel® vPro® Technology.

If AMT is provisioned, then network teaming with the integrated LAN port is not possible.

“Gigabit” Ethernet indicates compliance with IEEE standard 802.3ab for Gigabit Ethernet, and does not connote actual operating speed of 1 Gb/sec. For high-speed transmission, connection to a Gigabit Ethernet server and network infrastructure is required.

Supported Components

Input Devices

	Factory Configure d	Option Kit	Option Kit Part Number
HP USB 320K Keyboard	Y	N	
HP 320M Wired Mouse	Y	Y	9VA80AA
HP 975 USB+BT Dual Mode Wireless	N	Y	3Z726AA
HP 655 Wireless USB BLK KBD/MSE Kit	N	Y	N/A
HP 128 Laser Wired Mouse	Y	Y	265D9AA
HP 455 Programmable Wireless Keyboard	Y	Y	4R177AA
HP 455 Programmable Wireless Keyboard (Bulk Qty.12)	Y	Y	4R177A6
HP 655 Wireless Keyboard and Mouse Combo	Y	Y	4R009AA
HP 655 Wireless Keyboard and Mouse Combo (Blk Qty.10)	Y	Y	4R009A6

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

Flex Module (Rear IO)

	Factory Configure d	Option Kit	Option Kit Part Number
HP 1GbE LAN Flex Port 2020	Y	Y	141J6AA/AT
HP DP Flex Port 2020	Y	Y	141J7AA/AT
HP Dual USB-A 3.2 Gen1 Flex Port 2020	Y	Y	141J8AA/AT
HP HDMI Flex Port	Y	Y	69D47AA/AT
HP USB-C 3.2 Gen2 Alt Flex Port 2020	Y	Y	141K6AA/AT
HP VGA Flex Port 2020	Y	N	
HP Flex 1GbE Fiber LC Single Port	Y	Y	20J15AA

Other Hardware

	Factory Configure d	Option Kit	Option Kit Part Number
HP Single TBT3 wType C and USB4 PCIe x4 Card	Y	N	N/A
HP Z2 Internal Serial Port and PS/2 Port	Y	Y	141K9AA/AT
HP Z2 Power Cord Kit	Y	Y	1N1D5AA
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	N	
HP Z2 2 nd serial port adapter	Y	Y	141K8AA/AT
HP Z2 Tower Dust Filter	Y	Y	141L2AA/AT

Supported Components

HP Z2 Tower Dust Filter and bezel	Y	N	
HP PCIe x1 Parallel Port Card	Y	Y	N1M40AA
HP Z2 G9 Single Type-C SuperSpeed USB 20Gbps Front Port	Y	Y	4M9X8AA/AT
HP Z2 TWR Dual Front Fan Kit	Y	Y	4N007AA
HP Optical Bay HDD Mounting Bracket	Y	Y	NQ099AA
HP Z2 Tower HDD Cable Kit	N	Y	6Z9U6AA
HP Integrated Remote System Controller	Y	Y	7K6D9AA
HP Remote System Controller Main Board Adapter	Y	Y	7K6D8AA
HP Remote System Controller	Y	Y	7K6D7AA
HP Remote System Controller for Universal KVM	N	Y	7K7N2AA

Racking and Physical Security

	Factory Configured	Option Kit	Option Kit Part Number
HP Z2 Mini and Z2/Z4/Z6 TWR Depth Adjustable Fixed Rail Rack Kit	Y	Y	2A8Y5AA
HP Keyed Cable Lock	Y	Y	T1A62AA
HP Master Keyed Cable Lock 10mm	Y	Y	T1A63AA
HP Business PC Security Lock V3 Kit	Y	Y	3XJ17AA

Software

	Factory Configuration	Option Kit	Support Notes
HP Performance Advisor	Y	N	1
HP PC Hardware Diagnostics UEFI		N	3
HP Wolf Security	Y	N	
HP Notifications	Y	N	
HP Desktop Support Utility	Y	N	
HP Documentation	Y	N	
HP Image Assistant	N	N	
HP Support Assistant	N	N	
myHP	Y	N	
Kingsoft WPS Office	Y	N	4
My Office	Y	N	5
Adobe Substance 3D Collection Plan	N	Y	6

Supported Components

WSL2/Ubuntu Data Science Stack	Y	N	7
Wolf Pro Security			8
HP Manageability Integration Kit			

Notes:

1. Supports, and preinstalled with Windows 10 only. Also available as a free download from <http://www.hp.com/go/performanceadvisor>
2. Windows OS only
3. Not available in Russia
4. Only available in China
5. Only available in Russia
6. Not available in China
7. Optional Software
8. 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.

Operating Systems Windows 11 Pro - HP recommends Windows 11 Pro²

Windows 11 Home - HP recommends Windows 11 Pro²

Linux[®]-ready⁵

Ubuntu[®]4,5

- Intel 12th generation processors will support and preinstall Ubuntu 20.02 and 20.04.
- Intel 13th generation processors support and preinstall Ubuntu 22.04 LTS

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>.

Supported Components

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

⁵For detailed Linux® OS/hardware support information, see:

http://www.hp.com/support/linux_hardware_matrix

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

Supported Components

HP BIOS

Additional HP BIOS Features:

- Power-On password – Helps prevent an unauthorized user from powering on the system.
- Administrator password – Also known as the BIOS Setup password, this helps prevent unauthorized changes to the system configuration. If the administrator password is not known, the BIOS cannot be updated and changes cannot be made to BIOS settings using BIOS Setup or under the OS.
- S4/S5 Maximum Power Savings setting supports EU Lot6 requirement and allows the computer to power down below 0.5W in S4/S5 (when turned off). When S4/S5 Maximum Power Savings feature is enabled below features are turned off:
 - Power to expansion connectors / slots
 - Most Wake events other than power buttons and WOL(Wake on LAN supported by embedded Lan controller under S4/S5 Maximum Power Saving Enabled)
 - USB charging ports

HP Sure Start Gen7 Start

- 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

[Note: HP Sure Start Gen7 is available on HP Workstation products equipped with Intel® 12th generation processors.](#)

HP Performance Control Modes

HP Z Desktop Workstations offers Performance Control Modes in the F10 BIOS menu. Z2 G9 offers Quiet Mode, Performance Mode and High-Performance Mode. HP recommends using High Performance Mode unless you have concerns about acoustics in an open office environment. Customers can get up to 41% performance improvements using High Performance Mode over Performance Mode*. High Performance Mode is configured as default from the factory.

How to Set HP Performance Control Modes in HP F10 BIOS Menu

Supported Components

In the F10 BIOS Menu, the setting titled “Performance Control” is adjustable to High Performance Mode, Performance Mode or Quiet Mode. These modes are choice points for performance and acoustic trade-offs based on user needs or recommended balanced conditions in performance and noise optimization.

At startup, push the F10 key while system is booting to get to the BIOS Menu.

Go to → Advanced -> System Options -> scroll down and choose “Performance Control”

Set the Performance Mode you desire and then go back to Main->Save Changes and Exit -> Yes
The machine will restart in the mode you’ve chosen.

How to change Performance Modes in HP Performance Advisor software?

Select BIOS Settings -> Advanced -> System Options -> Performance Controls

The machine will restart in the mode you’ve chosen.

You can change these modes anytime you prefer to prioritize acoustics (Quiet Mode), want a balance between performance and acoustics (Performance Mode) or prefer to prioritize performance (High Performance Mode).

For more information on performance control modes, please see the white paper called, HP Performance Control Modes for Z Desktop Workstations.

[*Compared to Performance Mode. Performance improvement based on Z2 Tower G9 with 64GB of memory, 1TB NVMe, Windows 11 22H2 OS, RTX A4000, i7-14700 CPU using Blender OpenData CPU Render and Arnold 2023 CPU multi-core benchmarking.](#)

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 Advisor¹

myHP

WSL/Ubuntu Data Science Stack

HP Privacy Settings

Touchpoint Customizer for Commercial

Supported Components

Manageability Features

HP Driver Packs²
HP UWP Pack
HP System Software Manager (SSM)
HP Manageability Integration Kit Gen4³
HP Client Catalog (download)
HP Image Assistant (download)
HP Cloud Recovery
HP Client Management Script Library (download)
HP BIOSphere Gen6¹³
HP BIOS Configuration Utility (download)

Client Security Software

HP Client Security Suite Gen7⁴ including: (including Credential Manager, HP Password Manager⁶, HP Spare Key)
HP Power On Authentication
Microsoft Defender⁷

Security Management

HP Secure Erase¹⁶
HP Wolf Pro Security Edition (optional)¹⁸
HP Wolf Security for Business²² Includes:
HP Sure Click¹¹
HP Sure Sense¹²
HP Sure Run Gen5⁹
HP Sure Recover Gen4¹⁰
HP Sure Start Gen7⁸
HP Tamper Lock
HP Sure Admin¹⁷
HP Client Security Manager Gen 7⁴
Hood Sensor Optional Kit

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

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

³ HP Manageability Integration Kit can be downloaded from <http://www8.hp.com/us/en/ads/clientmanagement/overview.html>

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

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.

Supported Components

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 - or the methods outlined in the National Institute of Standards and Technology Special Publication 800-88 "Clear" sanitation method. HP Secure Erase does not support platforms with Intel® Optane.

¹⁷ HP Sure Admin requires Windows 11, HP BIOS, HP Manageability Integration Kit from <http://www.hp.com/go/clientmanagement> and HP Sure Admin Local Access Authenticator smartphone app from the Android or Apple store.

¹⁸ HP Wolf Pro Security Edition is available preloaded on select SKUs, and, depending on the HP product purchased, includes a 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 higher, includes various HP security features and is available on HP Pro, Elite, RPOS and Workstation products. See product details for included security features

System Technical Specifications

System Board

System Board Form Factor	Customized PCB 36.056 x 25.130 mm (14.197 x 9.894 inch)		
Processor Socket	Single LGA-1700		
CPU Bus Speed	DMI Gen4		
Chipset	Intel® PCH W680		
Super I/O Controller	Nuvoton SIO21		
Memory Expansion Slots	4 DDR5 memory slots		
Memory Type Supported	DDR5, UDIMM (Unbuffered), ECC& non-ECC		
Memory Modes	Non-Interleaved for single channel. Interleaved when both channels are populated.		
Memory Speed Supported	3600MT/s to 4400MT/s DDR5, dependent on memory configuration ¹		
	¹ Though the memory modules can run up to 4800MHz, the current platform will only be able to support the maximum memory speed of 4400MHz.		
	The system speed will be determined by a number of key factors:		
	Module Configuration	Description of configuration	Max Memory Speed (Actual Memory speed is dependent on CPU)
	Single DIMM per channel	Configurations that contain only one or two DIMM modules with DIMMs only in the black slots	4400MHz
	Two single ranked DIMMs in a channel	Configurations with 3 or 4 single ranked DIMMs (8GB and 16GB) installed in a system	4000MHz
	Two dual ranked DIMMs in a channel	Configurations with 3 or 4 dual ranked DIMMs (32GB) installed in a system	3600MHz
Memory Protection	ECC available on data		
Maximum Memory	192GB		
Memory Configuration (Supported)	8GB, 16GB, 32GB and 48GB non-ECC, 16GB and 32GB ECC unbuffered DIMMs are supported. ECC and non-ECC memory DIMMs cannot be mixed in the same system		
PCI Express Connectors	(1) PCI Express Gen5 slot x16 mechanical/ x16 electrical (full height, full length) (1) PCI Express Gen3 slot x4 mechanical/ x1 electrical (full height, full length, open-ended) (1) PCI Express Gen3 slot x16 mechanical/ x4 electrical (full height, full length) (1) PCI Express Gen3 slot x4 mechanical/ x4 electrical (full height, full length, open-ended) (1) M.2 2280 Storage (PCIe Gen4 x4) (1) M.2 2280 Storage (PCIe Gen4 x4) (1) M.2 2280 Storage (PCIe Gen4 x4) (1) M.2 2230 WLAN (PCIe Gen3 x1+ Intel CNVi)		

System Technical Specifications

NOTE: The PCIe Gen5 x16 slot has validated and passed PCI-SIG electrical compliance test ONLY. HP does not guarantee and support any PCIe Gen5 cards available in the open market. May or may not see performance reduced when device MRRS (Maximum Read Request Size) is 512Bytes and above. To reach highest Gen5 PCIe performance, Use the top bin DRAM module (e.g. 4400) to minimize the impact.		
Supported Interfaces	SATA	Integrated (4) Serial ATA interfaces (6Gb/s SATA). RAID 0 and 1 supported. Factory integrated RAID for Microsoft Windows only.
	Integrated Graphics	Intel® UHD Graphics 730 (on Core i5-12400/i3-12300/i3-12100) processors); Intel® UHD Graphics 770 (on 13 th and 14 th gen Core i5/i7/i9 processors); Based on Unified Memory Architecture (UMA) - - region of system memory is reserved and dedicated to the graphics display. Support for Microsoft DirectX 12, OpenGL 4.6 and OpenCL 3.0 on Intel® UHD Graphics 730/770; Based on Unified Memory Architecture (UMA) - - region of system memory is reserved and dedicated to the graphics display.
		2 DP 1.4 graphics ports integrated in motherboard; Supports up to three simultaneous displays across DisplayPort*/HDMI*/DVI outputs. Max. resolution supported on onboard DP 1.4/HBR2 ports: 4096x2304 @ 60Hz, 24bpp Max. resolution supported on FlexIO DP 1.4/HBR3 port: 5120x3200 @60Hz, 24bpp
	Network Controller	Integrated Ethernet PHY Connection I219LM. Management capabilities: WOL, PXE 2.1 and AMT 16
	Serial	1 internal header (requires optional Serial Port and PS/2 Combo Kit with PCIe bracket)
USB Connector(s)	2 nd Serial	1 internal header(requires optional Serial Port Adapter Kit)
	Front	2 Type-A SuperSpeed USB 10Gbps signaling rate port (charge supports up to 5V/2.1A); 2 Type-A SuperSpeed USB 10Gbps signaling rate port; 1 Type-C® SuperSpeed USB 20Gbps signaling rate port (optional, charge supports up to 5V/3A)
	Rear	3 High-speed USB 480Mbps signaling rate port; 1 Type-A SuperSpeed USB 5Gbps signaling rate port; 2 Type-A SuperSpeed USB 10Gbps signaling rate port;

System Technical Specifications

	Internal	Flex I/O option: 1 SuperSpeed USB Type-C® 10Gbps signaling rate (Power Delivery 15W, Alt Mode DisplayPort); 1 Dual SuperSpeed USB Type-A 5Gbps signaling rate 1 High-speed USB 480Mbps signaling rate header for SD Card Reader
HD Integrated Audio	Realtek ALC3205-VA2-CG, 2.0W internal mono speaker	
Flash ROM	Yes	
CPU Fan Header	Yes	
Memory Fan Header	None	
Chassis Fan Header	1 Rear System Chassis Fan Header, 1 Graphic chassis Fan Header.	
Front PCI Fan Header	None	
Front Control Panel/Speaker Header	Yes	
CMOS Battery Holder - Lithium	Yes	
Integrated Trusted Platform Module	Integrated TPM 2.0 (Infineon SLB9672) Convertible to FIPS 140-2 Certified mode through firmware v15.21	
Power Supply Headers	Yes	
Power Switch, Power LED & Hard Drive LED Header	Yes	
Clear Password Jumper	None	
Keyboard/Mouse	USB or PS/2 (option)	
Power Supply	700W EPA92, 500W EPA90, 450W EPA90 and 350W EPA92	

¹Maximum memory capacities assume 64-bit operating systems, such as Genuine Windows® 10 Professional 64 bit, Red Hat Linux 64-bit. 32-bit Windows Operating Systems support up to 4 GB.

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

PROCESSORS

Name	Ghz P-Core Base Frequency	Ghz E-Core Base Frequency	Up to X P-Core Max Turbo Freq	Up to x GHz E-Core Max Turbo Frequency	L3 Cache (MB)	P-Cores	E-Cores	Total Cores	Process or Threads	Memory Speed (MT/s) (DDR5) ⁴	ECC Memory Supported ⁵	Integrated Graphics	Featuring Intel® vPro® Technology ³	TDP (W)	Max Turbo Frequency (GHz)
Intel 14th Generation Processors															
Intel® Core™ i9-14900K	3.2	2.40	5.6	4.4	36	8	16	24	32	5600	Y	Intel® UHD Graphics 770	Y	125	6

System Technical Specifications

Intel® Core™ i9-14900	2	1.50	5.4	4.3	36	8	16	24	32	5600	Y	Intel® UHD Graphics 770	Y	65	5.8
Intel® Core™ i7-14700K	3.4	2.50	5.5	4.3	33	8	12	20	28	5600	Y	Intel® UHD Graphics 770	Y	125	5.6
Intel® Core™ i7-14700	2.1	1.50	5.3	4.2	33	8	12	20	28	5600	Y	Intel® UHD Graphics 770	Y	65	5.4
Intel® Core™ i5-14600K	3.5	2.60	5.3	4.2	24	6	8	14	20	5600	Y	Intel® UHD Graphics 770	Y	65	5.3
Intel® Core™ i5-14600	2.7	2.00	5.2	3.9	24	6	8	14	20	5600	Y	Intel® UHD Graphics 770	Y	65	5.2
Intel® Core™ i5-14500	2.6	1.80	5	3.7	24	6	8	14	20	4800	Y	Intel® UHD Graphics 770	Y	65	5.0
Intel® Core™ i5-14400	2.5	1.80	4.7	3.5	20	6	4	20	16	4800	N	Intel® UHD Graphics 730	N/A	65	4.7
Intel 13th Generation Processors															
Intel® Core™ i9-13900K	3	2.20	5.4	4.3	36	8	16	24	32	5600	Y	Intel® UHD Graphics 770	Y	125	5.8
Intel® Core™ i9-13900	2	1.50	5.2	4.2	36	8	16	24	32	5600	Y	Intel® UHD Graphics 770	Y	65	5.6
Intel® Core™ i7-13700K	3.4	2.50	5.3	4.2	30	8	8	16	24	5600	Y	Intel® UHD Graphics 770	Y	125	5.8
Intel® Core™ i7-13700	2.1	1.50	5.1	4.10	30	8	8	16	24	5600	Y	Intel® UHD Graphics 770	Y	65	5.2
Intel® Core™ i5-13600K	3.5	2.60	5.1	3.9	24	6	8	14	20	5600	Y	Intel® UHD Graphics 770	Y	65	5.1
Intel® Core™ i5-13600	2.7	2.00	5.0	3.7	24	6	8	14	20	4800	Y	Intel® UHD Graphics 770	Y	65	5.0
Intel® Core™ i5-13500	2.5	1.80	4.8	3.5	24	6	8	14	20	4800	Y	Intel® UHD Graphics 770	Y	65	4.8
Intel® Core™ i5-13400	2.5	1.80	4.6	3.3	20	6	4	10	16	4800	N	Intel® UHD Graphics 730	N/A	65	4.6
Intel 12th Generation Processors															
Intel® Core™ i9-12900	5	1.8	5.0	3.8	30	8	8	16	24	4800	Y	Intel® UHD Graphics 770	Y	65	5.1
Intel® Core™ i7-12700	2.1	1.6	4.8	3.6	25	8	4	12	20	4800	Y	Intel® UHD Graphics 770	Y	65	4.9
Intel® Core™ i5-12600	3.3	N/A	4.8	N/A	18	6	0	6	12	4800	Y	Intel® UHD Graphics 770	Y	65	4.8
Intel® Core™ i3-12100	3.3	N/A	4.3	N/A	12	4	0	4	8	4800	N	Intel® UHD Graphics 730	N/A	60	4.3

System Technical Specifications

	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. ³ Intel Turbo Boost performance varies depending on hardware, software and overall system configuration. See http://www.intel.com/technology/turboboost for more information. ⁴ 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 ⁵ Memory will run at 4400 speed (MT/s) in 2DPC within 1DIMM population; memory will run at 4000 speed (MT/s) in
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System Technical Specifications

System Configurations							
Example Configuration #1	Processor Info	Core i5-12500,6C 3.0G 65W					
	Memory Info	2 x 8G DDR5 4800 UDIMM NECC					
	Graphics Info	NVIDIA T400 4GB					
	Disks/Optical/Floppy	512GB SSD Z Turbo					
	PSU	350W					
	Other	NA					
Energy Consumption (Watts)		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows long Idle (S0)	17.866		17.912		17.804	
	Windows short Idle (S0)	18.926		19.024		18.883	
	Windows Busy Typ (S0)	160.167		155.973		161.10	
	Windows Busy Max (S0)	192.557		187.067		193.063	
	Sleep (S3)	1.367	1.259	1.401	1.367	1.259	1.401
	Off (S5)	0.555	0.552	0.561	0.555	0.552	0.561
	Zero Power Mode (EuP)	0.171		0.173		0.168	
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)	60.959		61.116		60.747	
	Windows short Idle (S0)	64.576		64.91		64.429	
	Windows Busy Typ (S0)	546.489		532.181		549.707	
	Windows Busy Max (S0)	657.003		638.271		658.732	
	Sleep (S3)	4.664	4.296	4.78	4.664	4.296	4.78
	Off (S5)	1.894	1.883	1.914	1.894	1.883	1.914
	Zero Power Mode (EuP)	0.583		0.59		0.573	
Example Configuration #2	Processor Info	Core i7-12700,12C 2.1G 65W					
	Memory Info	2 x 16G DDR5 4800 UDIMM NECC					
	Graphics Info	NVIDIA T1000 8GB					
	Disks/Optical/Floppy	512GB SSD Z Turbo					
	PSU	450W					
	Other	NA					
		115 VAC		230 VAC		100 VAC	

System Technical Specifications

Energy Consumption (Watts)		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows long Idle (S0)	20.169		20.335		20.087	
	Windows short Idle (S0)	21.222		21.547		21.195	
	Windows Busy Typ (S0)	119.48		117.953		120.406	
	Windows Busy Max (S0)	157.13		155.03		157.833	
	Sleep (S3)	1.575	1.461	1.582	1.575	1.461	1.582
	Off (S5)	0.944	0.941	0.952	0.944	0.941	0.952
	Zero Power Mode (EuP)	0.204		0.207		0.202	

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)	68.817		69.383		68.537	
	Windows short Idle (S0)	72.409		73.518		72.317	
	Windows Busy Typ (S0)	407.666		402.457		410.824	
	Windows Busy Max (S0)	536.128		528.962		538.527	
	Sleep (S3)	5.374	4.985	5.398	5.374	4.985	5.398
	Off (S5)	3.221	3.211	3.248	3.221	3.211	3.248
	Zero Power Mode (EuP)	0.696		0.706		0.689	

Example Configuration #3	Processor Info	Core i9-12900,16C 2.4G 65W					
	Memory Info	2 x 16G DDR5 4800 UDIMM ECC					
	Graphics Info	NVIDIA RTX A2000					
	Disks/Optical/Floppy	512GB SSD Z Turbo					
	PSU	450W					
	Other	NA					

Energy Consumption (Watts)		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows long Idle (S0)	22.555		23.324		22.484	
	Windows short Idle (S0)	23.414		24.656		23.397	
	Windows Busy Typ (S0)	159.883		156.853		161.463	
	Windows Busy Max (S0)	189.99		185.89		190.127	
	Sleep (S3)	1.585	1.492	1.694	1.585	1.492	1.694
	Off (S5)	0.952	0.95	1.083	0.952	0.95	1.083
	Zero Power Mode (EuP)	0.21		0.217		0.198	

System Technical Specifications

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)	76.958		79.581		76.715	
	Windows short Idle (S0)	79.889		84.126		79.831	
	Windows Busy Typ (S0)	545.522		535.184		550.913	
	Windows Busy Max (S0)	648.246		634.257		648.712	
	Sleep (S3)	5.408	5.091	5.78	5.408	5.091	5.78
	Off (S5)	3.248	3.241	3.695	3.248	3.241	3.695
	Zero Power Mode (EuP)	0.717		0.74		0.676	

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

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

System Technical Specifications

Operating Voltage Range	90-269 VAC
Rated Voltage Range	100-240 VAC
Rated Line Frequency	50-60 Hz
Operating Line Frequency Range	47-63 Hz
Rated Input Current	8.2A @ 100-240V
Heat Dissipation	Typical: 1598.101 btu/hr (402.984 kcal/hr) Maximum: 1619.608 btu/hr (408.407 kcal/hr)
ENERGY STAR® certified (Config Dependent)	Yes
CECP Compliant @ 220V	Yes
FEMP Standby Power Compliant	Yes, with Wake-on-LAN disabled: <1W in S4/S5 - - ower 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 - - ower Off)	Yes
ErP Lot 6- Tier 2 Compliance @ 230V (<0.5W in S5 - - ower Off)	Yes

Declared Noise Emissions (Entry-level, Mid-level, and High-end configurations; tested on floor)			
System Configuration (Mid-level)	Processor Info	Intel® CPU Core i9-12900 16C LGA 2.40G 30 MB 65W ECC (Intel - - lder Lake-S)	
	Memory Info	4* 32GB 4800 SK hynix memory	
	Graphics Info	NVIDIA® RTX A5000	
	Disks/Optical	3*2TB Samsung M.2 SSD; 2*WD 2TB 7200RPM SATA HDD	
	Power Supply	Chicony 700W EPA92	
Declared Noise Emissions		Sound Power (LWAd, bels)	Deskside Sound Pressure (LpAm, decibels)

System Technical Specifications

	Idle	3.59	18.5
	Hard drive Operating (Drive Random Seek)	3.82	20.1
	Hard drive Operating (Active mode)	3.97	23.6
System Configuration (High-end)	Processor Info	Intel® Core i9-12900K 16C 3.20G LGA 30 MB 125W ECC (Intel - -lder Lake-S)	
	Memory Info	4* 32GB 4800 SK hynix memory	
	Graphics Info	NVIDIA® RTX A5000	
	Disks/Optical	3*2TB Samsung M.2 SSD; 2*WD 2TB 7200RPM SATA HDD	
	Power Supply	Chicony 700W EPA92	
Declared Noise Emissions		Sound Power (LWAd, bels)	Deskside Sound Pressure (LpAm, decibels)
	Idle	3.58	18.2
	Hard drive Operating (Drive Random Seek)	3.78	20
	Hard drive Operating (Active mode)	4.05	20.9

Environmental Requirements

Temperature

Operating: 5° to 35° C (40° to 95° F)
 Non-operating: -40° to 60° C (-40° to 140° F)
 Maximum rate of change: 10°C/hr

Humidity

Operating: 8% to 85% RH, 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 Cooling for details.

Dynamic

Shock
 Operating: ½-sine: 40g, 2-3ms (~62 cm/sec)
 Non-operating: ½-sine: 160 cm/s, 2-3ms (~105g)
 square: 422 cm/s, 20g

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

System Technical Specifications

Cooling	Above 1524 m (5,000 feet) altitude, the maximum operating temperature is reduced by 1° C (1.8° F) for every 305 m (1,000 feet) increase in elevation, up to 3048 m (10,000 feet)
NOTE:	System enduring or operating beyond the environmental requirement range is not recommended and may compromise system reliability permanently.

System Technical Specifications

Physical Security and Serviceability

Access Panel	Tool-less Includes support information
Optical Drive	Tool-less, except for Screw-In carrier
Hard Drives	Tool-less, except for 2.5" "bay
Expansion Cards	Tool-less
Processor Socket	Tool-less, except for the processor heatsink
Blue User Touch Points	Yes, on tool-less internal chassis mechanisms
Color-coordinated	Yes
Cables and Connectors	
Memory	Tool-less
System Board	Screw-In
Padlock Support	Yes (optional): Locks side cover and secures chassis from theft 0.22-in diameter padlock loop at rear of system
Cable Lock Support	Yes, Kensington Cable Lock (optional): Locks side cover and secures chassis from theft 3 mm x 7 mm slot at rear of system
Universal Chassis	Yes (optional): Locks side cover and locks cables to chassis. Secures chassis from theft and allows
Clamp Lock Support	multiple units to be chained together when used with optional cable Threaded feature at rear of system
Solenoid Lock and Hood	Yes (optional)
Sensor	The Solenoid Hood Lock eliminates the need for a physical key by making the chassis lockable through software and a password. You can also lock and unlock the chassis remotely over the network. The Sensor Kit detects when the access panel has been removed.
Rear Port Control Cover	No
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
Internal Speaker	Yes
Power Supply Fans	70mm x 70mm x 25mm 4-wire PWM (non-serviceable)
Access Panel Key Lock	No
Integrated Chassis	Rear Recessed Handle
Handles	
Power Supply	Requires T15 Torx or flat blade screwdriver
PCI Card Retention	Yes, rear (all), middle (optional), front (full-length cards with extender)

Service, Support, and Warranty

On-site Warranty and Service¹: Three-years, limited warranty and service offering delivers on-site, next business-day² service for parts and labor and includes free telephone support³ 8am - -pm. Global coverage² ensures that any product purchased in one country and transferred to another, non-restricted country will remain fully covered under the original warranty and

System Technical Specifications

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

BIOS 64-bit Services	BIOS supports 64-bit Operating systems only.
PCI 3.0 Support	Full BIOS support for PCI Express through industry standard interfaces.
ATAPI	ATAPI Removable Media Device BIOS Specification Version 1.0.
BBS	BIOS Boot Specification v1.01.(Not support)

System Technical Specifications

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 Boot Spec 1.01+	Provides more control over how and from what devices the workstation will boot.(Not Support)
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 3.4, for system management information.
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 - -CPI 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.

System Technical Specifications

ROM revision levels	Reports the system BIOS revision level in Computer Configuration Utility (F10 Setup). Version is available through an industry standard interface (SMBIOS and WMI) so that management SW applications can use and report this information.
System board revision level	Allows management SW to read revision level of the system board. Revision level is digitally encoded into the HW and cannot be modified.
Start-up Diagnostics (Power-on Self-Test)	Assesses system health at boot time with selectable levels of testing.
Auto Setup when new hardware installed	System automatically detects addition of new hardware.
Keyboard-less Operation	The system can be booted without a keyboard.
Localized ROM Setup	Common BIOS image supports System Configuration Utility (F10 Setup) menus in 15 languages with local keyboard mappings.
Asset Tag	The user or MIS to set a unique tag string in non-volatile memory.
Per-slot Control	Allows I/O slot parameters (option ROM enable/disable, bus latency) 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	2.7B
ACPI	Advanced Configuration and Power Management Interface, Version 6.0
ATA (IDE)	AT Attachment 6 with Packet Interface (ATA/ATAPI-6), Revision 3b
CD Boot	"E" Torito" ootable CD-ROM Format Specification Version 1.0
EDD	Enhanced Disk Drive Specification Version 1.1 BIOS Enhanced Disk Drive Specification Version 3.0(Not support)
EHCI	Enhanced Host Controller Interface for Universal Serial Bus, Revision 1.0
PCI	PCI Local Bus Specification, Revision 2.3 PCI Power Management Specification, Revision 1.1 PCI Firmware Specification, Revision 3.0, Draft .7
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 Ready
PMM	POST Memory Manager Specification, Version 1.01
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 9670). Common Criteria EAL4+ certified. FIPS 140-2 Certification TCG TPM Certified products list: http://www.trustedcomputinggroup.org/certification/tpm-certified-products/

System Technical Specifications

UHCI	Universal Host Controller Interface Design Guide, Revision 1.1
USB	Universal Serial Bus Revision 1.1 Specification Universal Serial Bus Revision 2.0 Specification Universal Serial Bus Revision 3.1 Specification Universal Serial Bus Revision 3.2 Specification
SMBIOS	System Management BIOS Reference Specification, Version 3.4

External BIOS simulator found at: <http://csrmsl.itcs.hp.com/>

Social and Environmental Responsibility

Eco-Label Certifications & Declarations	This product is low halogen except for configurations that include HP Z Turbo Quad Pro PCIe TLC SSD, CRU QX 428 & QX448 removable storage frames, ConnectX-6 DX Amphenol 10 & 25 Gb Transceivers, Broadcom 5720-2P NIC Card, power cords, cables, and peripherals. Service parts obtained after purchase may not be Low Halogen.
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This product has received or is in the process of being certified to the following approvals and may be labeled with one or more of these marks:

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

Sustainable Impact Specifications	• Product Carbon Footprint (hp.com) • Ocean-bound plastic in System FAN, CPU FAN and Speaker • 50% post-consumer recycled plastic • Low halogen PCAs • Outside Box and corrugated cushions are 100% sustainably sourced and recyclable • Molded Paper Pulp Cushion inside box is 100% sustainably sourced and recyclable • 10% ITE-derived closed loop plastic • Bulk packaging available • Contains recycled metal • 80 Plus® Gold power supplies available
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System Configuration	The configuration used for the Energy Consumption and Declared Noise Emissions data for the Notebook model is based on a "Typically Configured Notebook".
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System Technical Specifications

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

	115VAC, 60Hz	230VAC, 50Hz	100VAC, 50Hz
Normal Operation (Sort idle)	34.16 W	34.01 W	34.39 W
Normal Operation (Long idle)	32.77 W	32.74 W	33.15 W
Sleep	2.57 W	2.54 W	2.57 W
Off	0.67 W	0.68 W	0.67 W

Note:

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

Heat Dissipation*

	115VAC, 60Hz	230VAC, 50Hz	100VAC, 50Hz
Normal Operation (Short idle)	116.8 BTU/hr	116.3 BTU/hr	117.6 BTU/hr
Normal Operation (Long idle)	112.1 BTU/hr	112 BTU/hr	113.4 BTU/hr
Sleep	8.8 BTU/hr	8.7 BTU/hr	8.8 BTU/hr
Off	2.3 BTU/hr	2.3 BTU/hr	2.3 BTU/hr

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

Longevity and Upgrading

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

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

Additional Information

- This product is in compliance with the Restrictions of Hazardous Substances (RoHS) directive - 2011/65/EC.
- This HP product is designed to comply with the Waste Electrical and Electronic Equipment (WEEE) Directive - 2002/96/EC.
- This product is in compliance with California Proposition 65 (State of California; Safe Drinking Water and Toxic Enforcement Act of 1986).

System Technical Specifications

- This product is in compliance with the IEEE 1680 (EPEAT) standard at the Gold level, see www.epeat.net
- Plastics parts weighing over 25 grams used in the product are marked per ISO11469 and ISO1043.
- This product is 94.8% recycle-able when properly disposed of at end of life.

Packaging Materials	External:	PAPER/Corrugated	1214 g
		PAPER/Molded Pulp	890 g
	Internal:	PLASTIC/Polyethylene low density - - DPE	40 g

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

The corrugated paper packaging materials contains at least 62.5% 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

System Technical Specifications

- Halogenated Diphenyl Methanes
- Lead carbonates and sulfates
- Lead and Lead compounds
- Mercuric Oxide Batteries
- Nickel – finishes must not be used on the external surface designed to be frequently handled or carried by the user.
- Ozone Depleting Substances
- Polybrominated Biphenyls (PBBs)
- Polybrominated Biphenyl Ethers (PBBEs)
- Polybrominated Biphenyl Oxides (PBBOs)
- Polychlorinated Biphenyl (PCB)
- Polychlorinated Terphenyls (PCT)
- Polyvinyl Chloride (PVC) – except for wires and cables, and certain retail packaging has been voluntarily removed from most applications.
- Radioactive Substances
- Tributyl Tin (TBT), Triphenyl Tin (TPT), Tributyl Tin Oxide (TBTO)

Packaging Usage

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

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

End-of-life Management and Recycling

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

The EU WEEE directive (2002/95/EC) requires manufacturers to provide treatment information for each product type for use by treatment facilities. This information (product disassembly instructions) is posted on the Hewlett Packard web site at: <http://www.hp.com/go/recyclers>. These instructions may be used by recyclers and other WEEE treatment facilities as well as HP OEM customers who integrate and re-sell HP equipment.

System Technical Specifications

HP, Inc. Corporate Environmental Information	For more information about HP's commitment to the environment:
	Global Citizenship Report
	http://www.hp.com/hpinfo/globalcitizenship/gcreport/index.html
	Eco-label certifications
	http://www8.hp.com/us/en/hp-information/environment/ecolabels.html
footnotes	ISO 14001 certificates:
	http://h20195.www2.hp.com/V2/GetDocument.aspx?docname=c04755842
	and
	http://www.hp.com/hpinfo/globalcitizenship/environment/pdf/cert.pdf
	• 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.

Technical Specifications - Hard Drives

SATA Hard Drives for HP Workstations "	500GB SATA 7200 rpm 6Gb/s 3.5" "DD	Capacity	500GB	
		Protocol	SATA	
		Controller	AHCI	
		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	32MB	
		Seek Time (typical reads, includes controller overhead, including settling)	Single Track	2 ms *
			Average	11 ms *
			Full Stroke	21 ms *
		Rotational Speed	7,200 rpm	
		Logical Blocks	976,773,168	
		Operating Temperature	41° to 131° F (5° to 55° C)	

*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.

1TB SATA 7200 rpm 6Gb/s 3.5" "DD "		Capacity	1TB	
		Protocol	SATA	
		Controller	AHCI	
		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 600 MB/s *	
		Buffer	64MB	
		Seek Time (typical reads, includes controller overhead, including settling)	Single Track	2 ms *
			Average	11 ms *
			Full Stroke	21 ms *
		Rotational Speed	7,200 rpm	
		Logical Blocks	1,953,525,168	
		Operating Temperature	41° to 131° F (5° to 55° C)	

Technical Specifications - Hard Drives

*Actual performance may vary.

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

2TB SATA 7200 rpm 6Gb/s 3.5" "DD	Capacity	2TB
	Protocol	SATA
	Controller	AHCI
	Annualized Failure Rate (based on Rated POH)	<0.62%
	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 (6.0 Gb/s), NCQ Enabled
	Synchronous Transfer Rate (Maximum)	Up to 600MB/s *
	Buffer	64MB
	Seek Time (typical reads, includes controller overhead, including settling)	Single Track 2.0 ms * Average 11 ms * Full Stroke 21 ms *
	Rotational Speed	7,200 rpm
	Logical Blocks	3,907,029,168
	Operating Temperature	41° to 131° F (5° to 55° C)

*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.

1TB SATA 7200 rpm 6Gb/s 3.5" "DD (Enterprise Class)	Capacity	1TB
	Height	1 in; 2.54 cm
	Protocol	SATA
	Controller	AHCI
	Reliability	2.0M hours
	Rated Power On Hours	8760/yr
	Annualized Failure Rate (based on Rated POH)	<0.62%
	Width	Media Diameter 3.5 in; 8.9 cm
		Physical Size 4 in; 10.17 cm
	Interface	Serial ATA (6.0 Gb/s), NCQ Enabled
	Synchronous Transfer Rate (Maximum)	Up to 600MB/s *

Technical Specifications - Hard Drives

Buffer	128MB	
Seek Time (typical reads, includes controller overhead, including settling)	Single Track	0.32ms*
	Average	7.45ms*
	Full Stroke	14.2ms*
Rotational Speed	7,200 rpm	
Operating Temperature	41° to 140° F (5° to 60° C)	
Performance	Sequential Read	up to 226MB/s*
	Sequential Write	up to 226MB/s*
Enterprise Class Features	High Reliability	

*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 SATA 7200 rpm 6Gb/s 3.5" "DD (Enterprise Class)	Capacity	2TB	
	Protocol	SATA	
	Controller	AHCI	
	Reliability (MTBF)	2.0M hours	
	Rated Power On Hours	8760/yr	
	Annualized Failure Rate (based on Rated POH)	<0.62%	
	Rated for 24/7/365 Operation		
	Physical Size (Height)	1 in; 2.54 cm	
	Physical Size (Width)	4 in; 10.17 cm	
	Media Diameter	3.5 in; 8.9 cm	
	Interface	Serial ATA (6Gb/s), NCQ enabled	
	Synchronous Transfer Rate (Maximum)	Up to 600MB/s*	
	Buffer	128MB	
	Seek Time (typical reads, includes controller overhead, including settling)	Single Track	0.7ms*
		Average	8.5ms*
		Full Stroke	15.7ms*
	Rotational Speed	7,200 rpm	
	Operating Temperature	41° to 131° F (5° to 55° C)	
	Performance	Sequential Read	up to 226MB/s*
		Sequential Write	up to 226MB/s*

Technical Specifications - Hard Drives

Enterprise Class
Features

High Reliability

*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 SATA 7200 rpm 6Gb/s 3.5" "DD (Enterprise Class)	Capacity	4TB	
	Protocol	SATA	
	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		
	Physical Size (Height)	1 in; 2.54 cm	
	Physical Size (Width)	4 in; 10.17 cm	
	Media Diameter	3.5 in; 8.9 cm	
	Physical Size	4 in; 10.17 cm	
	Interface	Serial ATA (6Gb/s), NCQ enabled	
	Synchronous Transfer Rate (Maximum)	Up to 600MB/s*	
	Buffer	256MB	
	Seek Time (typical reads, includes controller overhead, including settling)	Single Track	0.7ms*
		Average	8.5ms*
		Full Stroke	15.7ms*
	Rotational Speed	7,200 rpm	
	Operating Temperature	41° to 131° F (5° to 55° C)	
	Performance	Sequential Read	up to 226MB/s*
		Sequential Write	up to 226MB/s*
	Enterprise Class Features	High Reliability	

*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	8TB
Protocol	SATA

Technical Specifications - Hard Drives

8TB SATA 7200 rpm 6Gb/s 3.5" "DD (Enterprise Class)	Controller	AHCI	
	Reliability	2.0M hours	
	Width	Media Diameter	3.5 in; 8.9 cm
		Physical Size	4 in; 10.17 cm
	Interface	Serial ATA (6Gb/s), NCQ enabled	
	Synchronous Transfer Rate (Maximum)	Up to 600MB/s*	
	Buffer	256MB	
	Seek Time (typical reads, includes controller overhead, including settling)	Single Track	0.7ms*
		Average	8.5ms*
		Full Stroke	15.7ms*
	Rotational Speed	7,200 rpm	
	Operating Temperature	41° to 140° F (5° to 60° C)	
	Performance	Sequential Read	up to 226MB/s*
		Sequential Write	up to 226MB/s*
	Enterprise Class Features	High Reliability	

*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.

500GB SATA 7.2K SED 2.5" "DD	Capacity	500GB	
	Protocol	SATA	
	Height	0.275 in; 0.7 cm	
	Width	Media Diameter	2.5 in; 6.36 cm
		Physical Size	2.75 in; 6.99 cm
	Interface	Serial ATA (6.0Gb/s), NCQ enabled	
	Synchronous Transfer Rate (Maximum)	Up to 600MB/s*	
	Buffer	64MB	
	Seek Time (typical reads, includes controller overhead, including settling)	Single Track	1ms*
		Average	4.2ms*
		Full Stroke	25ms (Typical)*
	Rotational Speed	7,200 rpm	
	Operating Temperature	32° to 131° F (0° to 60° C)	

Technical Specifications - Hard Drives

Self-Encrypting Drive Support Yes

*Actual performance may vary.

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

HP Z Turbo Drv PCIe-4X4 512GB TLC PCIe SSD (Z2G9)	Capacity	512GB	
	Protocol	PCIe	
	Form Factor	M.2 in native Slot on motherboard	
	Controller	NVMe	
	NAND Type	3D TLC	
	Endurance	150TBW (TB Written)	
	Reliability (MTBF)	1.5M hours	
	Interface	PCI Express 4.0 x4 electrical	
	Operating Temperature	32° to 178° F (0° to 81° C)	
	Performance	Sequential Read	6400MB/s*
		Sequential Write	3400MB/s*
		Random Read	600K IOPS*
		Random Write	600K IOPS*

*Actual performance may vary.

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

HP Z Turbo Drv PCIe-4X4 1TB TLC PCIe SSD (Z2G9)	Capacity	1TB	
	Protocol	PCIe	
	Form Factor	M.2 in native Slot on motherboard	
	Controller	NVMe	
	NAND Type	3D TLC	
	Endurance	300TBW (TB Written)	
	Reliability	1.5M Hours	
	Interface	PCI Express 4.0 x4 electrical	
	Operating Temperature	32° to 178° F (0° to 81° C)	
	Performance	Sequential Read	6500MB/s*
		Sequential Write	5000MB/s*
		Random Read	800K IOPS*
		Random Write	800K IOPS*

Technical Specifications - Hard Drives

*Actual performance may vary.

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

HP Z Turbo Drv PCIe- 4X4 2TB TLC PCIe SSD (Z2G9)	Capacity	2TB
	Protocol	PCIe
	Form Factor	M.2 in native Slot on motherboard
	Controller	NVMe
	NAND Type	3D TLC
	Endurance	500TBW (TB Written)
	Reliability	1.5M Hours
	Interface	PCI Express 4.0 x4 electrical
	Operating Temperature	32° to 178° F (0° to 81° C)
	Performance	
	Sequential Read	6500MB/s*
	Sequential Write	5000MB/s*
	Random Read	800K IOPS*
	Random Write	800K IOPS*

*Actual performance may vary.

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

HP Z Turbo Drv PCIe- 4X4 4TB TLC PCIe SSD	Capacity	4TB
	Protocol	PCIe
	Form Factor	M.2 in native Slot on motherboard
	Controller	NVMe
	NAND Type	3D TLC
	Endurance	600TBW (TB Written)
	Reliability (MTBF)	1.5M Hours
	Interface	PCI Express 4.0 x4 electrical
	Operating Temperature	32° to 178° F (0° to 81° C)
	Performance	
	Sequential Read	6500MB/s*
	Sequential Write	5000MB/s*
	Random Read	700K IOPS*
	Random Write	700K IOPS*

*Actual performance may vary.

Technical Specifications - Hard Drives

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

HP Z Turbo Drv PCIe Gen4x4 4TB TLC PCIe SED OPAL2	Capacity	4TB		
	Protocol	PCIe		
	Form Factor	M.2 in native Slot on motherboard		
	Controller	NVMe		
	NAND Type	3D TLC		
	Endurance	600TBW (TB Written)		
	Interface	PCI Express 4.0 x4 electrical		
	Operating Temperature	32° to 178° F (0° to 81° C)		
	Performance	Sequential Read	6500MB/s*	
		Sequential Write	5000MB/s*	
		Random Read	700K IOPS*	
		Random Write	700K IOPS*	
Self-Encrypting Drive Support	OPAL2			

*Actual performance may vary.

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

HP Z Turbo Drv 512GB TLC PCIe SED OPAL2 (Z2G9)	Capacity	512GB		
	Protocol	PCIe		
	Form Factor	M.2 in native Slot on motherboard		
	Controller	NVMe		
	NAND Type	3D TLC		
	Endurance	150TBW (TB Written)		
	Reliability	1.5M Hours		
	Interface	PCI Express 4.0 x4 electrical		
	Operating Temperature	32° to 178° F (0° to 81° C)		
	Performance	Sequential Read	6400MB/s*	
		Sequential Write	3400MB/s*	
		Random Read	600K IOPS*	
		Random Write	600K IOPS*	
Self-Encrypting Drive Support	OPAL2			

Technical Specifications - Hard Drives

*Actual performance may vary.

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

HP Z Turbo Drv 1TB TLC PCIe SED OPAL2 (Z2G9)	Capacity	1TB	
	Protocol	PCIe	
	Form Factor	M.2 in native Slot on motherboard	
	Controller	NVMe	
	NAND Type	3D TLC	
	Endurance	300TBW (TB Written)	
	Reliability	1.5M Hours	
	Interface	PCI Express 4.0 x4 electrical	
	Operating Temperature	32° to 178° F (0° to 81° C)	
	Performance	Sequential Read	6500MB/s*
		Sequential Write	5000MB/s*
		Random Read	800K IOPS*
		Random Write	800K IOPS*
	Self-Encrypting Drive Support	OPAL2	

*Actual performance may vary.

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

HP Z Turbo Drv 2TB TLC PCIe SED OPAL2 (Z2G9)	Capacity	2TB	
	Protocol	PCIe	
	Form Factor	M.2 in native Slot on motherboard	
	Controller	NVMe	
	NAND Type	3D TLC	
	Endurance	500TBW (TB Written)	
	Reliability	1.5M Hours	
	Interface	PCI Express 4.0 x4 electrical	
	Operating Temperature	32° to 178° F (0° to 81° C)	
	Performance	Sequential Read	6500MB/s*
		Sequential Write	5000MB/s*
		Random Read	800K IOPS*
		Random Write	800K IOPS*

Technical Specifications - Hard Drives

Self-Encrypting Drive OPAL2
Support

*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.

256GB 2280 PCIe-4x4 Value M.2 SSD	Capacity	256GB	
	Protocol	PCIe	
	Form Factor	M.2 in native Slot on motherboard	
	Controller	NVMe	
	NAND Type	3D TLC	
	Endurance	150TBW (TB Written)	
	Reliability	1.5M Hours	
	Interface	PCI Express 4.0 x4 electrical	
	Operating Temperature	32° to 158° F (0° to 70° C)	
	Performance	Sequential Read	3100MB/s*
		Sequential Write	1400MB/s*
		Random Read	200K IOPS*
		Random Write	400K 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.

512GB 2280 PCIe-4x4 Value M.2 SSD	Capacity	512GB	
	Protocol	PCIe	
	Form Factor	M.2 in native Slot on motherboard	
	Controller	NVMe	
	NAND Type	3D TLC	
	Endurance	150 TBW (TB Written)	
	Reliability	1.5M Hours	
	Interface	PCI Express 4.0 x4 electrical	
	Operating Temperature	32° to 158° F (0° to 70° C)	
	Performance	Sequential Read	3400MB/s*
		Sequential Write	2500MB/s*
		Random Read	380K IOPS*
		Random Write	430K IOPS*

Technical Specifications - Hard Drives

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

1TB 2280 PCIe-4x4 Value M.2 SSD	Capacity	1TB	
	Protocol	PCIe	
	Form Factor	M.2 in native Slot on motherboard	
	Controller	NVMe	
	NAND Type	3D TLC	
	Endurance	400TBW (TB Written)	
	Reliability	1.5M Hours	
	Interface	PCI Express 4.0 x4 electrical	
	Operating Temperature	32° to 158° F (0° to 70° C)	
	Performance	Sequential Read	3400MB/s*
		Sequential Write	2500MB/s*
		Random Read	500K IOPS*
		Random Write	440K 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.

Technical Specifications - Graphics

AMD Radeon™ Pro W6600 8GB Graphics	Form Factor	Single slot, full-height, 9.5" length
	Graphics Controller	Navi23 architecture Power: 122 Watts Cooling Solution: Active Fan Heatsink
	Bus Type	PCI Express 4.0 x8
	Memory	8GB GDDR6 Memory Memory Bandwidth: 224 GB/s Memory Interface: 128 bit
	Connectors	4x DisplayPort™ 1.4 with DSC - HDR Ready - Supports Multi-Stream Transport (MST)
	Max simultaneous displays	@ 60Hz with HDR Enabled 4x @ 3840x2160px (4K) 4x @ 5120x2880px (5K) 1x @ 7680x4320px (8K)
	Shading Architecture	DirectX 12 Shader Model 6.5
	Supported Graphics APIs	DirectX® 12 Ultimate OpenGL® 4.6 OpenCL™ 2.1 Vulkan™ 1.2
	Available Graphics Drivers	Windows 10 64-bit Windows 11 64-bit Linux® 64-bit (selected Enterprise distributions)
		HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html

AMD Radeon™ Pro W6800 32GB Graphics	Form Factor	Double slot, full-height, 10.5" length
	Graphics Controller	Navi21 architecture Power: 261 Watts Cooling Solution: Active Fan Heatsink
	Bus Type	PCI Express 4.0 x16
	Memory	8GB GDDR6 Memory Memory Bandwidth: 512 GB/s Memory Interface: 256 bit

Technical Specifications - Graphics

NVIDIA® T400 4GB Graphics	Connectors	6x Mini-DisplayPort™ 1.4 with DSC - HDR Ready - Supports Multi-Stream Transport (MST)
	Max simultaneous displays	@ 60Hz with HDR Enabled 6x @ 3840x2160px (4K) 6x @ 5120x2880px (5K) 2x @ 7680x4320px (8K)
	Shading Architecture	DirectX 12 Shader Model 6.5
	Supported Graphics APIs	DirectX® 12 Ultimate OpenGL® 4.6 OpenCL™ 2.1 Vulkan™ 1.2
	Form Factor	Single Slot, Low Profile (2.7" H x 6.1" L)
	Graphics Controller	Turing architecture Max Power: 30 Watts Cooling Solution: Active fan heatsink
	Bus Type	PCI Express 3.0 x16
	Memory	4GB GDDR6 Memory Memory Bandwidth: 80 GB/s Memory Interface: 64 bit
	Connectors	3x mDP (Mini DisplayPort™) 1.4 Connectors
	Max simultaneous displays	- 3x 3840 x 2160 @ 120Hz - 3x 5120 x 2880 @ 60Hz - supports Multi-Stream Transport (MST)
	Shading Architecture	DirectX 12 Shader Model 5.1
	Supported Graphics APIs	OpenGL 4.6 DirectX 12 Vulkan 1.2 API support includes: CUDA, OpenCL 1.2
	Available Graphics Drivers	Windows 10 64-bit Windows 11 64-bit Linux® 64-bit (selected Enterprise distributions)
		HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html

Technical Specifications - Graphics

NVIDIA® T600 4GB Graphics*	Form Factor	Single Slot, Low Profile (2.7" H x 6.1" L)
	Graphics Controller	Turing architecture Max Power: 40 Watts Cooling Solution: Active fan heatsink
	Bus Type	PCI Express 3.0 x16
	Memory	4GB GDDR6 Memory Memory Bandwidth: 160 GB/s Memory Interface: 128 bit
	Connectors	4x mDP (Mini DisplayPort™) 1.4 Connectors
	Max simultaneous displays	- 4x 3840 x 2160 @ 120Hz - 4x 5120 x 2880 @ 60Hz - 2x 7680 x 4320 @ 60Hz - supports Multi-Stream Transport (MST)
	Shading Architecture	DirectX 12 Shader Model 5.1
	Supported Graphics APIs	OpenGL 4.6 DirectX 12 Vulkan 1.2 API support includes: CUDA, OpenCL 1.2
	Available Graphics Drivers	Windows 10 64-bit Windows 11 64-bit Linux® 64-bit (selected Enterprise distributions)
		HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html

*May go End of Life in late 2022

AMD® Radeon™ RX 6400 4GB Graphics	Form Factor	Single slot, Low Profile (2.8" H x 6.3" L) Weight: 155g
	Graphics Controller	Radeon™ RX 6400 Max Power: 53W Cooling Solution: Active axial fan Architecture: RDNA™ 2
	Bus Type	PCI Express x4 Gen4
	Memory	Size: 4GB GDDR6 Interface: 64-bit Bandwidth: up to 128 GB/s

Technical Specifications - Graphics

Connectors	DP (DisplayPort™) 1.4 + HDMI 2.1
Max simultaneous displays	- up to 4x 5120 x 2880 x 24 bpp @ 60Hz
Shading Architecture	Microsoft DirectX 12 Shader Model 5.1
Supported Graphics APIs	OpenGL® 4.6 DirectX® 12 Ultimate Vulkan™ 1.1 API support includes: OpenCL™ 2.2
Available Graphics Drivers	Microsoft Windows 10 64-bit, Windows 11 64-bit HP qualified drivers may be preloaded or the latest prosumer graphics drivers are available from the AMD.com
Notes	This is a Prosumer or Consumer graphics card, and not a Professional graphics card. As such, it does not have formal professional application validation, but is intended per AMD to function properly for game development, real-time engine, and many prosumer application workloads. Customers using Prosumer or Consumer graphic cards with axial fan cooling solutions are likely to experience higher acoustics in comparison with Professional graphic cards that use blower fan cooling.

NVIDIA® T1000 4GB Graphics	Form Factor	Single Slot, Low Profile (2.7" H x 6.1" L)
	Graphics Controller	Turing architecture Max Power: 50 Watts Cooling Solution: Active fan heatsink
	Bus Type	PCI Express 3.0 x16
	Memory	4GB GDDR6 Memory Memory Bandwidth: 160 GB/s Memory Interface: 128 bit
	Connectors	4x mDP (Mini DisplayPort™) 1.4 Connectors
	Max simultaneous displays	- 4x 3840 x 2160 @ 120Hz - 4x 5120 x 2880 @ 60Hz - 2x 7680 x 4320 @ 60Hz - supports Multi-Stream Transport (MST)
	Shading Architecture	DirectX 12 Shader Model 5.1
	Supported Graphics APIs	OpenGL 4.6 DirectX 12 Vulkan 1.2

Technical Specifications - Graphics

Available Graphics Drivers	API support includes: CUDA, OpenCL 1.2
	Windows 10 64-bit Windows 11 64-bit Linux® 64-bit (selected Enterprise distributions)

HP qualified drivers may be preloaded or available from the HP support Web site:

<http://welcome.hp.com/country/us/en/support.html>

NVIDIA® T1000 8GB Graphics	Form Factor	Single Slot, Low Profile (2.7" H x 6.1" L)
	Graphics Controller	Turing architecture Max Power: 50 Watts Cooling Solution: Active fan heatsink
	Bus Type	PCI Express 3.0 x16
	Memory	8GB GDDR6 Memory Memory Bandwidth: 160 GB/s Memory Interface: 128 bit
	Connectors	4x mDP (Mini DisplayPort™) 1.4 Connectors
	Max simultaneous displays	- 4x 3840 x 2160 @ 120Hz - 4x 5120 x 2880 @ 60Hz - 2x 7680 x 4320 @ 60Hz - supports Multi-Stream Transport (MST)
	Shading Architecture	DirectX 12 Shader Model 5.1
	Supported Graphics APIs	OpenGL 4.6 DirectX 12 Vulkan 1.2 API support includes: CUDA, OpenCL 1.2
	Available Graphics Drivers	Windows 10 64-bit Windows 11 64-bit Linux® 64-bit (selected Enterprise distributions)

HP qualified drivers may be preloaded or available from the HP support Web site:

<http://welcome.hp.com/country/us/en/support.html>

NVIDIA® RTX 2000 Ada	Form Factor	Half Height Dual Slot (2.7" Height x 6.7" Length)
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Technical Specifications - Graphics

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 Drivers	Windows 10 Windows 11

NVIDIA® RTX™ A2000 12GB Graphics

Form Factor	Low-Profile Double Slot (2.7" H x 6.1" L)
Graphics Controller	Ampere architecture Power: 70 Watts Cooling: Active Fan Heatsink
Bus Type	PCI Express 4.0 x16
Memory	12GB GDDR6 memory Memory Bandwidth: 288 GB/s Memory Interface: 192 bit Support Error-correcting code (ECC)
Connectors	4x mDP (Mini DisplayPort™) 1.4 Connectors
Max simultaneous displays	4x 4096 x 2160 @ 120 Hz, 4x 5120 x 2880 @ 60 Hz 2x 7680 x 4320 @ 60 Hz
Shading Architecture	Shader Model 6.6
Supported Graphics APIs	OpenGL 4.6 DirectX 12 Ultimate Vulkan 1.3 API support includes: CUDA, OpenCL 1.2
Available Graphics Drivers	Windows 10 64-bit Windows 11 64-bit Linux® 64-bit (selected Enterprise distributions)

HP qualified drivers may be preloaded or available from the HP support Web site:

<http://welcome.hp.com/country/us/en/support.html>

Technical Specifications - Graphics

NVIDIA® RTX 4000 Ada	Form Factor	Full-Height Single Slot (4.4" Height x 11.5" Length)
	Max Power Consumption	130W
	GPU Memory	20GB GDDR6 Memory Bandwidth: 360 GB/s Memory Width: 160-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 Express 4.0 x16
	Available Drivers	Windows 10 Windows 11

NVIDIA® RTX™ A4000 16GB Graphics	Form Factor	Full Height Single Slot (9.5" Length)
	Graphics Controller	Ampere architecture Power: 140 Watts Cooling: Active Fan Heatsink
	Bus Type	PCI Express 4.0 x16
	Memory	16GB GDDR6 memory Memory Bandwidth: 448 GB/s Memory Interface: 256 bit Support Error-correcting code (ECC)
	Connectors	4x DP 1.4 Connectors
	Max simultaneous displays	4x 4096 x 2160 @ 120 Hz, 4x 5120 x 2880 @ 60 Hz, 2x 7680 x 4320 @ 60 Hz
	Shading Architecture	Shader Model 6.5
	Supported Graphics APIs	OpenGL 4.6 DirectX 12 Vulkan 1.2 API support includes: CUDA, OpenCL 1.2
	Available Graphics Drivers	Windows 10 64-bit Windows 11 64-bit Linux® 64-bit (selected Enterprise distributions)

Technical Specifications - Graphics

HP qualified drivers may be preloaded or available from the HP support Web site:

<http://welcome.hp.com/country/us/en/support.html>

NVIDIA® RTX™ A4500 20GB Graphics	Form Factor	Full Height Double Slot (10.5" Length)
	Graphics Controller	Ampere architecture Power: 200 Watts Cooling: Active Fan Heatsink
	Bus Type	PCI Express 4.0 x16
	Memory	20GB GDDR6 memory Memory Bandwidth: 640 GB/s Memory Interface: 320 bit Support Error-correcting code (ECC)
	Connectors	4x DP 1.4 Connectors
	Max simultaneous displays	4x 4096 x 2160 @ 120 Hz, 4x 5120 x 2880 @ 60 Hz, 2x 7680 x 4320 @ 60 Hz
	Shading Architecture	Shader Model 6.5
	Supported Graphics APIs	OpenGL 4.6 DirectX 12 Vulkan 1.2 API support includes: CUDA, OpenCL 1.2
	Available Graphics Drivers	Windows 10 64-bit Windows 11 64-bit Linux® 64-bit (selected Enterprise distributions)

HP qualified drivers may be preloaded or available from the HP support Web site:

<http://welcome.hp.com/country/us/en/support.html>

NVIDIA® RTX™ A5000 24GB Graphics	Form Factor	Full Height Double Slot (10.5" Length)
	Graphics Controller	Ampere architecture Power: 230 Watts Cooling: Active Fan Heatsink
	Bus Type	PCI Express 4.0 x16

Technical Specifications - Graphics

Memory	24GB GDDR6 memory Memory Bandwidth: 768 GB/s Memory Interface: 384 bit Support Error-correcting code (ECC)
Connectors	4x DP 1.4 Connectors
Max simultaneous displays	4x 4096 x 2160 @ 120 Hz, 4x 5120 x 2880 @ 60 Hz, 2x 7680 x 4320 @ 60 Hz
Shading Architecture	Shader Model 6.5
Supported Graphics APIs	OpenGL 4.6 DirectX 12 Vulkan 1.2 API support includes: CUDA, OpenCL 1.2
Available Graphics Drivers	Windows 10 64-bit Windows 11 64-bit Linux® 64-bit (selected Enterprise distributions)
HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html	

AMD® Radeon™ Pro W7600 8GB	Form Factor	Full-Height Single Slot (4.38" "eight x 9.5" "ength)
	Max Power Consumption	130W
	GPU Memory	8GB GDDR6 Memory Bandwidth: 288 GB/s Memory Width: 128-bit
	Connectors	4x DP 2.1 Requires : 1x 6-pin PCIe Aux Power
	Maximum Resolution	4x @ 3840x2160 (4K) 4x @ 5120x2880 (5K) 2x @ 7680x4320 (8K)
	Bus Type	PCI Express 4.0 x8
MD® Radeon™	Available Graphics Drivers	Windows 10 Windows 11
	Form Factor	Full-Height Single Slot (4.38" "eight x 8.5" "ength)

Technical Specifications - Graphics

AMD Radeon™ RX 6700 XT	Pro W7500 8GB	Max Power	70W
		Consumption	
		GPU Memory	8 GB GDDR6 Memory Bandwidth: 173 GB/s Memory Width: 128-bit
		Connectors	4x DP 2.1
		Maximum Resolution	4x @ 3840x2160 (4K) 4x @ 5120x2880 (5K) 2x @ 7680x4320 (8K)
		Bus Type	PCI Express 4.0 x8
		Available Graphics Drivers	Windows 10 Windows 11
		Form Factor	Dual slot, Full Length (254mm L x 38mm W x 108.65mm H)
		Graphics Controller	AMD Radeon™ RX 6700 XT Graphics GPU: 2560 Navi2 Stream Processors Memory: 12GB GDDR6 Power: 230 Watts, Standard graphics 8pin + 6pin auxiliary power Cooling: Active, Dual Axial fan
		Bus Type	PCI Express 4.0 x16
		Connectors	3DP 1.4 + HDMI 2.1 Outputs
		Maximum Resolution	DisplayPort™ 1.4 with DSC: - up to 4x 5210 x 3200 x 24 bpp @ 60Hz, uncompressed - up to 7680 x 4320, compressed Display Outputs 3 DP + 1 HMDI
		Shading Architecture	Microsoft DirectX 12 Shader Model 6.1
		Supported Graphics APIs	OpenGL 4.6 DirectX 12 Feature Level 12_1 Vulkan 1.1 OpenCL 2.2
		Available Graphics Drivers	Windows 11 Linux® 64-bit (selected distributions) Typically, latest drivers will be available from amd.com

Notes: This is a Prosumer or Consumer graphics card, and not a Professional graphics card. As such, it does not have formal professional application validation, but is intended per AMD to function properly for game development, real-time engine, and many prosumer application workloads. Customers using Prosumer or Consumer graphic cards are likely to experience higher acoustics in comparison with Professional graphic cards. The higher acoustics observed with non-professional graphics is expected, as HP Workstations' designs do not have control in this area.

Technical Specifications - Graphics

HP 9.5mm Slim DVD Writer	Description	9.5mm height, tray-load	
	Mounting Orientation	Either horizontal or vertical	
	Interface Type	SATA/ATAPI	
	Dimensions (WxHxD)	128 x 9.5 x 127mm	
	Supported Media Types	DVD+R	
		DVD+RW	
		DVD+R DL	
		DVD-R DL	
		DVD-R	
		DVD-RW	
		CD-R	
		CD-RW	
	Disc Capacity	DVD-ROM	8.5 GB DL or 4.7 GB standard
	Access Times	Full Stroke DVD	< 200 ms (seek)
		Full Stroke CD	< 200 ms (seek)
	Maximum Data Transfer Rates	CD ROM Read	CD-ROM, CD-R Up to 24X CD-RW Up to 24X
		DVD ROM Read	DVD+RW Up to 8X DVD-RW Up to 8X DVD+R DL Up to 8X DVD-R DL Up to 8X DVD-ROM Up to 8X DVD-ROM DL Up to 8X DVD+R Up to 8X DVD-R Up to 8X
Power	Source	SATA DC power receptacle	
	DC Power Requirements	5 VDC ± 5%-100 mV ripple p-p	
	DC Current	5 VDC -< 800 mA typical, <1600 mA maximum	
Operating Environmental (all conditions non-condensing)	Temperature	41° to 122° F (5° to 50° C)	
	Relative Humidity	10% to 80%	
	Maximum Wet Bulb Temperature	84° F (29° C)	
	Operating Systems Supported	Windows 11, Windows 10, Windows 7 Professional 64-bit, Windows Vista Business 64*, Windows 2000. Linux®.	

Technical Specifications - Graphics

Kit Contents	HP SATA DVD Writer drive, installation guide.
Approvals	USB-IF, WHQL, Compliant with USB Mass Storage Class Bulk only Transport Specification Rev. 1.0, Compliant Intel Front Panel I/O Connectivity Design Guide V. 1.3, FCC, CE, BSMI, C-Tick, VCCI, MIC, cUL, TUVT

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

HP 9.5mm Slim DVD-ROM Drive	Description	9.5mm height, tray-load	
	Mounting Orientation	Either horizontal or vertical	
	Interface Type	SATA / ATAPI	
	Dimensions (WxHxD)	128 x 9.5 x 127mm	
	Disc Capacity	DVD-ROM	Single layer: Up to 4.7 GB Double layer: Up to 8.5 GB
	Access Times	DVD-ROM Single Layer	< 110 ms (typical)
		CD-ROM Mode 1	< 110 ms (typical)
		Full Stroke DVD	< 230 ms (typical)
		Full Stroke CD	< 220 ms (typical)
	Power	Source	SATA DC power receptacle
	Operating Environmental (all conditions non-condensing)	DC Power Requirements	5 VDC $\pm$ 5%-100 mV ripple p-p
		DC Current	5 VDC - <800mA typical, < 1600 mA maximum
		Temperature	41° to 122° F (5° to 50° C)
		Relative Humidity	10% to 80%
		Maximum Wet Bulb Temperature	84° F (29° C)
	Operating Systems Supported	Windows 11, Windows 10, Windows 7 Professional 64-bit,	
		Windows Vista Business 64*, Windows 2000. Linux®.	
	Kit Contents	9.5mm Slim DVD-ROM Drive, slim SATA data/power cable, installation guide	

Technical Specifications - Graphics

Approvals

USB-IF, WHQL, Compliant with USB Mass Storage Class Bulk only Transport Specification Rev. 1.0,
Compliant Intel Front Panel I/O Connectivity Design Guide V. 1.3, FCC, CE, BSMI, C-Tick, VCCI, MIC, cUL, TUVT

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

HP SD Media Card Reader

Description

USB3.0-SD4.0

NOTE: actual throughput is USB2.0.

Interface Type

- Support USB 2.0 LPM function
- Support USB 3.0 U1/U2/U3 Power saving mode
- Support USB 3.0 LTM function.

Dimensions (WxHxD)

Dedicated slot in front bezel (orderable option)

Supported Media Types

- i. Secure Digital Card (SD)
- ii. Secure Digital Support up to 2TB
- iii. Secure Digital HC (SDHC)
- iv. Secure Digital XC (SDXC)
- v. Support SD UHS50 mode
- vi. miniSD *1
- vii. miniSDHC*1
- viii. MicroSD*1
- ix. MicroSDHC*1
- x. MicroSDXC*1

Note: “*1” means Adapter Needed

Operating Systems Supported

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

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 10 is automatically updated, which is always enabled. ISP fees may apply and additional requirements may apply over time for updates. See <http://www.microsoft.com>.

Technical Specifications - Graphics

See <http://www.microsoft.com/windows/windows-7/> for details.

Technical Specifications - 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	10/100/1000 Mbps
	Compliance	802.1as/1588, 802.1p, 802.1Q, 802.3, 802.3ab, 802.3az, 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 Requirement	Requires 3.3V (integrated regulators for core Vdc)
	Boot ROM Support	Yes
	Network Transfer Mode	Full-duplex; Half-duplex
	Network Transfer Rate	10BASE-T (half-duplex) 10 Mbps 10BASE-T (full-duplex) 20 Mbps 100BASE-TX (half-duplex) 100 Mbps 100BASE-TX (full-duplex) 200 Mbps 1000BASE-T (full-duplex) 2000 Mbps
	Management Capabilities	vPro®, WOL, auto MDI crossover, PXE, Multi-port teaming, RSS, ACPI, Advanced cable diagnostic, loopback modes, AMT 16.0 support, Circuit Breaker, VLAN, Multicast Listener Discovery (MLD)

¹Requires 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-management-technology.html>

HP 1-Port 1GbE Flex IO NIC	Connector	RJ-45
	Cabling	1GbE over Category 5e (or better) up to 100m
	Controller	Realtek RTL8153
	Data Rates Supported	10/100/1000 Mbps
	Compliance	802.3 (LAN) 802.3u (100BASE-TX) 802.3ab (1000BASE-T) 802.3x (Ethernet Flow Control)

Technical Specifications - Networking and Communications

	802.1Q (Virtual LAN)
	802.3az (Energy Efficient Ethernet)
Bus Architecture	USB
Power Requirement	Requires 3.3V (integrated regulators for core Vdc)
Boot ROM Support	Yes
Network Transfer Mode	Full-duplex; Half-duplex
Network Transfer Rate	10BASE-T (half-duplex) 10 Mbps 10BASE-T (full-duplex) 20 Mbps 100BASE-TX (half-duplex) 100 Mbps 100BASE-TX (full-duplex) 200 Mbps 1000BASE-T (full-duplex) 2000 Mbps
Operating Temperature	32° to 131° F (0° to 55° C)
Dimensions (HxW)	1.5 in x 1.5 in. x 0.75 in (3.81 cm x 3.81 cm x 1.9 cm)
Operating System	Windows 11 64-bit
Driver Support	Windows 10 64-bit Linux®

Intel® X550-T2 2-Port 10GbE NIC	Connector	Dual-port RJ-45
	Cabling	10GbE: Cat6a (or better) up to 100m 5GbE and below: Cat5e (or better) up to 100m
	Controller	Intel® Ethernet Controller X550
	Network Transfer Rates Supported	10GbE, 5GbE, 2.5GbE, 1GbE, 100MbE
	Data Path Width	PCIe Gen3x4
	Power Requirement	11.2W (typical) 13.0 (Maximum)
	Operating Temperature	32° to 131° F (0° to 55° C)
	Dimensions (HxW)	5.1 x 2.7 in (without brackets)
	Operating System	Windows 11 64-Bit
	Driver Support	Windows 10 64-bit Linux®
	Kit Contents	• Intel® X550-T2 2-Port 10GbE NIC with standard height bracket attached • Low-profile bracket • Product Literature

Connector	Dual-port SFP28
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Technical Specifications - Networking and Communications

NVIDIA Mellanox ConnectX-6 DX Dual Port 10/25GbE SFP28 NIC	Cabling	Transceiver with Multi-Mode Fiber OM3 or OM4)
	Controller	ConnectX-6 Dx
	Network Transfer Rates Supported	1/10/25 GbE
	Data Path Width	PCIe Gen4x8
	Power Requirement	19.74W Maximum power available through SFP28 port: 2.5W (each port)
	Operating Temperature	32° to 131° F (0° to 55° C)
	Dimensions (HxW)	6.22in. x 2.67in (158mm x 68mm)
	Operating System Driver	Windows 11 64-Bit Windows 10 64-bit Linux®
	Kit Contents	• NVIDIA Mellanox ConnectX-6 SFP28 25GbE NIC with standard height bracket attached • Low-profile bracket • Product Literature

NOTE: The NVIDIA Mellanox ConnectX-6 DX network adapter requires either a PCIeG4 x4 or PCIeG4 x8 slot (electrical connection) to have full performance with two 25GbE SFP28 transceivers installed in the network adapter. When the network adapter is installed in a PCIeG3 x4 slot, the performance will be limited when installing two 25GbE SFP28 transceivers or installing a 25GbE SFP28 transceiver plus a 10GbE SFP+ transceiver

Intel® I350-T4 4-Port 1GbE NIC	Connector	4 RJ-45
	Cabling	Cat5e (or better) up to 100m
	Controller	Intel® Ethernet I350 Controller
	Network Transfer Rates Supported	1GbE, 100MbE, 10MbE
	Data Path Width	PCIe Gen2.1x4
	Power Requirement	5W (typical)
	Operating Temperature	32° to 131° F (0° to 55° C)
	Dimensions (HxW)	2.75 x 5.5 inches (without brackets)
	Operating System Driver Support	Windows 11 Windows 10 Linux®

Technical Specifications - Networking and Communications

Kit Contents

- Intel® I350-T4 4-Port 1GbE NIC with standard height bracket attached
- Low-profile bracket
- Product Literature

HP Flex 1GbE Fiber LC Single Port

Connector	Fiber
Cabling	1GbE over Category OM1 (or better) up to 100m
Controller	Microchip LAN7801
Data Rates Supported	100/1000 Mbps
Compliance	IEEE 802.1p priority encoding/tagging (QoS, CoS) IEEE 802.1q VLAN tagging IEEE 802.3x flow control
Bus Architecture	USB
Power Requirement	Requires 3.3V (integrated regulators for core Vdc)
Boot ROM Support	Yes
Network Transfer Mode	Full-duplex; Half-duplex
Network Transfer Rate	100BASE-X (half-duplex) 100 Mbps 1000BASE-X (half-duplex) 1000 Mbps 1000BASE-X (full-duplex) 2000 Mbps
Operating Temperature	32° to 158° F (0°C to 70°C)
calvin	1.5 in x 1.7 in. x 0.75 in (3.84 cm x 4.3 cm x 1.9 cm)
Operating System Driver Support	Windows 11 64-Bit Windows 10 64-bit Linux®

Intel® I225-T1 1-Port 2.5GbE NIC

Connector	RJ-45
Cabling	Cat5e (or better) up to 85m
Controller	Intel® Ethernet I225 Controller
Network Transfer Rates Supported	2.5GbE, 1GbE, 100MbE, 10MbE
Data Path Width	PCIe Gen3.1x1
Power Requirement	1.9W (typical)
Operating Temperature	32° to 158° F (0°C to 70°C)
Dimensions (HxW)	2.7 in x 2.57 in. (68.7mm x 65.3mm)

Technical Specifications - Networking and Communications

Operating System	Windows 11 64-Bit
Driver	Windows 10 64-bit Linux®
Kit Contents	• Intel® I225-T1 1-Port 2.5GbE NIC with standard height bracket attached • Low-profile bracket • Product Literature

Intel® Wi-Fi 6E* AX211 802.11ax, BT 5.3, M.2 With Internal Antenna	WLAN Standards	802.11abgn+acR2+axR2(Pre-Standard) MIMO 2x2 High performance, low power dual band Pre-Standard-802.11ax R2 2x2, both with 160MHz channel support - Wi-Fi 6E
	Antenna	2x2 Dual-Band (internal)
	Bluetooth Standards	5.2
	Operating Temperature	32° to 176° F (0° to 80° C)
	Interface	M.2 CNVio2
	Dimensions	M.2 2230
	Kit Contents	Not Available

NOTE: The AX211 with internal antenna only support WIFI 6

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

Intel® Wi-Fi 6E* AX211 802.11ax, BT 5.3, M.2 With External Antenna	WLAN Standards	802.11abgn+acR2+axR2(Pre-Standard) MIMO 2x2 High performance, low power dual band Pre-Standard-802.11ax R2 2x2, both with 160MHz channel support - Wi-Fi 6E
	Antenna	2x2 Dual-Band (External)
	Bluetooth Standards	5.2
	Operating Temperature	32° to 176° F (0° to 80° C)
	Interface	M.2 CNVio2
	Dimensions	M.2 2230
	Kit Contents	ANTENNA, External, Dipole, WLAN, WIFI 6E

NOTE: The AX211 with external antenna support WIFI 6E

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

Technical Specifications - Networking and Communications

Intel® Wi-Fi 7 BE200	WLAN Standards	802.11abgn+acR2+axR2+be+dehikrv
	Antenna	2x2 Dual-Band (External)
	Bluetooth Standards	5.4
	Operating Temperature	32° to 176° F (0° to 80° C)
	Interface	M.2: PCIe, USB
	Dimensions	M.2 2230
	Kit Contents	ANTENNA, External, Dipole, WLAN, WIFI 7
	NOTE: Not available with 12th Gen Intel ADL processors; Wireless access point and Internet service required and sold separately. Availability of public wireless access points limited. Wi-Fi 7 (802.11BE) functionality requires Windows 11 24H2, select Intel® processor, and a Wi-Fi 7 router, sold separately. Wi-Fi 7 is backwards compatible with prior 802.11 specs. Available in countries where Wi-Fi 7 is supported.	

Intel® Wi-Fi 7 BE200 802.11be, BT 5.4, M.2 With Internal Antenna	WLAN Standards	802.11 a/b/g/n/ac/axR2/be MIMO 2x2 High performance, low power dual band 802.11be 2x2, Both 320MHz/160MHz Channel support - Wi-Fi 6E/7
	Antenna	2x2 Dual-Band (internal)
	Bluetooth Standards	5.4
	Operating Temperature	32° to 176° F (0° to 80° C)
	Interface	M.2: PCIe
	Dimensions	M.2 2230
	Kit Contents	Not Available
	NOTE: Not available with 12th/13th Gen Intel ADL/RPL processors The BE200 with internal antenna only supports Wi-Fi 6	

Intel® Wi-Fi 7 BE200 802.11be, BT 5.4, M.2 With External Antenna	WLAN Standards	802.11 a/b/g/n/ac/axR2/be MIMO 2x2 High performance, low power dual band 802.11be 2x2, Both 320MHz/160MHz Channel support - Wi-Fi 6E/7
	Antenna	2x2 Dual-Band (External)
	Bluetooth Standards	5.4
	Operating Temperature	32° to 176° F (0° to 80° C)
	Interface	M.2: PCIe
	Dimensions	M.2 2230

Technical Specifications - Networking and Communications

Kit Contents

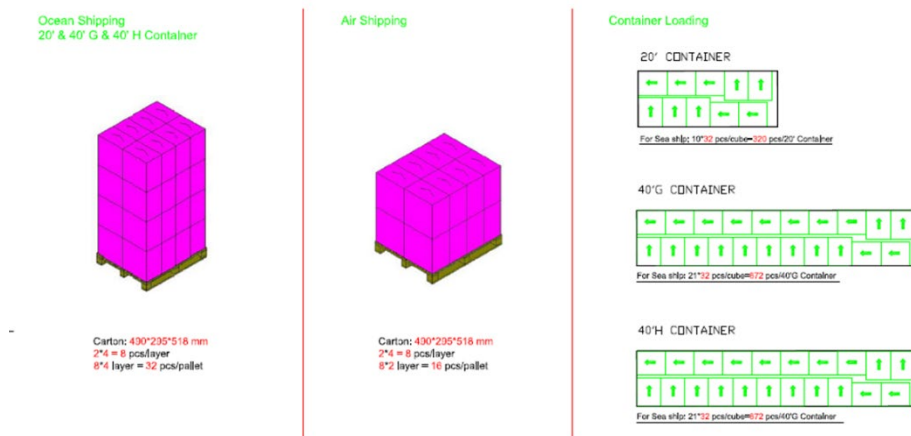
ANTENNA, External, Dipole, WLAN, Wi-Fi 7

NOTE: Not available with 12th/13th Gen Intel ADL/RPL processors; Wireless access point and Internet service required and sold separately. Availability of public wireless access points limited. Wi-Fi 7 (802.11BE) functionality requires Windows 11 24H2, select Intel® 14th processor, and a Wi-Fi 7 router, sold separately. Wi-Fi 7 is backwards compatible with prior 802.11 specs. Available in countries where Wi-Fi 7 is supported.

Palletization

Ocean Shipping uses a 20' x 40' x 40' (490mm x 295mm x 518mm) container with 4 layers; 2x4=8 pieces per layer for a total of 32 pieces per pallet

Air shipping uses 490mm x 295mm x 518mm carton with 2 layers; 2x4=8 pieces per layer for a total of 16 pieces per pallet.



Date of change:	Version History:		Description of change:
March 8, 2022	From v1 to v2	Changed	Format
March 16, 2022	From v2 to v3	Changed	Social and Environmental Responsibility section
May 6, 2022	From v3 to v4	Changed	Processors, Graphics, Networking and Communications sections
June 1, 2022	From v4 to v5	Changed	Operating Systems and SATA Hard Drives sections
June 15, 2022	From v5 to v6	Changed	Networking and Communications section
July 1, 2022	From v6 to v7	Changed	Graphics section
July 8, 2022	From v7 to v8	Changed	System Board section
August 1, 2022	From v8 to v9	Changed	SATA Hard Drives, Other Hardware sections
August 4, 2022	From v9 to v10	Changed	Format
September 1, 2022	From v10 to v11	Changed	Storage / Hard Drives, Graphics, Optical and Removable Storage Networking and Communications sections
October 1, 2022	From v11 to v12	Changed	Graphics, Networking and Communications sections
November 1, 2022	From v12 to v13	Changed	Graphics Adapters section
February 6, 2023	From v13 to v14	Changed	Processors section
March 1, 2023	From v14 to v15	Changed	Manageability section

Technical Specifications - Networking and Communications

March 30, 2023	From v15 to v16	Changed	Processors section
April 25, 2023	From v16 to v17	Changed	Power Supply, Social and Environmental Responsibility sections
May 1, 2023	From v17 to v18	Changed	Other Hardware section
June 1, 2023	From v18 to v19	Changed	Graphics, Social and Environmental Responsibility, Palletization sections
July 1, 2023	From v19 to v20	Changed	Networking and Communications, Other Hardware, HP BIOS sections
July 5, 2023	From v20 to v21	Changed	System Board section
August 1, 2023	From v21 to v22	Changed	Social and Environmental Responsibility section
August 1, 2023	From v22 to v23	Changed	ENVIRONMENTAL DATA section
September 15, 2023	From v23 to v24	Changed	Networking and Communications
October 1, 2023	From v24 to v25	Changed	Graphics, Input Devices sections
November 1, 2023	From v25 to v26	Changed	Graphics, Input Devices sections
December 1, 2023	From v26 to v27	Changed	Graphics, Other Hardware, Social and Environmental Responsibility sections
December 11, 2023	From v27 to v28	Changed	Optical and Removable Storage section
December 21, 2023	From v28 to v29	Changed	Graphics section
February 1, 2024	From v29 to v30	Changed	Social and Environmental Responsibility section
March 1, 2024	From v30 to v31	Changed	Graphics, System Configurations, Declared Noise Emissions and Networking and Communications sections
March 12, 2024	From v31 to v32	Changed	Processors section
April 1, 2024	From v32 to v33	Changed	Graphics and Other Hardware sections
May 1, 2024	From v33 to v34	Changed	Graphics, Social and Environmental Responsibility sections
June 1, 2024	From v34 to v35	Changed	Storage section
July 1, 2024	From v35 to v36	Changed	Graphics, Memory, Networking and Communications sections
July 18, 2024	From v36 to v37	Changed	Software section
August 1, 2024	From v37 to v38	Changed	Graphics, Memory sections
August 1, 2024	From v38 to v39	Changed	Graphics section
September 24, 2024	From v39 to v40	Changed	Humidity, HP SD Media Card Reader sections
October 8, 2024	From v40 to v41	Changed	Format
October 31, 2024	From v41 to v42	Changed	Memory section
November 21, 2024	From v42 to v43	Changed	Format
January 2, 2025	From v43 to v44	Changed	Networking and Communications
May 8, 2025	From v44 to v45	Changed	Graphics section
June 1, 2025	From v45 to v46	Changed	Optical and Removable Storage section
June 9, 2025	From v46 to v47	Changed	Operating Systems, Optical and Removable Storage sections
September 1, 2025	From v47 to v48	Changed	Storage, Graphics Adapters, Optical and Removable Storage, Input Devices, Other Hardware sections
October 16, 2025	From v48 to v49	Changed	Graphics section
November 20, 2025	From v49 to v50	Changed	Networking and Communications section
July 2, 2026	From v50 to v51	Changed	Storage Drive Section

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