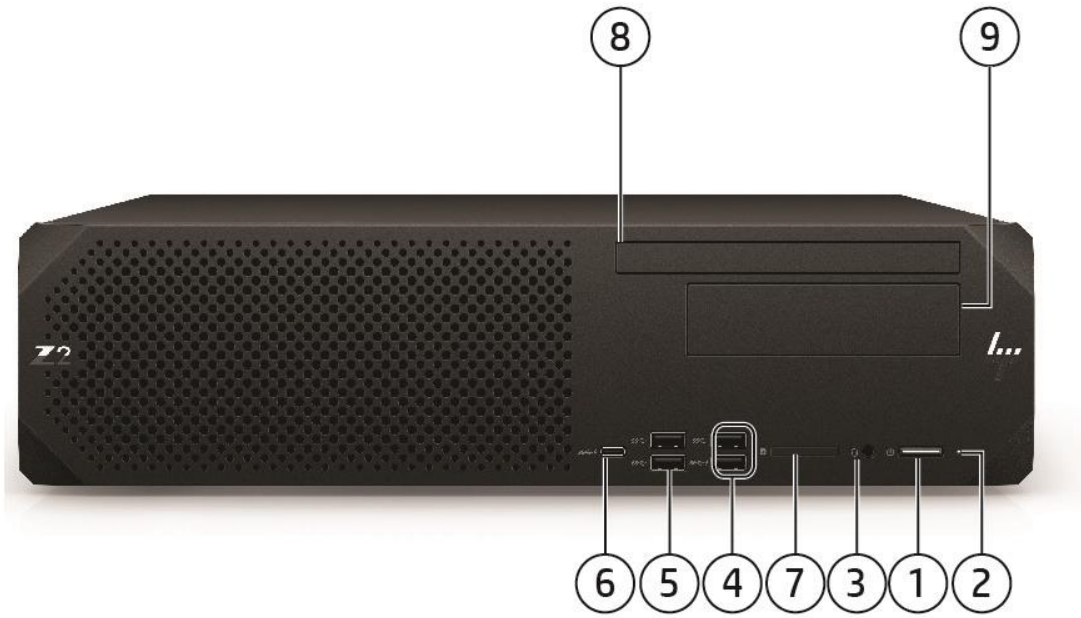
Overview

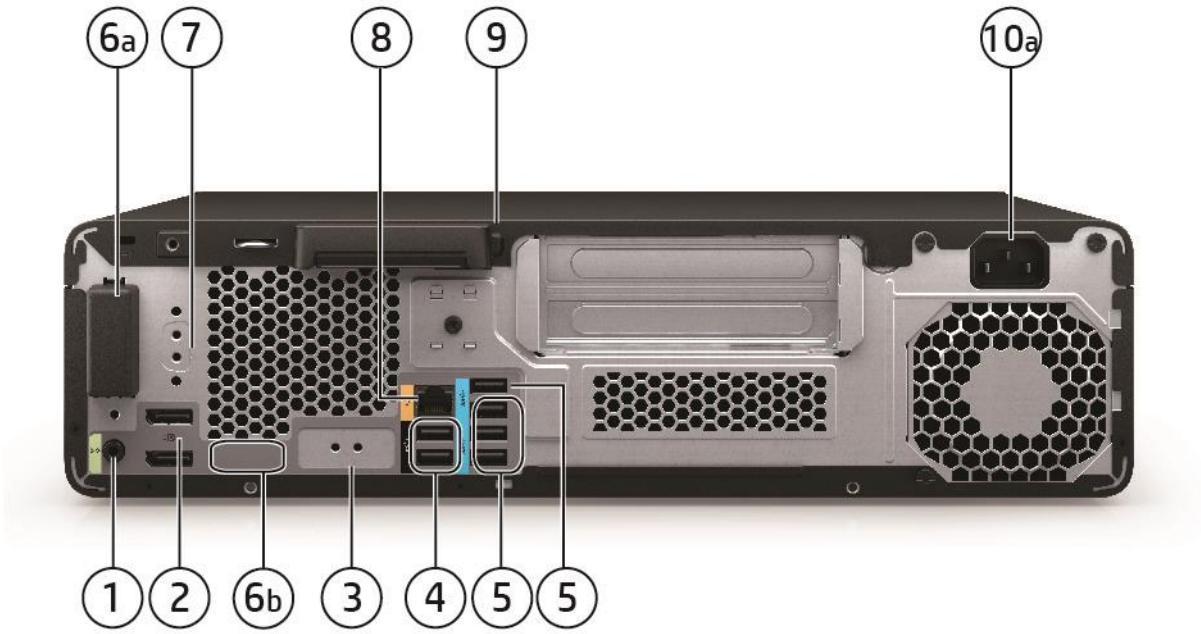
HP Z2 G9 SFF Workstation Desktop PC



Front View

1. Power button
2. HDD Activity LED & Power button LED
3. Universal audio jack (with CTIA & OMTP headset support)
4. (2) Type-A SuperSpeed USB 10Gbps signaling rate port (1 charge port supports up to 5V/2.1A)
5. (2) Type-A SuperSpeed USB 10Gbps signaling rate port
6. (1) Type-C® SuperSpeed USB 20Gbps signaling rate port (charge supports up to 5V/3A)
7. Media Card Reader 4.0 (optional)
8. Slim ODD bay
9. Shared internal/external 3.5" bay

Overview

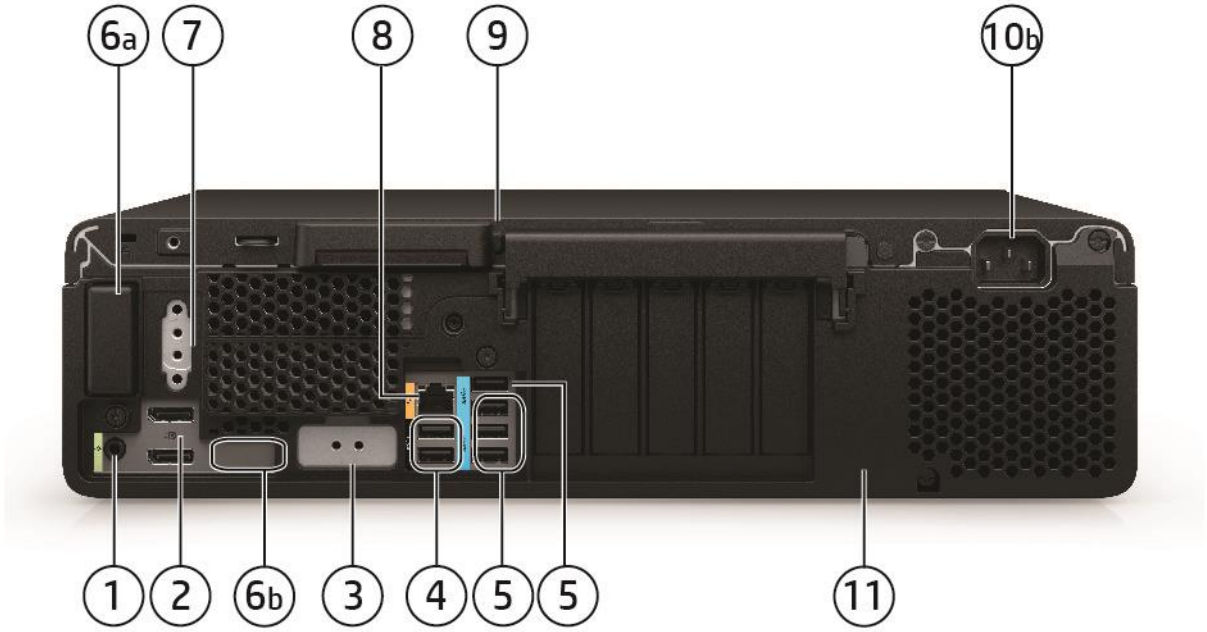


Rear View (Riser Chassis)

1. Audio line out
2. (2) DisplayPort 1.4
3. Flex I/O module: choose one from the following: (1) DisplayPort 1.4, (1) HDMI 2.0b, (1) VGA, 1 Dual SuperSpeed USB Type-A 5Gbps signaling rate, 1 SuperSpeed USB Type-C® 10Gbps signaling rate (Power Delivery 15W, Alt Mode DisplayPort), (1) 2nd 1GbE LAN, (1) 1Gbps Fiber LC LAN, (1) Thunderbolt 3** with SuperSpeed USB4 Type-C® 40Gbps signaling rate (cabled to PCIe AIC)
4. (2) Hi-Speed USB 480Mbps signaling rate port
5. (3) Type A SuperSpeed USB 5Gbps signaling rate port
   (1) Hi-Speed USB 480Mbps signaling rate port
6. WLAN Antenna (optional)
   a. Internal
   b. External
7. 2nd serial port (optional)
8. RJ-45
9. Release latch
10. Power connector
    a. 550W PSU (full height graphic/chassis)

Note: Onboard Display support DP1.4/HBR2. Flex I/O module Display support DP1.4/HBR3. Resolution all support up to 5120x3200 24bpp @60Hz.
**Thunderbolt only support on PCI-E slot3.

Overview



Rear View (Standard Chassis)

1. Audio line out
2. (2) DisplayPort 1.4
3. Flex I/O module: choose one from the following: (1) DisplayPort 1.4, (1) HDMI 2.0b, (1) VGA, 1 Dual SuperSpeed USB Type-A 5Gbps signaling rate, 1 SuperSpeed USB Type-C® 10Gbps signaling rate (Power Delivery 15W, Alt Mode DisplayPort), (1) 2nd 1GbE LAN, (1) 1Gbps Fiber LC LAN, (1) Thunderbolt 3** with SuperSpeed USB4 Type-C® 40Gbps signaling rate (cabled to PCIe AIC)
4. (2) Hi-Speed USB 480Mbps signaling rate port
5. (3) Type A SuperSpeed USB 5Gbps signaling rate port
   (1) Hi-Speed USB 480Mbps signaling rate port
6. WLAN Antenna (optional)
   a. Internal
   b. External
7. 2nd serial port (optional)
8. RJ-45
9. Release latch
10. Power connector
    b. 260W/450W PSU (low-profile graphic/chassis)
11. GS Mark Cover

Note: Onboard Display support DP1.4/HBR2. Flex I/O module Display support DP1.4/HBR3. Resolution all support up to 5120x3200 24bpp @60Hz.
**Thunderbolt only support on PCI-E slot3.

Overview

Form Factor Small Form Factor

Operating Systems Preinstalled:

- Windows 11 Pro - HP recommends Windows 11 Pro[2]
- Windows 11 Home - HP recommends Windows 11 Pro[2]
- Windows 10 Pro (available through downgrade rights from Windows 11 Pro) [1,2,3]
- Linux®-ready[5]
- Ubuntu 20.04 LTS[4]

Web-supported only:

- Windows 10 Enterprise 64[2]

Supported Version:

- HP tested Windows 10, versions 20H2, 21H1 and 21H2 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 8[5]
- SUSE Linux® Enterprise Desktop 15[5]
- Ubuntu 20.04, 22.04 LTS[4,5]

[1] Device comes with Windows 10 and a free Windows 11 upgrade or may be preloaded with Windows 11. Upgrade timing may vary by device. Features and app availability may vary by region. Certain features require specific hardware (see Windows 11 Specifications).
[2] Not all features are available in all editions or versions of Windows. Systems may require upgraded and/or separately purchased hardware, drivers, software or BIOS update to take full advantage of Windows functionality. Windows is automatically updated and enabled. High speed internet and Microsoft account required. ISP fees may apply and additional requirements may apply over time for updates. See http://www.windows.com.
[3]This system is preinstalled with Windows 10 Pro software and also comes with a license for Windows 11 Pro software and provision for recovery software. You may only use one version of the Windows software at a time. Switching between versions will require you to uninstall one version and install the other version. You must back up all data (files, photos, etc.) before uninstalling and installing operating systems to avoid loss of your data.
[4] Not all features are available in all editions or versions of Ubuntu. Systems may require upgraded and/or separately purchased hardware, drivers, software or BIOS to take full advantage of Ubuntu functionality. Ubuntu may be automatically updated. ISP fees may apply, and additional requirements may apply over time for updates.
[5]For detailed Linux® OS/hardware support information, see:
http://www.hp.com/support/linux_hardware_matrix

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

Processors*

Name	Cores	Clock Speed (GHz)	Threads	Cache (MB)	Memory Speed (MT/s)[5]	Hyper-Threading	Integrated Graphics	Intel® Turbo Boost Technology [3]	Featuring Intel® vPro® Technology [4]	16GB Intel® Optane™ memory[2]	TDP (W)
Intel® Core™ i9-12900K Processor	16	3.2	24	30	4800	Y	Intel® UHD Graphics 770	5.2	Y	N	125

Overview

Intel® Core™ i9-12900 Processor	16	2.1	24	30	4800	Y	Intel® UHD Graphics 770	5.1	Y	N	65
Intel® Core™ i7-12700K Processor	12	3.6	20	25	4800	Y	Intel® UHD Graphics 770	5.0	Y	N	125
Intel® Core™ i7-12700 Processor	12	2.1	20	25	4800	Y	Intel® UHD Graphics 770	4.9	Y	N	65
Intel® Core™ i5-12600K Processor	10	3.7	16	20	4800	Y	Intel® UHD Graphics 770	4.9	Y	N	125
Intel® Core™ i5-12600 processor	6	3.3	12	18	4800	Y	Intel® UHD Graphics 770	4.8	Y	N	65
Intel® Core™ i5-12500 processor	6	3.0	12	18	4800	Y	Intel® UHD Graphics 770	4.6	Y	N	65
Intel® Core™ i5-12400 processor	6	2.5	12	18	4800	Y	Intel® UHD Graphics 730	4.4	N/A	N	65
Intel® Core™ i3-12300 processor	4	3.5	8	12	4800	Y	Intel® UHD Graphics 730	4.4	N/A	N	60
Intel® Core™ i3-12100 processor	4	3.3	8	12	4800	Y	Intel® UHD Graphics 730	4.3	N/A	N	60

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

[2] Intel® Optane™ memory system acceleration does not replace or increase the DRAM in your system.

[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) if there is one DIMM per channel. 2 DIMMS per channel will run 4800 speed (MT/s)

Note: ECC memory is supported on the following: Intel® Core™ i9-12900K, Intel® Core™ i9-12900, Intel® Core™ i7-12700K, Intel® Core™ i7-12700, Intel® Core™ i5-12600K, Intel® Core™ i5-12600 and Intel® Core™ i5-12500 processors

Color	Black
Convertibility	The SFF can either be placed flat on the desktop or made to stand on the desk with the optional tower stand.
Expansion Slots (see system board section for more details)[1]	Slot 1: PCIe Gen4 x16 Slot 2: PCIe Gen3 x4 Slot 3: PCIe Gen3 x4 - with x16 Connector Slot 4: PCIe Gen3 x1

Overview

Expansion Bays (see storage section for more details)	(1) Shared internal/external 3.5" bay (1) Internal 3.5" bay (1) Internal 3.5" bay (optional) (1) Dedicated 9.5mm slim optical disk drive bay
Front I/O	2 Type-A SuperSpeed USB 10Gbps signaling rate port (1 charge port supports up to 5V/2.1A), 2 Type-A SuperSpeed USB 10Gbps signaling rate port, 1 Type-C SuperSpeed® USB 20Gbps signaling rate port (charge supports up to 5V/3A), 1 SD card reader (optional), 1 universal audio jack
Internal I/O [5]	(1) Hi-Speed USB 480Mbps signaling rate 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 [3], 1 Audio Line out, 1 RJ-45, 3 Hi-Speed USB 480Mbps signaling rate port, 3 Type-A SuperSpeed USB 5Gbps signaling rate port, 1 serial (optional), 1 Flex I/O port (VGA, HDMI 2.0b, DisplayPort 1.4, Type-C® SuperSpeed USB 10Gbps signaling rate port (Power Delivery 15W, Alt Mode Display Port), Dual Tye-A SuperSpeed USB 5Gbps signaling rate port, 2nd 1GbE LAN, 1 Thunderbolt 3 with SuperSpeed USB4 Type-C® 40Gbps signaling rate (cabled to PCIe AIC), 1 1Gbps Fiber LC NIC
Optional I/O	Flex IO* – choose one of the following options: 1 DisplayPort™ 1.4, 1 HDMI 2.0b, 1 VGA,1 2nd 1GbE LAN, 1 1Gbps Fiber LC NIC, 1 Dual SuperSpeed USB Type-A 5Gbps signaling rate,1 SuperSpeed USB Type-C® 10Gbps signaling rate (15W USB Power Delivery, Alt Mode DisplayPort™) 1 Thunderbolt™ 3 with SuperSpeed USB4 Type-C® 40Gbps signaling rate (cabled to PCIe® AIC); Front - 1 SD card reader; Rear – 1 serial; 1 SD 4.0 card reader * Flex IO port and one PCIe slot will be occupied when Thunderbolt is installed. Thunderbolt will be available in Q2, 2022 (1st refresh).
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: 3.95" [100mm] W: 15.1" [384mm] D: 12.1" [308mm] (Standard desktop orientation)
Packaged Dimensions	H: 20.4" (514mm) W: 7.83" (199mm) D: 19.29" (490mm)
Weight	Exact weights depend upon configuration (System weight only). Starting at 5.0kg (11.1lbs.)
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: 10% to 85% RH, non-condensing, 35° C maximum wet bulb Non-operating: 10% to 90% RH, non-condensing, 35° C maximum wet bulb
Maximum Altitude (non-pressurized)	Operating (with Rotational Hard Drives): 3,048 m (10,000 feet) Operating (with only Solid-State Drives): 5,000 m (16,404 feet) Non-operating: 12,192 m (40,000 feet) Maximum operating temperature is reduced as altitude increases. See Temperature for details.
Power Supply	
	550W wide-ranging, active Power Factor Correction, 92% Efficiency. 450W wide-ranging, active Power Factor Correction, 90% Efficiency. 260W wide-ranging, active Power Factor Correction, 92% Efficiency. NOTE: The Power Supply Efficiency Report for the 450W 90% Efficiency and 260W 92% Efficiency Power Supply may be found at the following links:

Overview

	550W PSU: https://www.plugloadsolutions.com/80PlusPowerSuppliesDetail.aspx?id=0&type=2 450W PSU: https://www.plugloadsolutions.com/80PlusPowerSuppliesDetail.aspx?id=0&type=2 260W PSU: https://www.plugloadsolutions.com/80PlusPowerSuppliesDetail.aspx?id=0&type=2
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
Chipset	Intel® W680 chipset
Memory	4 DIMM slots, supporting up to 128GB ECC/non-ECC, DDR5 4800 MT/s speed depending on the system configuration

Supported Components

Processors		Factory Configured	Option Kit	Option Kit Part Number	Support Notes
	12th Generation Intel Core Processors[1]				
	Intel® Core™ i9-12900K Processor	Y	N		
	Intel® Core™ i9-12900 Processor	Y	N		
	Intel® Core™ i7-12700K Processor	Y	N		
	Intel® Core™ i7-12700 Processor	Y	N		
	Intel® Core™ i5-12600K Processor	Y	N		
	Intel® Core™ i5-12600 processor	Y	N		
	Intel® Core™ i5-12500 processor	Y	N		
	Intel® Core™ i5-12400 processor	Y	N		1
	Intel® Core™ i3-12300 processor	Y	N		1
	Intel® Core™ i3-12100 processor	Y	N		1

Note: ECC memory is supported on the following: Intel® Core™ i9-12900K, Intel® Core™ i9-12900, Intel® Core™ i7-12700K, Intel® Core™ i7-12700, Intel® Core™ i5-12600K, Intel® Core™ i5-12600 and Intel® Core™ i5-12500 processors

NOTE 1: These processors support only non-ECC memory
NOTE 2: No iGfx. A discrete graphics card must be purchased at the same time.

Storage / Hard Drives*		Factory Configured	Option Kit	Option Kit Part Number	Support Notes
	SATA Hard Drives[1]				
	500GB SATA 7200 rpm 6Gb/s 3.5" HDD	Y	Y	LQ036AA	
	1TB SATA 7200 rpm 6Gb/s 3.5" HDD	Y	Y	LQ037AA	
	2TB SATA 7200 rpm 6Gb/s 3.5" HDD	Y	Y	QB576AA	
	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 7200 RPM SATA-6G 3.5in Enterprise HDD	Y	Y	5S461AA	
	500GB SATA 7.2K SED SFF HDD	Y	Y	D8N29AA	
	PCIe Solid State Drives				
	HP ZTurbo 512GB PCIe-Gen 4x4 TLC Z2 SSDKit	Y	Y	201G0AA	
	HP ZTurbo 512GB PCIe-Gen 4x4 SED Z2 SSDKit	Y	Y	201F9AA	
	HP ZTurbo 1TB PCIe-Gen 4x4 TLC Z2 SSDKit	Y	Y	201F5AA	
	HP ZTurbo 2TB PCIe-Gen 4x4 TLC Z2 SSDKit	Y	Y	201F8AA	
	HP Z Turbo Drive 1TB 2280 PCIe-4x4 SED OPAL2 TLC Z2 Kit SSD	Y	Y	223A3AA	
	HP Z Turbo Drive 2TB 2280 PCIe-4x4 SED OPAL2 TLC Z2 Kit SSD	Y	Y	223A4AA	
	Z Turbo 4TB 2280 PCIe-4x4 SED OPAL2 TLC M.2 Z2 Kit SSD	Y	Y	5S498AA	
	HP 256GB PCIe NVME TLC M.2 Z2 G9 TWR/SFF SSD	Y	Y		

Supported Components

HP 500GB PCIe NVME TLC M.2 Z2 G9 TWR/SFF SSD	Y	Y	
HP 1TB PCIe NVME TLC M.2 Z2 G9 TWR/SFF SSD	Y	Y	
HP 256GB 2280 PCIe-4x4 NVMe Value M.2 Z2 Kit SSD	Y	Y	4M9Z1AA
HP 512GB 2280 PCIe-4x4 NVMe Value M.2 Z2 Kit SSD	Y	Y	4M9Z2AA
HP 1TB 2280 PCIe-4x4 NVMe Value M.2 Z2 Kit SSD	Y	Y	4M9Z3AA
HP Z Turbo 4TB 2280 PCIe-4x4 TLC M.2 Z2 Kit SSD	Y	Y	5S492AA
HP Z Turbo 2TB PCIe-4x4 TLC SSD Module	Y	Y	38T75AA
HP Z Turbo 1TB 2280 PCIe-4x4 SED OPAL2 TLC M.2 SSD Module	Y	Y	38T76AA
HP Z Turbo 1TB PCIe-4x4 TLC SSD Module	Y	Y	38T77AA
HP Z Turbo 2TB 2280 PCIe-4x4 SED OPAL2 TLC M.2 SSD Module	Y	Y	38T79AA
HP Z Turbo 512GB PCIe-4x4 TLC SSD Module	Y	Y	38T80AA
HP Z Turbo 512GB 2280 PCIe-4x4 SED OPAL2 TLC M.2 SSD Module	Y	Y	38T81AA
HP Z Turbo 4TB 2280 PCIe-4x4 TLC M.2 SSD Module	Y	Y	5S496AA
HP Z Turbo 4TB 2280 PCIe-4x4 SED OPAL2 TLC M.2 SSD Module	Y	Y	5S497AA

NOTE 1: HDD option kits also require purchase of separate cable kit (available Sept '22)

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

Graphics	Factory Configured	Option Kit	Option Kit Part Number	Support Notes	Supported # of cards
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/A6		
HP DisplayPort To VGA Adapter	Y	Y	AS615AA/AT		
HP DisplayPort To VGA Adapter	Y	Y	AS615A6		
HP DisplayPort To VGA Adapter	Y	Y	F7W97AA		
HP USB-C to DisplayPort Adapter	Y	Y	4SH08AA		
HP USB-C to HDMI Adapter	Y	Y	4SH07AA		
HP USB-C to VGA Adapter	Y	Y	4SH06AA		
Entry 3D					
NVIDIA® T400 2 GB Graphics	Y	Y	340K8AA	1	2
NVIDIA® T400 4 GB Graphics	Y	Y	5Z7E0AA/AT	3	2
NVIDIA® T600 4 GB Graphics	Y	Y	340K9AA	1	2
Mid-range 3D					
NVIDIA® T1000 4 GB Graphics	Y	Y			2
NVIDIA® T1000 8 GB Graphics	Y	Y	5Z7D8AA/AT	3	2
NVIDIA® RTX™ A2000 12GB Graphics*	Y	Y	5Z7D9AA/AT		1
AMD Radeon™ Pro W6600 Graphics (8GB GDDR6 dedicated) *	Y	Y	340K5AA		1

Supported Components

High-end 3D					
AMD Radeon™ RX 6700 XT Graphics (12 GB GDDR6 dedicated) *	Y	N		2	1
NVIDIA® RTX™ A4000 16 GB Graphics*	Y	Y	20X24AA/AT	2	1

Note 1: NVIDIA® T400 (2 GB GDDR6 dedicated) and NVIDIA® T600 (4 GB GDDR6 dedicated) may go End of Life in late 2022.
Note 2: Full Height Graphics (eg. NV A4000, AMD 6700) are only supported by Full Height Chassis/550W PSU)
Note 3: Second graphics available in May 2022 in 450W chassis only
Note 4: Available in May 2022

***** Requires 700W chassis.

Memory

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP 8GB (1x8GB) DDR5-4800 UDIMM NECC	Y	Y	4M9X9AA	3
HP 16GB (1x16GB) DDR5-4800 UDIMM NECC	Y	Y	4M9Y0AA	3
HP 16GB (1x16GB) DDR5-4800 UDIMM ECC	Y	Y	4M9Y1AA	1,3
HP 32GB (1x32GB) DDR5-4800 UDIMM NECC	Y	Y	4M9Y2AA	3
HP 32GB (1x32GB) DDR5- 4800 UDIMM ECC	Y	Y	4M9Y3AA	1,3

NOTE 1: ECC memory is supported on the following: Intel® Core™ i9-12900K, Intel® Core™ i9-12900, Intel® Core™ i7-12700K, Intel® Core™ i7-12700, Intel® Core™ i5-12600K, Intel® Core™ i5-12600 and Intel® Core™ i5-12500 processors
NOTE 2: Two channels of DDR5 memory are supported. To realize full performance at least one DIMM must be inserted into each channel.
NOTE 3: Though the memory modules can run up to 4800MHz, the current platform will support the maximum memory speed of 4400MHz.

The system speed will be determined by these 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

Optical and Removable Storage

	Factory Configured	Option Kit	Option Kit Part Number
HP DP25 Removable 2.5" HDD Frame/Carrier	Y	Y	W3J84AA
HP DP25 2.5 in HDD Spare Carrier	Y	Y	W3J85AA
HP Z2 SFF DVD-Writer 9.5mm Slim ODD	Y	Y	4L5J9AA
HP Z2 SFF DVD-ROM 9.5mm Slim ODD	Y	Y	4L5J8AA
HP CRU QX328 3.5 in Front Removable Frame/Carrier	Y	Y	4N012AA

Supported Components

HP CRU SHIPS M.2 2TB Storage Module	Y	Y	56Q87AA
HP CRU SHIPS M.2 1TB Storage Module	Y	Y	56Q88AA
HP CRU SHIPS M.2 512GB Storage Module	Y	Y	56Q89AA
HP CRU SHIPS M.2 Spare Carrier	Y	Y	633X9AA

NOTE: With Blu-Ray, certain disc, digital connection, compatibility and/or performance issues may arise, and do not constitute defects in the product. Flawless playback on all systems is not guaranteed. In order for some Blu-ray titles to play, they may require a DVI or HDMI digital connection and your display may require HDCP support. HD-DVD movies cannot be played on this Desktop PC.
NOTE: 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 Configured	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
Intel Ethernet I350-T4 4-Port 1Gb NIC*	N	Y	W8X25AA
Intel X550 10GBASE-T Dual Port NIC	Y	Y	1QL46AA
NVIDIA Mellanox 25GbE SFP28 Transceiver	Y	Y	436N4AA
Intel Ethernet Network Adapter I225-T1	Y	Y	406L9AA
Intel Wi-Fi 6E AX211 BT 5.2 M.2 non-vPro[1,**]	Y	N	

*Intel I350-T4 4-port GbE NIC is an After Market Option only.
[1] Intel AX211 with Internal antenna support WIFI 6
[1] Intel 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.
NOTE 1: The integrated network connection is required to support Intel® vPro® Technology.
NOTE 2: If AMT is provisioned, then network teaming with the integrated LAN port is not possible.
NOTE 3: "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

Racking and Physical Security	Factory Configured	Option Kit	Option Kit Part Number
HP Keyed Cable Lock	N	Y	T1A62AA
HP Master Keyed Cable Lock 10mm	N	Y	T1A63AA
HP Business PC Security Lock V3 Kit	N	Y	3XJ17AA

Input Devices	Factory Configured	Option Kit	Option Kit Part Number
HP 320K Wired Keyboard	Y	Y	9SR37AA
HP 455 Programmable Wireless Keyboard	Y	Y	4R177AA

Supported Components

HP 975 USB+BT Dual-Mode Wireless Keyboard	Y	Y	3Z726AA
HP 655 Wireless Keyboard and Mouse Combo	Y	Y	4R009AA
HP 125 Wired Keyboard	Y	Y	266C9AA
HP Wired Desktop 320MK Mouse and Keyboard	Y	Y	9SR36AA
HP Wired 320M Mouse	Y	Y	9VA80AA
HP 128 Laser Wired Mouse	Y	Y	265D9AA
HP 125 Wired Mouse	Y	Y	265A9AA
HP Creator 935 Black Wireless Mouse	Y	Y	1D0K8AA
HyperX Cloud MIX Wireless GAM HEADSET	N	Y	4P5K9AA
HyperX Cloud Core BLK GAM HEADSET	N	Y	4P4F2AA
HyperX Cloud Flight - Wireless Gaming Headset (Black-Red) (HX-HSCF-BK/AM)	N	Y	4P5L4AA
HyperX Cloud Stinger Core GAM HEADSET PC	N	Y	4P4F4AA
HyperX SoloCast - USB Microphone (Black) (HMIS1X-XX-BK/G)	N	Y	4P5P8AA

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

Other Hardware	**Factory Configured**	**Option Kit**	**Option Kit Part Number**
HP Z2 Internal Serial Port and PS/2 Port	Y	Y	141K9AA/AT
HP Z2 Power Cord Kit	Y	Y	1N1D5AA
HP Z2 2nd serial port adapter	Y	Y	141K8AA/AT
HP PCIe x1 Parallel Port Card	Y	Y	N1M40AA
HP DP Flex Port 2020	Y	Y	141J7AA/AT
HP 1GbE LAN Flex Port 2020	Y	Y	141J6AA/AT
HP Flex 1GbE Fiber LC Single Port	Y	Y	20J15AA
HP Dual USB-A 3.2 Gen1 Flex 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	Y	141K7AA/AT
HP Z2 SFF Dust Filter	Y	Y	4N002AA
HP Z2 SFF Dust Filter and bezel	Y	Y	4N003AA

[1]Available in Q3, 2021

Software	**Factory Configured**	**Option Kit**	**Support Notes**
HP Performance Advisor	Y	N	1
HP PC Hardware Diagnostics UEFI (Windows OS only)	Y	N	2
HP PC Hardware Diagnostics Windows		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	
HP Quick Drop	Y	N	

Supported Components

myHP	Y	N	
HP Easy Clean	Y	N	
HP Smart Health	Y	N	7
Kingsoft WPS Office	Y	N	4
My Office	Y	N	5
Adobe Substance 3D Collection Plan	N	Y	6
WSL2/Ubuntu Data Science Stack	Y	N	7

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

Supported Components

Operating Systems

Windows 11 Pro - HP recommends Windows 11 Pro[2]
Windows 11 Home - HP recommends Windows 11 Pro[2]
Windows 10 Pro (available through downgrade rights from Windows 11 Pro) [1,2,3]
Linux®-ready[5]
Ubuntu 20.04 LTS[4]

[1] Device comes with Windows 10 and a free Windows 11 upgrade or may be preloaded with Windows 11. Upgrade timing may vary by device. Features and app availability may vary by region. Certain features require specific hardware (see Windows 11 Specifications).
[2] Not all features are available in all editions or versions of Windows. Systems may require upgraded and/or separately purchased hardware, drivers, software or BIOS update to take full advantage of Windows functionality. Windows is automatically updated and enabled. High speed internet and Microsoft account required. ISP fees may apply and additional requirements may apply over time for updates. See http://www.windows.com.
[3]This system is preinstalled with Windows 10 Pro software and also comes with a license for Windows 11 Pro software and provision for recovery software. You may only use one version of the Windows software at a time. Switching between versions will require you to uninstall one version and install the other version. You must back up all data (files, photos, etc.) before uninstalling and installing operating systems to avoid loss of your data.
[4] Not all features are available in all editions or versions of Ubuntu. Systems may require upgraded and/or separately purchased hardware, drivers, software or BIOS to take full advantage of Ubuntu functionality. Ubuntu may be automatically updated. ISP fees may apply and additional requirements may apply over time for updates.
[5]For detailed Linux® OS/hardware support information, see:
http://www.hp.com/support/linux_hardware_matrix

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

Supported Components

HP BIOS

Key features of the HP BIOS include:

- Deployment and manageability – HP BIOS provides several technologies that help integrate the HP Z2 G9 SFF Workstation Desktop PC into the enterprise, such as PXE, remote recovery, remote configuration, remote control, and BIOS (F10) Setup support for 15 languages.
- Network firmware updates – Update your BIOS via the cloud or standardize on a BIOS version hosted on an Enterprise network.
- Stability – HP BIOS supports the HP stable product roadmap by releasing only critical BIOS changes to the factory and advanced change notification.
- Class 3 UEFI specification version 2.7
- Absolute Persistence agent – For tracking and tracing services, available in select countries, separate software and purchase of a subscription is required.
- Thermal and power management – The HP BIOS provides and enables thermal and power management technologies so component temperatures are managed for high reliability and to assist in operating the HP Workstation computer in any enterprise environment.
- Acoustic performance – Industry leading acoustic emissions across the range of operating conditions.
- Serviceability – HP BIOS provides diagnostic and detailed service information.
- Upgrades and recovery – HP BIOS provides numerous ways to upgrade HP Workstation computers, including BIOS updates from within Windows (HP Firmware Update and Recovery), Capsule update, HP Client Manager, and fail-safe recovery. In addition, the HP BIOS Configuration Utility enables replication of BIOS settings within Windows while the Replicated Setup feature provides the same capability within BIOS (F10) Setup. The BIOS Configuration Utility is available from the HP support website.
- HP BIOS uses PKI signing of the BIOS for trusted BIOS upgrades and recovery.

Additional HP BIOS Features:

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

HP Sure Start Gen7

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

- Audit enabled – System Audit via Sure Start Event Logs capture data such as incident, repair date and time for troubleshooting and investigating.

NOTE: HP Sure Start Gen7 is available on HP Workstation products equipped with Intel® 12th generation processors.

SOFTWARE COMPONENTS AND APPLICATIONS WITH WINDOWS

Software
HP Support Assistant [14]
HP Image Assistant
HP Desktop Support Utility
HP Documentation
HP Notifications
HP PC Hardware Diagnostics UEFI
HP PC Hardware Diagnostics Windows
HP Performance Advisor[1]
myHP
HP QuickDrop[19]
HP Easy Clean[20]
HP Smart Health[21]
WSL/Ubuntu Data Science Stack
HP Privacy Settings
Touchpoint Customizer for Commercial

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

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

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

Supported Components

HP Client Security Manager Gen 7[4]

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

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

[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.

[5] HP Smart Support automatically collects the telemetry necessary upon initial boot of the product to deliver device-level configuration data and health insights and is available preinstalled on select products, thru HP Factory Configuration Services; or it can be downloaded. For more information about how to enable HP Smart Support or for download, please visit http://www.hp.com/smart-support.

[6] HP Password Manager requires Internet Explorer or Chrome or FireFox. Some websites and applications may not be supported. User may need to enable or allow the add-on / extension in the internet browser.

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

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

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

[10] HP Sure Recover Gen4 is available on select HP PCs and requires Windows 10 and an open network connection. You must back up important files, data, photos, videos, etc. before using HP Sure Recover to avoid loss of data. Network based recovery using Wi-Fi is only available on PCs with Intel Wi-Fi Module

[11] HP Sure Click requires Windows 10 Pro or higher or Enterprise. See https://bit.ly/2PrLT6A_SureClick for complete details.
[12] HP Sure Sense requires Windows 11 Pro or Enterprise and supports Microsoft Internet Explorer, Google Chrome™, and Chromium™. Supported attachments include Microsoft Office (Word, Excel, PowerPoint) and PDF files in read only mode, when Microsoft Office or Adobe Acrobat are installed.
[13] HP BIOSphere Gen6 features may vary depending on the platform and configurations.
[14] HP Support Assistant requires Windows and Internet access.
[16] Secure Erase - For the methods outlined in the National Institute of Standards and Technology Special Publication 800-88 "Clear" sanitation method. HP Secure Erase does not support platforms with Intel® Optane.
[17] HP Sure Admin requires Windows 11, HP BIOS, HP Manageability Integration Kit from http://www.hp.com/go/clientmanagement and HP Sure Admin Local Access Authenticator smartphone app from the Android or Apple store.
[18] HP Wolf Pro Security Edition is available preloaded on select SKUs and, depending on the HP product purchased, includes a paid 1-year or 3-year license. The HP Wolf Pro Security Edition software is licensed under the license terms of the HP Wolf Security Software - End-User license Agreement (EULA) that can be found at: https://support.hp.com/us-en/document/ish_3875769-3873014-16 as that EULA is modified by the following: “7. Term. Unless otherwise terminated earlier pursuant to the terms contained in this EULA, the license for the HP Wolf Pro Security Edition (HP Sure Sense Pro and HP Sure Click Pro) is effective upon activation and will continue for either a twelve (12) month or thirty-six (36) month license term (“Initial Term”). At the end of the Initial Term you may either (a) purchase a renewal license for the HP Wolf Pro Security Edition from HP.com, HP Sales or an HP Channel Partner, or (b) continue using the standard versions of HP Sure Click and HP Sure Sense at no additional cost with no future software updates or HP Support.
[19] HP Quick Drop requires Internet access and Windows 10 or higher PC preinstalled with HP QuickDrop app and either an Android device (phone or tablet) running Android 7 or higher with the Android HP QuickDrop app, and /or an iOS device (phone or tablet) running iOS 12 or higher with the iOS HP QuickDrop app.
[20] HP Easy Clean requires Windows 10 RS3 and higher and will disable the keyboard, touchscreen, and clickpad only. Ports are not disabled. See user guide for cleaning instructions.
[21] HP Smart Health automatically collects the telemetry necessary upon initial boot of the product to deliver device-level configuration data and health insights and is available preinstalled on select products, thru HP Factory Configuration Services;

or it can be downloaded. For more information about how to enable HP Smart Support or for download, please visit http://www.hp.com/smart-support.

[22] HP Wolf Security for Business requires Windows 10 or higher, includes various HP security features and is available on HP Pro, Elite, RPOS and Workstation products. See product details for included security features

System Technical Specifications

System Board

System Board Form Factor Customized PCB 231.04 x 301.24 mm (9.213X11.86inches)

Processor Socket Single LGA-1700

CPU Bus Speed DMI

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 128GB

Memory Configuration (Supported) 8GB, 16GB and 32GB non-ECC, 16GB and 32GB ECC unbuffered DIMMs are supported. ECC and non-ECC memory DIMMs cannot be mixed in the same system

NOTE: Maximum memory capacities assume 64-bit operating systems, such as Genuine Windows® 11 Professional 64 bit, Red Hat Linux 64-bit. 32-bit Windows Operating Systems support up to 4 GB.

PCI Express Connectors

(1) PCI Express Gen4 slot x16 mechanical/ x16 electrical (Low-Profile)
(1) PCI Express Gen3 slot x4 mechanical/ x4 electrical (Low-Profile, open-ended)
(1) PCI Express Gen3 slot x16 mechanical/ x4 electrical (Low-Profile)
(1) PCI Express Gen3 slot x1 mechanical/ x1 electrical (Low-Profile, 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 Gen 4 x16 slot is meant for HP qualified cards, configured or after market. HP does not provide warranty support for 3rd party cards.

Supported Interfaces	**SATA**	Integrated (4) Serial ATA interfaces (6Gb/s SATA).
	Serial Attached SCSI	None
	Integrated Graphics	Intel® UHD Graphics 730 (on Core i5-12400/i3-12300/i3-12100) processors); Intel® UHD Graphics 770 (on Core i5/i7/i9 processors); Based on Unified Memory Architecture (UMA) - a 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) - a 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
	External SATA (eSATA)	None
	IDE connector	None
	Floppy connector	None
	Serial	1 internal header (requires optional Serial Port and PS/2 Combo Kit with PCIe bracket)
	2nd Serial	1 internal header (requires optional Serial Port Adapter Kit)
Connector(s)	**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 (charge supports up to 5V/3A)
	Rear	3 High-speed USB 480Mbps signaling rate port; 3 Type-A SuperSpeed USB 5Gbps signaling rate port; 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
	Internal	1 High-speed USB 480Mbps signaling rate header for SD Card Reader
HD Integrated Audio	Realtek ALC3252	
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	

System Technical Specifications

Power Supply Headers	Yes
Power Switch, Power LED & Hard Drive LED Header	Yes
Clear Password Jumper	None
Keyboard/Mouse	USB or PS/2 Mouse (option)
Power Supply	260W EPA92, 450W EPA90 and 550W EPA92

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

System Configurations

HP Z2 G9 SFF Workstation Desktop PC 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	260W
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)	16.907		16.195		16.452	
Windows short Idle (S0)	17.323		17.742		17.245	
Windows Busy Typ(S0)	165.717		168.913		164.628	
Windows Busy Max (S0)	187.903		183.393		186.965	
Sleep (S3)	1.001	0.991	1.033	1.001	0.991	1.033
Off (S5)	0.657	0.631	0.672	0.657	0.631	0.672
Zero Power Mode (ErP)	0.229		0.237		0.224	

Heat Dissipation (Btu/hr)

	115 VAC		230 VAC		100 VAC	
	LAN Enabled	LAN Disabled	LAN Enabled	LAN Enabled	LAN Enabled	LAN Enabled
Windows long Idle (S0)	57.687		55.257		56.134	
Windows short Idle (S0)	59.106		60.536		58.84	
Windows Busy Typ(S0)	565.426		576.331		561.711	
Windows Busy Max (S0)	641.125		625.737		637.925	
Sleep (S3)	3.415	3.381	3.525	3.415	3.381	3.525
Off (S5)	2.242	2.153	2.293	2.242	2.153	2.293
Zero Power Mode (ErP)	0.781		0.809		0.764	

HP Z2 G9 SFF Workstation Desktop PC Configuration #2

Processor Info	Core i7-12700,12C 2.1G 65W
Memory Info	2 x 8G DDR5 4800 UDIMM NECC
Graphics Info	NVIDIA T1000 8GB
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)	19.136		19.335		19.211	

System Technical Specifications

Windows short Idle (S0)	20.404		21.197		20.32	
Windows Busy Typ(S0)	245.533		239.257		242.62	
Windows Busy Max (S0)	268.903		247.683		266.482	
Sleep (S3)	1.132	1.101	1.211	1.132	1.101	1.211
Off (S5)	0.735	0.722	0.744	0.735	0.722	0.744
Zero Power Mode (ErP)	0.265		0.268		0.252	

Heat Dissipation (Btu/hr)

	115 VAC		230 VAC		100 VAC	
	LAN Enabled	LAN Disabled	LAN Enabled	LAN Enabled	LAN Enabled	LAN Enabled
Windows long Idle (S0)	65.292		65.971		65.548	
Windows short Idle (S0)	69.618		72.324		69.332	
Windows Busy Typ(S0)	837.759		816.345		827.819	
Windows Busy Max (S0)	917.497		845.094		909.237	
Sleep (S3)	3.862	3.757	4.132	3.862	3.757	4.132
Off (S5)	2.508	2.463	2.539	2.508	2.463	2.539
Zero Power Mode (ErP)	0.904		0.914		0.86	

HP Z2 G9 SFF Workstation Desktop PC Configuration #3

Processor Info	Core i7-12700K,12C 3.6G 125W
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)	21.043		20.428		20.228	
Windows short Idle (S0)	23.125		22.638		22.444	
Windows Busy Typ(S0)	258.063		253.127		256.521	
Windows Busy Max (S0)	274.25		263.977		268.45	
Sleep (S3)	1.302	1.221	1.411	1.302	1.221	1.411
Off (S5)	0.705	0.691	0.725	0.705	0.691	0.725
Zero Power Mode (ErP)	0.238		0.242		0.239	

Heat Dissipation (Btu/hr)

	115 VAC		230 VAC		100 VAC	
	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
Windows long Idle (S0)	71.799		69.700		69.018	
Windows short Idle (S0)	78.903		77.241		76.579	
Windows Busy Typ(S0)	880.511		863.669		875.25	
Windows Busy Max (S0)	935.741		900.69		915.951	
Sleep (S3)	4.442	4.166	4.814	4.442	4.166	4.814
Off (S5)	2.405	2.358	2.474	2.405	2.358	2.474
Zero Power Mode (ErP)	0.812		0.826		0.815	

HP Z2 G9 SFF Workstation Desktop PC Configuration #4

Processor Info	Core i7-12700K,12C 3.6G 125W
Memory Info	4 x 16G DDR5 4800 UDIMM NECC
Graphics Info	NVIDIA RTX A2000
Disks/Optical/Floppy	1T SSD Z Turbo
PSU	550W

System Technical Specifications

	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)	16.118		16.525		16.022	
Windows short Idle (S0)	17.591		17.935		17.485	
Windows Busy Typ(S0)	166.23		166.157		165.652	
Windows Busy Max (S0)	215.6		214.207		213.633	
Sleep (S3)	1.023	0.968	1.215	1.023	0.968	1.215
Off (S5)	0.654	0.642	0.678	0.654	0.642	0.678
Zero Power Mode (ErP)	0.248		0.252		0.248	

Heat Dissipation (Btu/hr)

	115 VAC		230 VAC		100 VAC	
	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
Windows long Idle (S0)	54.995		56.383		54.667	
Windows short Idle (S0)	60.020		61.194		59.659	
Windows Busy Typ(S0)	567.177		566.928		565.205	
Windows Busy Max (S0)	735.627		730.874		728.916	
Sleep (S3)	3.491	3.303	4.146	3.491	3.303	4.146
Off (S5)	2.231	2.191	2.313	2.231	2.191	2.313
Zero Power Mode (ErP)	0.846		0.86		0.846	

HP Z2 G9 SFF Workstation Desktop PC Configuration #5

Processor Info	Core i9-12900K,16C 3.2G 125W
Memory Info	4 x 32G DDR5 4800 UDIMM ECC
Graphics Info	NVIDIA RTX A4000
Disks/Optical/Floppy	1T SSD Z Turbo
PSU	550W
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)	32.725		32.709		32.711	
Windows short Idle (S0)	33.525		35.083		33.432	
Windows Busy Typ(S0)	392.633		392.11		390.621	
Windows Busy Max (S0)	419.361		406.324		414.845	
Sleep (S3)	1.929	1.862	2.142	1.929	1.862	2.142
Off (S5)	0.776	0.749	0.825	0.776	0.749	0.825
Zero Power Mode (ErP)	0.213		0.219		0.208	

Heat Dissipation (Btu/hr)

	115 VAC		230 VAC		100 VAC	
	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
Windows long Idle (S0)	111.658		111.603		111.61	
Windows short Idle (S0)	114.387		119.703		114.07	
Windows Busy Typ(S0)	1339.664		1337.879		1332.799	
Windows Busy Max (S0)	1430.86		1386.377		1415.451	
Sleep (S3)	6.582	6.353	7.309	6.582	6.353	7.309
Off (S5)	2.648	2.556	2.815	2.648	2.556	2.815
Zero Power Mode (ErP)	0.727		0.747		0.71	

NOTE: The Power Supply Efficiency report may be found at the following links: https://www.plugloadsolutions.com/80PlusPowerSuppliesDetail.aspx?id=0&type=2

Declared Noise Emissions

System Configuration (Entry level, Lowprofile)	**Processor Info**	Intel® CPU Core i5-12400 6C LGA 2.50G 18 MB 65W (Intel - Alder Lake-S)	
	Memory Info	1* 32GB 4800 SK hynix memory	
	Graphics Info	Intel® UHD	
	Disks/Optical/Floppy	1*2TB Samsung M.2	
	Power Supply	LITE-ON 450W	
Declared Noise Emissions (in accordance with ISO 7779 and ISO 9296)		**Sound Power** (LWAd, bels)	**Deskside Sound Pressure** (LpAm, decibels)
	Idle	3.1	15.2
	Hard drive Operating (Drive Random Seek)	3.4	23.9
	Hard drive Operating (Active mode)	3.05	14.8
System Configuration (Mid-level, Lowprofile)	**Processor Info**	Intel® CPU Core i9-12900 16C LGA 2.40G 30 MB 65W ECC (Intel - Alder Lake-S)	
	Memory Info	4* 32GB 4800 SK hynix memory	
	Graphics Info	NVIDIA® T1000	
	Disks/Optical/Floppy	2*WD 2TB 7200RPM SATA HDD; 3*2TB Samsung M.2	
	Power Supply	LITE-ON 450W	
Declared Noise Emissions (in accordance with ISO 7779 and ISO 9296)		**Sound Power** (LWAd, bels)	**Deskside Sound Pressure** (LpAm, decibels)
	Idle	3.35	23.4
	Hard drive Operating (Drive Random Seek)	3.48	24.9
	Hard drive Operating (Active mode)	4.34	30.5
System Configuration (High-end, Lowprofile)	**Processor Info**	Intel® Core i9-12900K 16C 3.20G LGA 30 MB 125W ECC (Intel - Alder Lake-S)	
	Memory Info	4* 32GB 4800 SK hynix memory	
	Graphics Info	NVIDIA® T1000	
	Disks/Optical/Floppy	2*WD 2TB 7200RPM SATA HDD; 3*2TB Samsung M.2	
	Power Supply	LITE-ON 450W	
Declared Noise Emissions (in accordance with ISO 7779 and ISO 9296)		**Sound Power** (LWAd, bels)	**Deskside Sound Pressure** (LpAm, decibels)
	Idle	3.37	23.1
	Hard drive Operating (Drive Random Seek)	3.45	24.7
	Hard drive Operating (Active mode)	4.35	33.0
System Configuration (Entry level, Riser)	**Processor Info**	Intel® Core i5-12400 6C LGA 2.50G 18 MB 65W (Intel - Alder Lake-S)	
	Memory Info	1* 32GB 4800 SK hynix memory	
	Graphics Info	Intel® UHD	

System Technical Specifications

	Disks/Optical/Floppy	1*2TB Samsung M.2	
	Power Supply	Liteon 550W EPA92	
Declared Noise Emissions (in accordance with ISO 7779 and ISO 9296)		**Sound Power** (LWAd, bels)	**Deskside Sound Pressure** (LpAm, decibels)
	Idle	3.01	12.0
	Hard drive Operating (Drive Random Seek)	3.37	23.1
	Hard drive Operating (Active mode)	3.09	15.5

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: 10% to 85% RH, non-condensing, 35° C maximum wet bulb Non-operating: 10% to 90% RH, 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
	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)

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 internal/external 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 Cables and Connectors	Yes
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 Clamp Lock Support	Yes (optional): Locks side cover and locks cables to chassis. Secures chassis from theft and allows multiple units to be chained together when used with optional cable Threaded feature at rear of system
Solenoid Lock and Hood Sensor	Yes (optional) The Solenoid Hood Lock eliminates the need for a physical key by making the chassis lockable through software and a password. You can also lock and unlock the chassis remotely over the network. The Sensor Kit detects when the access panel has been removed.
Keyboard/Mouse/Video Cable Lock	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 Handles	No
Power Supply	Requires T15 Torx or flat blade screwdriver
PCI Card Retention	Yes, rear (all), middle (optional), front (none)

Service, Support, and Warranty

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

System Technical Specifications

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.

System Technical Specifications

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)
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.
BIOS Power On	Users can define a specific date and time for the system to power on.
ROM Based Computer Setup Utility (F10)	Review and customize system configuration settings controlled by the BIOS.
System/Emergency ROM Flash Recovery with Video	Recovers system BIOS in corrupted Flash ROM.
Replicated Setup	Saves BIOS settings to USB flash device in human readable file (HpSetup.txt). BiosConfigurationUtility.exe utility can then replicate these settings on machines being deployed without entering Computer Configuration Utility (F10 Setup).
SMBIOS	System Management BIOS Reference Specification, Version 3.4 External BIOS simulator found at: http://csrsml.itcs.hp.com/
Boot Control	Disables the ability to boot from removable media on supported devices.
Memory Change Alert	Alerts management console if memory is removed or changed.
Thermal Alert	Monitors the temperature state within the chassis. Three modes: • NORMAL - normal temperature ranges. • ALERTED - excessive temperatures are detected. Raises a flag so action can be taken to avoid shutdown or provide for a smoother system shutdown. • SHUTDOWN - excessive temperatures are encountered. Automatically shuts down the computer without warning before hardware component damage occurs.
Remote ROM Flash	Provides secure, fail-safe ROM image management from a central network console.
ACPI (Advanced Configuration and Power Management Interface)	Allows the system to enter and resume from low power modes (sleep states). Enables an operating system to control system power consumption based on the dynamic workload. Makes it possible to place individual cards and peripherals in a low-power or powered-off state without affecting other elements of the system. Supports ACPI 6.0 for full compatibility with 64-bit operating systems.
Ownership Tag	A user-defined string stored in non-volatile memory that is displayed in the BIOS splash screen.
Remote Wakeup/Remote Shutdown	System administrators can power on, restart, and power off a client computer from a remote location.
Instantly Available PC (Suspend to RAM - ACPI sleep state S3)	Allows for very low power consumption with quick resume time.
Remote System Installation via F12 (PXE 2.1) (Remote Boot from Server)	Allows a new or existing system to boot over the network and download software, including the operating system.
ROM revision levels	Reports the system BIOS revision level in Computer Configuration Utility (F10 Setup). Version is available through an industry standard interface (SMBIOS and WMI) so that management SW applications can use and report this information.
System board revision level	Allows management SW to read revision level of the system board. Revision level is digitally encoded into the HW and cannot be modified.
Start-up Diagnostics (Power-on Self-Test)	Assesses system health at boot time with selectable levels of testing.

System Technical Specifications

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 14 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	2.7
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	"El Torito" Bootable 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
PMM	POST Memory Manager Specification, Version 1.01(Not support)
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/
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
SMBIOS	System Management BIOS Reference Specification, Version 3.2 External BIOS simulator found at: http://csrsml.itcs.hp.com/

Social and Environmental Responsibility

Eco-Label Certifications & Declarations

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 registered in the United States. See http://www.epeat.net for registration status in your country.
- TCO Certified
- China Energy Conservation Program (CECP)

- China State Environmental Protection Administration (SEPA)
- Taiwan Green Mark
- Korea Eco-label
- Japan PC Green label*

Sustainable Impact Specifications

- Ocean-bound plastic in System FAN, CPU FAN and Speaker
- 45% post-consumer recycled plastic
- Low halogen
- Outside Box and corrugated cushions are 100% sustainably sourced and recyclable
- Molded Paper Pulp Cushion inside box is 100% sustainably sourced and recyclable
- Bulk packaging available

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".

Energy Consumption (in accordance with US ENERGY STAR® test method)	**115VAC, 60Hz**	**230VAC, 50Hz**	**100VAC, 50Hz**
Normal Operation (Sort idle)	45.62 W	45.60 W	45.63 W
Normal Operation (Long idle)	41.46 W	41.62 W	41.57 W
Sleep	2.34 W	2.34 W	2.39 W
Off	0.89 W	0.91 W	0.90 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)	156 BTU/hr	156 BTU/hr	156.1 BTU/hr
Normal Operation (Long idle)	141.8 BTU/hr	142.3 BTU/hr	142.2 BTU/hr
Sleep	8 BTU/hr	8 BTU/hr	8.2 BTU/hr
Off	3 BTU/hr	3.1 BTU/hr	3.1 BTU/hr

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

Declared Noise Emissions (in accordance with ISO 7779 and ISO 9296)	Sound Power (L_{WAd}, bels)	Sound Pressure (L_{pAm}, decibels)
Typically Configured – Idle	3.37	23.1
Fixed Disk – Random writes	3.45	24.7
Optical Drive – Sequential reads	4.35	33.0

System Technical Specifications

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.

Batteries

This battery in this product complies with EU Directive 2006/66/EC
Battery size: CR2032 (coin cell)
Battery type: Lithium Metal

The battery in this product does not contain:

- Mercury greater than5ppm by weight
- Cadmium greater than 10ppm by weight
- Lead greater than 40 ppm by weight

Additional Information

- This product is in compliance with the Restrictions of Hazardous Substances (RoHS) directive - 2011/65/EC.
- This HP product is designed to comply with the Waste Electrical and Electronic Equipment (WEEE) Directive – 2002/96/EC.
- This product is in compliance with California Proposition 65 (State of California; Safe Drinking Water and Toxic Enforcement Act of 1986).
- This product is in compliance with the IEEE 1680 (EPEAT) standard at the Gold level, see www.epeat.net
- Plastics parts weighing over 25 grams used in the product are marked per ISO11469 and ISO1043.
- This product is 93.5% recycle-able when properly disposed of at end of life.

Packaging Materials

External:	PAPER/Corrugated	1204 g
	PAPER/Molded Pulp	722 g
Internal:	PLASTIC/Polyethylene low density - LDPE	40 g

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

The corrugated paper packaging materials contains at least 35% recycled content.

RoHS Compliance

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

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

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

To obtain a copy of the HP RoHS Compliance Statement, see HP RoHS position statement.

System Technical Specifications

Material Usage

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

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

Packaging Usage

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

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

End-of-life Management and Recycling

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

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

	instructions may be used by recyclers and other WEEE treatment facilities as well as HP OEM customers who integrate and re-sell HP equipment.
HP, Inc. Corporate Environmental Information	For more information about HP's commitment to the environment: Global Citizenship Report http://www.hp.com/hpinfo/globalcitizenship/gcreport/index.html Eco-label certifications http://www8.hp.com/us/en/hp-information/environment/ecolabels.html ISO 14001 certificates: http://h20195.www2.hp.com/V2/GetDocument.aspx?docname=c04755842 and http://www.hp.com/hpinfo/globalcitizenship/environment/pdf/cert.pdf
footnotes	• Percentage of ocean-bound plastic contained in each component varies by product • Recycled plastic content percentage is based on the definition set in the IEEE 1680.1-2018 standard. • External power supplies, WWAN modules, power cords, cables and peripherals excluded. • 100% outer box packaging and corrugated cushions made from sustainably sourced certified and recycled fibers. • Fiber cushions made from 100% recycled wood fiber and organic materials.

Technical Specifications - Processors

12th Generation Intel® Core™ Processors

Intel® Core™ i9-12900K Processor
Intel® Core™ i9-12900 Processor
Intel® Core™ i7-12700K Processor
Intel® Core™ i7-12700 Processor
Intel® Core™ i5-12600K Processor
Intel® Core™ i5-12600 Processor
Intel® Core™ i5-12500 Processor
Intel® Core™ i5-12400 Processor
Intel® Core™ i3-12300 Processor
Intel® Core™ i3-12100 Processor

Technical Specifications - Hard Drives

SATA Hard Drives for HP Workstations	**500GB SATA 7200 rpm 6Gb/s 3.5" HDD**	**Capacity**	500GB	
		Protocol	SATA	
		Form Factor	3.5"	
		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" HDD	**Capacity**	1TB	
		Protocol	SATA	
		Form Factor	3.5"	
		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)	

*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" HDD	**Capacity**	2TB	
		Protocol	SATA	
		Form Factor	3.5"	
		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" HDD (Enterprise Class)	**Capacity**	1TB	
	Height	1 in; 2.54 cm	
	Protocol	SATA	
	Form Factor	3.5"	
	Controller	AHCI	
	Reliability	2.0M hours	
	Rated Power On Hours	8760/yr	
	Annualized Failure Rate (based on Rated POH)	<0.62%	
	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	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.

	Capacity	2TB	

Technical Specifications - Hard Drives

2TB SATA 7200 rpm 6Gb/s 3.5" HDD (Enterprise Class)	**Protocol**	SATA	
	Form Factor	3.5"	
	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*
	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" HDD (Enterprise Class)	**Capacity**	4TB
	Protocol	SATA
	Form Factor	3.5"
	Controller	AHCI
	Reliability	2.0M hours
	Rated Power On Hours	8760/yr
	Annualized Failure Rate (based on Rated POH)	<0.62%
	Rated for 24/7/365 Operation	
	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.

8TB SATA 7200 rpm 6Gb/s 3.5" HDD (Enterprise Class)	**Capacity**	8TB	
	Protocol	SATA	
	Form Factor	3.5"	
	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 (6.0Gb/s), NCQ enabled	
	Synchronous Transfer Rate (Maximum)	Up to 600MB/s [1]	
	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[1]
		Sequential Write	up to 226MB/s[1]
	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" HDD	**Capacity**	500GB	
	Protocol	SATA	
	Form Factor	2.5"	
	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	
		Single Track	1ms*

	Seek Time (typical reads, includes controller overhead, including settling)	**Average**	4.2ms*
		Full Stroke	25ms (Typical)*
	Rotational Speed	7,200 rpm	
	Operating Temperature	32° to 131° F (0° to 60° C)	
	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*

*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	2TB

Technical Specifications - Hard Drives

HP Z Turbo Drv PCIE-4X4 2TB TLC PCIe SSD (Z2G9)	**Protocol**	PCIe	
	Form Factor	M.2 in native Slot on motherboard	
	Controller	NVMe	
	NAND Type	3D TLC	
	Endurance	600TBW (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	1200TBW (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.
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	1200TBW (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	

*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	600TBW (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.

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	200TBW (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	300TBW (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
NVIDIA® T400 2GB Graphics	**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	2GB 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
NVIDIA® T400 4GB Graphics	**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
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

Technical Specifications - Graphics

		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® 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 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® 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

Technical Specifications - Graphics

		- 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™ 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 6.5
	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
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 10, Windows 7 Professional 32-bit and 64-bit, Windows Vista Business 64*, Windows Vista Business 32*, Windows Vista Home Basic 32*, Windows 2000, Windows XP Professional or Windows XP Home 32*. Linux® No driver is required for this device. Native support is provided by the operating system.	
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	

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

Technical Specifications - Graphics

	Access Times	**DVD-ROM Single Layer**	< 110 me (typical)
		CD-ROM Mode 1	< 110 ms (typical)
		Full Stroke DVD	< 230 ms (typical)
		Full Stroke CD	< 220 ms (typical)
	Power	**Source**	SATA DC power receptacle
		DC Power Requirements	5 VDC ± 5%-100 mV ripple p-p
		DC Current	5 VDC – <800mA 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 10, Windows 7 Professional 32-bit and 64-bit, Windows Vista Business 64*, Windows Vista Business 32*, Windows Vista Home Basic 32*, Windows 2000, Windows XP Professional or Windows XP Home 32*. Linux® No driver is required for this device. Native support is provided by the operating system.	
	Kit Contents	9.5mm Slim DVD-ROM Drive, slim SATA data/power cable, 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	
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 USH50 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.

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 16.0[1])	**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, Muti-port teaming, RSS, ACPI, Advanced cable diagnostic, loopback modes, AMT 16.0 support, Circuit Breaker, VLAN, Multicast Listener Discovery (MLD)

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

Technical Specifications - Networking and Communications

		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 Driver Support	Windows 11 Windows 10 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 Driver Support	Windows 11 64-Bit Windows 10 64-bit Linux®
	Kit Contents	• Intel® X550-T2 2-Port 10GbE NIC with standard height bracket attached • Low-profile bracket • Product Literature

NVIDIA Mellanox ConnectX-6 DX Dual Port 10/25GbE SFP28 NIC	**Connector**	Dual-port SFP28
	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	
NVIDIA Mellanox 25GbE SFP28 Transceiver	**Operating Temperature**	32°F to 158°F (0°C to 70°C)
	Operating Humidity	5% to 85%, noncondensing
	Dimensions (HxWxD)	0.47 x 0.54 x 2.22 inches
	Kit Contents	NVIDIA Mellanox 25GbE SFP28 Transceiver
NVIDIA Mellanox 10GbE SFP+ SR Transceiver	**Operating Temperature**	32°F to 158°F (0°C to 70°C)
	Operating Humidity	5% to 85%, noncondensing
	Dimensions (HxWxD)	0.47 x 0.54 x 2.22 inches
	Kit Contents	NVIDIA Mellanox 10GbE SFP+ SR 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®
	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

Technical Specifications - Networking and Communications

	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)
	Operating System Driver	Windows 11 64-Bit 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 5.2, 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	
	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 5.2, 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

Technical Specifications - Networking and Communications

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.

Summary of Changes

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
May 19, 2022	From v4 to v5	Changed	Overview section in Packaged Dimensions subsection
June 1, 2022	From v5 to v6	Changed	Operating Systems and SATA Hard Drives sections
June 15, 2022	From v6 to v7	Changed	Networking and Communications section
July 1, 2022	From v7 to v8	Changed	Declared Noise Emissions section