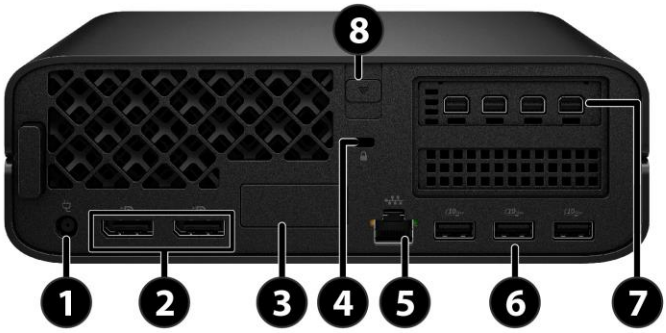
Overview

HP Z2 Mini G1i Workstation

Front-Side View

1. Power button
2. 1 SuperSpeed USB Std-A 10Gbps (charge supports up to 5V/2.1A)
3. 2 SuperSpeed USB Type-C® 20Gbps (charge supports up to 5V/3A)
4. headphone/microphone combo
5. Antenna cover

Overview



Rear View

1. Power connector
2. 2 DisplayPort™ 1.4
3. Flex IO, choice of:
   1 Dual SuperSpeed USB Std-A 5Gbps port, 1 SuperSpeed USB Type-C® 10Gbps port (Alt Mode DisplayPort™1.4 with 15W Output) [1], 1 Dual SuperSpeed USB Type-C® 10Gbps port [1], 1 Thunderbolt™ 4 port (40Gbps) [1], HP Remote System Controller,
   1) 1GbE NIC, (1) 1Gbps Fiber LC NIC, (1) 2.5GbE NIC[1], (1) 10GbE NIC[1],
4. Security cable slot
5. 1 RJ-45
6. 3 SuperSpeed USB Std-A 10Gbps
7. PCIe, choose of:
   1 Dual SuperSpeed USB Std-A 10Gbps, Graphic cards, Serial port
8. Cover release latch

Overview

Operating Systems

Preinstalled:

- Windows 11 Pro 64[1]
- Windows 11 Home 64[1]
- Linux®-ready[2]
- Ubuntu® 24.04 LTS[2,3]

Supported:

- Red Hat® Enterprise Linux® Workstation 9[2]
- SUSE Linux® Enterprise Desktop 15[2]
- Ubuntu® 24.04 LTS[2,3]

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

[2] 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.

[3]A certified preloaded version of Ubuntu® 24.04 LTS is available from HP for this platform. Not all features are available in all editions or versions of Ubuntu. Systems may require upgraded and/or separately purchased hardware, drivers, software or BIOS to take full advantage of Ubuntu functionality. Ubuntu may be automatically updated. ISP fees may apply, and additional requirements may apply over time for upgrades.

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

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

Processors Overview[1,2,3,4,5,6]

Intel® Core™ Ultra 9 Processor 285K with Intel® Graphics (3.2 GHz E-core base frequency, 3.7 GHz P-core base frequency, up to 4.6 GHz E-core Max Turbo frequency, up to 5.5 GHz P-core Max Turbo frequency, 36 MB L3 cache, 8 P-cores and 16 E-cores, 24 threads)

Intel® Core™ Ultra 9 Processor 285 with Intel® Graphics (1.9 GHz E-core base frequency, 2.5 GHz P-core base frequency, up to 4.6 GHz E-core Max Turbo frequency, up to 5.4 GHz P-core Max Turbo frequency, 36 MB L3 cache, 8 P-cores and 16 E-cores, 24 threads)

Intel® Core™ Ultra 7 Processor 265K with Intel® Graphics (3.3 GHz E-core base frequency, 3.9 GHz P-core base frequency, up to 4.6 GHz E-core Max Turbo frequency, up to 5.4 GHz P-core Max Turbo frequency, 30 MB L3 cache, 8 P-cores and 12 E-cores, 20 threads)

Intel® Core™ Ultra 7 Processor 265 with Intel® Graphics (1.8 GHz E-core base frequency, 2.4 GHz P-core base frequency, up to 4.6 GHz E-core Max Turbo frequency, up to 5.2 GHz P-core Max Turbo frequency, 30 MB L3 cache, 8 P-cores and 12 E-cores, 20 threads)

Intel® Core™ Ultra 5 Processor 245K with Intel® Graphics (3.6 GHz E-core base frequency, 4.2 GHz P-core base frequency, up to 4.6

Overview

GHz E-core Max Turbo frequency, up to 5.2 GHz P-core Max Turbo frequency, 24 MB L3 cache, 6 P-cores and 8 E-cores, 14 threads)

Intel® Core™ Ultra 5 Processor 245 with Intel® Graphics (3.0 GHz E-core base frequency, 3.5 GHz P-core base frequency, up to 4.5 GHz E-core Max Turbo frequency, up to 5.1 GHz P-core Max Turbo frequency, 24 MB L3 cache, 6 P-cores and 8 E-cores, 14 threads)

Intel® Core™ Ultra 5 Processor 235 with Intel® Graphics (2.9 GHz E-core base frequency, 3.4 GHz P-core base frequency, up to 4.4 GHz E-core Max Turbo frequency, up to 5.0 GHz P-core Max Turbo frequency, 24 MB L3 cache, 6 P-cores and 8 E-cores, 14 threads)

Intel® Core™ Ultra 5 Processor 225 with Intel® Graphics (2.7 GHz E-core base frequency, 3.3 GHz P-core base frequency, up to 4.4 GHz E-core Max Turbo frequency, up to 4.9 GHz P-core Max Turbo frequency, 20 MB L3 cache, 6 P-cores and 4 E-cores, 10 threads)

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

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

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

[4] 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.

[5] Processor speed denotes maximum performance mode; processors will run at lower speeds in battery optimization mode.

[6]Features and software that require a NPU may require software purchase, subscription or enablement by a software or platform provider, and third party software may have specific configuration or compatibility requirements. Performance varies by use, configuration, and other factors.

Expansion Slots	• 1 PCI Express Gen5 slot x16 mechanical/ x8 electrical (Low-profile HP graphics cards only*) * The HP Mini discrete graphics cards come with custom rear connector bulkhead. (see system board section for more details)
Side I/O	1 headphone/microphone combo 1 SuperSpeed USB Std-A 10Gbps port (charge supports up to 5V/2.1A) 2 SuperSpeed USB Type-C® 20Gbps port (charge supports up to 5V/3A),
Internal I/O [5]	
Rear I/O	(2) Display Port 1.4, (1) RJ-45, (3) SuperSpeed USB Std-A 10Gbps port
Optional I/O	Flex IO* – choose one of the following options: (1) Dual SuperSpeed USB Std-A 5Gbps port , (1) Dual SuperSpeed USB Type-C® 10Gbps port [1], (1) SuperSpeed USB Type-C® 10Gbps port (Alt Mode DisplayPort™ 1.4 with 15W Output) [1], (1) Thunderbolt™ 4[1], (1) USB-based Serial port option, (1) Displayport 2.1 port, (1) HDMI 2.1 port, (1) VGA port, (1) 1GbE NIC, (1) 1Gbps Fiber LC NIC *, (1) 2.5GbE NIC[1], (1) 10GbE NIC * Through 1 PCIe bulkhead space– choose one of the following options: (1) serial port, (1) Dual SuperSpeed USB Std-A 10Gbps port
Interfaces Supported	

Overview

On-board RAID Support	Factory integrated RAID 0, 1 for NVME drives
Chassis Dimensions (H x W x D)	H: 2.7" [6.9cm] W: 8.3" [21.1cm] D: 8.6" [21.8cm] (Standard desktop orientation)
Packaged Dimensions	L: 19.6" (49.9cm) W: 6.7" (16.9cm) H: 11.7" (29.7cm)
Rack Dimensions	5U, 6 units per shelf
Weight	Exact weights depend upon configuration (System weight only). Starting at 2.4 kg (5.29 lb)
Temperature	Operating: 5° to 35° C (40° to 95° F) Above 1524 m (5,000 feet) altitude, the maximum operating temperature is reduced by 1° C (1.8° F) for every 305 m (1,000 feet) increase in elevation Non-operating: -40° to 60° C (-40° to 140° F) Maximum rate of change: 10°C/hr
Humidity	Operating: 8% to 85% RH, non-condensing, 35° C maximum wet bulb Non-operating: 8% to 90% RH, non-condensing, 35° C maximum wet bulb
Maximum Altitude (non-pressurized)[6]	Operating (with Rotational Hard Drives): 3,048 m (10,000 feet) Operating (with only Solid-State Drives): 5,000 m (16,404 feet) Non-operating: 12,192 m (40,000 feet) Maximum operating temperature is reduced as altitude increases. See Temperature for details.
Power Adapter	280W 89% Average Efficiency. Power Adapter is external to the product.
Backup Devices	
Chipset	Intel® W880 Chipset
Memory	up to 96GB nECC at launch(or up to 128GB nECC, 64GB ECC later), DDR5 unbuffered DIMM memory.

Supported Components

Processors	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
Intel® Core™ Ultra Desktop Processors (series 2)				
Intel® Core™ Ultra 9 285K Processor	Y	N		
Intel® Core™ Ultra 9 285 Processor	Y	N		
Intel® Core™ Ultra 7 265K Processor	Y	N		
Intel® Core™ Ultra 7 265 Processor	Y	N		
Intel® Core™ Ultra 5 245K Processor	Y	N		
Intel® Core™ Ultra 5 245 Processor	Y	N		
Intel® Core™ Ultra 5 235 Processor	Y	N		
Intel® Core™ Ultra 5 225 Processor	Y	N		1

NOTE 1: support only non-ECC memory

PCIe Solid State Drives	Factory Configured	Option Kit	Option Kit Part Number
Z Turbo 512GB 2280 PCIe-4x4 TLC M.2 Z2 Mini Kit SSD	Y	Y	4M9Z5AA
Z Turbo 1TB 2280 PCIe-4x4 TLC M.2 Z2 Mini Kit SSD	Y	Y	4M9Z6AA
Z Turbo 1TB 2280 PCIe-4x4 TLC M.2 Z2 Mini Kit SSD	Y	Y	4M9Z7AA
Z Turbo 512GB 2280 PCIe-4x4 SED OPAL2 TLC M.2 Z2 Mini Kit SSD	Y	Y	4M9Z9AA
Z Turbo 1TB 2280 PCIe-4x4 SED OPAL2 TLC M.2 Z2 Mini Kit SSD	Y	Y	4N000AA
Z Turbo 2TB 2280 PCIe-4x4 SED OPAL2 TLC M.2 Z2 Mini Kit SSD	Y	Y	4N001AA
HP 512GB 2280 PCIe-4x4 Value M.2 Z2 MINI Kit SSD	Y	Y	4N008AA
HP 256GB 2280 PCIe-4x4 Value M.2 Z2 MINI Kit SSD	Y	Y	4N009AA
HP 1TB 2280 PCIe-4x4 Value M.2 Z2 MINI Kit SSD	Y	Y	4N010AA
Z Turbo 4TB 2280 PCIe-4x4 TLC M.2 Z2 MINI Kit SSD	Y	Y	5S493AA

Supported Components

Z Turbo 4TB 2280 PCIe-4x4 SED OPAL2 TLC M.2 Z2 MINI Kit SSD	Y	Y	5S499AA
Z Turbo 512GB 2280 PCIe-4x4 TLC M.2 China Z2 MINI Kit SSD	Y	Y	906H3AA
Z Turbo 1TB PCIe-4x4 TLC M.2 China Z2 MINI Kit SSD	Y	Y	906H9AA
HP Z Turbo 2TB 2280 PCIe-4x4 TLC M.2 China Z2 MINI Kit SSD	Y	Y	906J2AA
256GB 2280 PCIe-4x4 NVMe Value M.2 China Z2 MINI Kit SSD	Y	Y	906J8AA
HP 1TB 2280 PCIe-4x4 NVMe Value M.2 China Z2 MINI Kit SSD	Y	Y	906J9AA
512GB 2280 PCIe-4x4 NVMe Value M.2 China Z2 MINI Kit SSD	Y	Y	906K0AA
HP Z Turbo 1TB 2280 PCIe-5x4 TLC M.2 Z2 G12 MINI Kit SSD	Y	Y	A9TN7AA
HP Z Turbo 1TB 2280 PCIe-5x4 SED OPAL2 TLC M.2 Z2 G12 MINI Kit SSD	Y	Y	A9TN6AA
HP Z Turbo 2TB 2280 PCIe-5x4 TLC M.2 Z2 G12 MINI Kit SSD	Y	Y	A9TN9AA
HP Z Turbo 2TB 2280 PCIe-5x4 SED OPAL2 TLC M.2 Z2 G12 MINI Kit SSD	Y	Y	A9TN8AA

Graphics		Factory Configured	Option Kit	Option Kit Part Number	Supported # of cards	Support Notes
Graphics Cable Adapters	HP DisplayPort To VGA Adapter	Y	Y	AS615AA		
	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		
	HP Single miniDP-to-DP Adapter Cable	Y	Y	2MY05AA		
	HP DP to HDMI 2.0	Y	N			
Entry 3D	NVIDIA RTX A400 4 GB with Mini Bracket 4mDP Graphics	Y	Y	AV8J3AA	1	
Mid-range 3D	NVIDIA RTX A1000 8 GB with Mini Bracket 4mDP Graphics	Y	Y	AV8J4AA	1	
	NVIDIA RTX 2000 Ada 16 GB 4mDP Graphics	Y	Y	8D6B8AA	1	1
High-End 3D	NVIDIA RTX 4000 SFF Ada 20 GB 4mDP Graphics	Y	Y	8C1W1AA	1	1

Supported Components

Note 1: Discrete graphics cards require a Performance Base Unit chosen at time of order. Performance Base Units include a PCIe backplane riser and requires aa 280W power adapter. Standard Base Units are not capable of supporting discrete graphics

Memory	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
8GB DDR5 (1x8GB) 6400 CSODIMM NECC Memory	Y	N		
16GB (1x16GB) DDR5 6400 CSODIMM NECC Memory - NEW AMO	Y	Y	A9TM6AA	
32GB (1x32GB) DDR5 6400 CSODIMM NECC Memory - NEW AMO	Y	Y	A9TM7AA	
48GB (1x48GB) DDR5 6400 CSODIMM NECC Memory - NEW AMO	Y	Y	A9TM8AA	

Optical and Removable Storage	Factory Configured	Option Kit	Option Kit Part Number
HP USB External DVDRW Drive	N	Y	F2B56AA
HP USB External DVDRW Drive	N	Y	Y3T76AA

Networking and Communications	Factory Configured	Option Kit	Option Kit Part Number
HP 10GBase-T Flex IO	Y	Y	56Q71AA
HP Z2 2.5GbE LAN Flex Port	Y	Y	B96W7AA
HP 1GbE LAN Flex Port 2020	Y	Y	141J6AA
HP Flex 1GbE Fiber LC Single Port	Y	Y	20J15AA
Intel® Wi-Fi 6E AX211 BT 5.3 wireless card M.2 non-vPro	Y	N	
Intel® Wi-Fi 7 BE200 BT 5.4 wireless card M.2 non-vPro	Y	N	

NOTE: Specific Network on Modern standby feature Support limitation
HP 10GBase-T Flex IO NIC does not support modern standby. And system equipped with those non modern standby network card, when monitor off and it is not really entered Modern standby state for wake-up function support,

Supported Components

another path suggestion is Customer can use Onboard Lan for Wake event instead of legacy function WOL limitation because those commodities might not meet the required compliance standards in system modern standby configuration.

Input Devices

	Factory Configured	Option Kit	Option Kit Part Number
HP 685 Comfort Dual-Mode Keyboard	N	Y	8T6L9UT
HP 725 Multi-Device Rechargeable Wireless Keyboard	N	Y	9T5B2AA
HP Bus Slim v2 Smart Card USB Keyboard	Y	Y	A71J9AA
HP 125 G2 USB Wired Keyboard	Y	Y	AY2Y7AA
HP 320K G2 USB Wired Keyboard	Y	Y	9SR37UT
HP 685 Comfort Dual-Mode Keyboard and Mouse Combo	N	Y	8T6L7UT
HP 725 Multi-Device Rechargeable Wireless Keyboard and Mouse Combo	Y	Y	9T5B0UT
HP 655 Wireless Keyboard and Mouse Combo G2	N	Y	4R009UT
HP Wired Desktop 320MK Mouse and Keyboard G2	N	Y	9SR36UT
HP Wired 320M Mouse	Y	Y	9VA80AA
HP Creator 935 Black Wireless Mouse	N	Y	1D0K8AA
HP 128 LSR Wired Mouse	Y	Y	265D9AA
HP 125 Wired Mouse	Y	Y	265A9AA/AT/UT

Flex Module (Rear IO)

	Factory Configured	Option Kit	Option Kit Part Number
HP Serial Port v3 Flex IO	Y	Y	5B895AA
HP 10GBase-T Flex IO	Y	Y	56Q71AA
HP Z2 2.5GbE LAN Flex Port	Y	Y	B96W7AA
HP 1GbE LAN Flex Port 2020	Y	Y	141J6AA
HP Flex 1GbE Fiber LC Single Port	Y	Y	20J15AA

Other Hardware

	Factory Configured	Option Kit	Option Kit Part Number
HP Z2 Mini Remote System Controller Main Board Adapter	Y	Y	A6QT4AA
HP Z2 Mini Remote System Controller	Y	Y	7K6E4AA
HP Z2 Mini ePSU Sleeve	Y	Y	3RW68AA

Supported Components

HP B550 Z Display PC Mounting Bracket	N	Y	16U00AA
HP B560 PC Mounting Bracket	N	Y	763U8AA
HP Z Display B600 PC Mounting Bracket	N	Y	529H3AA
HP Z2 Mini Arm/Wall VESA Mount Solution	N	Y	4N004AA
HP Z2 Mini Vertical Stand	N	Y	4N006AA
HP Z2 Mini Serial Port v2 Adapter	Y	Y	4M9Y9AA
HP Z2 Mini Dual Type-A SuperSpeed USB 10Gbps Port	Y	Y	4M9Z0AA

Racking and Physical Security	**Factory Configured**	**Option Kit**	**Option Kit Part Number**
HP Z2 G1i Mini Rail Rack Kit	N	Y	A9TM4AA
HP Rack Cable Management Arm	N	Y	35Z34AA
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

Software	**Factory Configured**	**Option Kit**	**Support Notes**
HP PC Hardware Diagnostics UEFI	Y	N	1
HP PC Hardware Diagnostics Windows	Y	N	
HP Wolf Security	Y	N	
HP Notifications	Y	N	
HP Desktop Support Utility	Y	N	
HP Documentation	Y	N	
myHP	Y	N	
Kingsoft WPS Office	Y	N	2
Z by HP Data Science Stack Manager	Y	N	3
HP Image Assistant	N	N	
HP Support Assistant	N	N	

[1] Windows OS only
[2] Only available in China
[3] Optional software

Operating Systems Windows 11 Pro 64[1]

Supported Components

Windows 11 Home 64 - HP recommends Windows 11 Pro[1]

Linux®-ready[4]

Ubuntu® 24.04 LTS[2,3]

[1] Not all features are available in all editions or versions of Windows. Systems may require upgraded and/or separately purchased hardware, drivers, software or BIOS update to take full advantage of Windows functionality. Windows 11 is automatically updated, which is always enabled. ISP fees may apply and additional requirements may apply over time for updates. See http://www.windows.com.
[2] 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 requires may apply over time for updates.
[3] A certified preloaded version of Ubuntu® 24.04 LTS is available from HP for this platform. Not all features are available in all editions or versions of Ubuntu. Systems may require upgraded and/or separately purchased hardware, drivers, software or BIOS to take full advantage of Ubuntu functionality. Ubuntu may be automatically updated. ISP fees may apply, and additional requirements may apply over time for upgrades.
[4]For detailed OS/hardware support information for Linux, see:
http://www.hp.com/support/linux_hardware_matrix

HP BIOS

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

HP Performance Control Modes

HP Z Desktop Workstations offers Performance Control Modes in the F10 BIOS menu. Z2 G1i offers Quiet Mode, Performance Mode, Rack Mode, and High-Performance Mode. HP recommends using High Performance Mode unless you have concerns about acoustics in an open office environment. Customers can achieve CPU performance gains in multithreaded workloads using High Performance Mode over Performance Mode*. High Performance Mode is configured as default from the factory.

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

At startup, push the F10 key while system is booting to get to the BIOS Menu.
Go to → Advanced -> System Options ->scroll down and choose “Performance Control”

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

How to change Performance Modes in HP Performance Advisor software?
Select BIOS Settings -> Advanced -> System Options -> Performance Controls

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

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

SOFTWARE COMPONENTS AND APPLICATIONS WITH WINDOWS

Software
HP Support Assistant [1]
HP Image Assistant
HP Desktop Support Utility
HP Documentation
HP Notifications
HP PC Hardware Diagnostics UEFI
HP PC Hardware Diagnostics Windows
myHP
WSL/Ubuntu Data Science Stack
HP Privacy Settings

Manageability Features
HP Driver Packs[2]
HP UWP Pack
HP System Software Manager (SSM)
HP Manageability Integration Kit[3]
HP Client Catalog (download)
HP Image Assistant (download)
HP Cloud Recovery

Supported Components

HP Client Management Script Library (download)
HP BIOSphere[4]
BIOS Configuration Utility (download)

Client Security Software
HP Client Security Suite[5] including: (including Credential Manager, HP Password Manager[6], HP Spare Key)
HP Power On Authentication
Microsoft Defender[7]

Security Management
HP Secure Erase[8]
HP Wolf Pro Security Edition (optional) [9]
HP Wolf Security for Business[10] Includes:
HP Sure Click[11]
HP Sure Sense[12]
HP Sure Run[13]
HP Sure Recover[14]
HP Sure Start[15]
HP Tamper Lock
HP Sure Admin [16]
HP Client Security Manager[17]
Hood Sensor Optional Kit

[1] HP Support Assistant requires Windows and Internet access.

[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 BIOSphere features may vary depending on the platform and configurations.

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

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

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

[8] HP Secure Erase - –or the methods outlined in the National Institute of Standards and Technology Special Publication 800-88 “C“ear” ”anitation method. HP Secure Erase does not support platforms with Intel® Optane.

[9] HP Wolf Pro Security Edition is available preloaded on select SKUs, and, depending on the HP product purchased, includes a license with a term length communicated to you at purchase and in your order confirmation email. The HP Wolf Pro Security Edition software is licensed under the license terms of the HP Wolf Security Software - End-User license Agreement (EULA) that can be found at: https://support.hp.com/us-en/document/ish_3875769-3873014-16 as that EULA is modified by the following: 7. Term. Unless otherwise terminated earlier pursuant to the terms contained in this EULA, the license for the HP Wolf Pro Security Edition is effective upon 4 months after the date the HP Product was shipped by HP and will continue for the term communicated to you at purchase and in

your order confirmation email (“Initial Term”). At the end of the Initial Term you may either (a) purchase a renewal license for the HP Wolf Pro Security Edition from HP.com, HP Sales or an HP Channel Partner, or (b) continue using the standard versions of HP Sure Click and HP Sure Sense at no additional cost with no future software updates or HP Support. Notwithstanding the foregoing, the license shall expire no later than one year after the fixed term of the subject license ends.

[10] 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

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

[14] HP Sure Recover 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

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

[16] 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.

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

System Technical Specifications

System Board

System Board Form Factor	198.65 x 192.21 mm (7.82 x 7.567 inch)
Processor Socket	Single LGA-1851
CPU Bus Speed	DMI 4.0
Chipset	Intel® PCH W880
Super I/O Controller	Nuvoton SIO24
Memory Expansion Slots	2 DDR5 memory slots
Memory Type Supported	DDR5, CSODIMM ECC & non-ECC
Memory Modes	Non-Interleaved for single channel. Interleaved when both channels are populated.
Memory Speed Supported	6400MT/s DDR5
Memory Protection	ECC available on data
Maximum Memory	128GB
Memory Configuration (Supported)	8GB, 16GB, 32GB, 48GB and 64GB non-ECC/16GB, 32GB ECC unbuffered DIMMs are supported. ECC and non-ECC memory DIMMs cannot be mixed on the same system.
PCI Express Connectors	• 1 PCI Express Gen5 slot x16 mechanical/ x8 electrical (Low-profile, full length, Riser only) • 2 M.2 NVMe Storage (PCIe Gen5 x4) • 1 M.2 WLAN (PCIe Gen4x1 + Intel CNVi) In the PCIe Gen5 (x16 mechanical/x8 electrical) slot, it intent to supported HP certified dGFX card.
Supported Interfaces	PCIe

Integrated RAID	RAID 0, 1
Integrated Graphics	Intel® Graphics (on Core U9-285K/U7-265K/U5-254K/U9-285/U7-265/U5-245/U5-235/U5-225 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® Graphics; 2x DP 1.4 graphics ports integrated in motherboard; Supports up to four simultaneous displays across DisplayPort*/HDMI*/DVI outputs. Max. resolution supported on onboard DP 1.4/HBR3 ports: 3840 x2160 @ 60Hz. Max. resolution supported on flexIO DP 2.1/UHBR20 ports: 8K60Hz compressed, 5K120Hz compressed
Network Controller	Integrated Ethernet PHY Connection I219-LM. Management capabilities: WOL, PXE 2.1 and AMT 19
Serial	1 internal header (requires optional Serial Port Adapter Kit with PCIe Bracket)

System Technical Specifications

	2nd Serial	USB-based Serial port option through Flex IO
	HD Integrated Audio	Yes
USB Connector(s)	**Side**	1 SuperSpeed USB Std-A10Gbps port (support charging) 2 SuperSpeed USB Type-C® 20Gbps port (charge support up to 5V/3A)
	Rear	3 SuperSpeed USB Std-A 10Gbps port Flex IO, choice of: 1 Dual SuperSpeed USB Std-A 5Gbps port, 1 SuperSpeed USB Type-C® 10Gbps port (Alt Mode DisplayPort™1.4 with 15W Output) [1],1 Dual SuperSpeed USB Type-C® 10Gbps port [1], 1 Thunderbolt™ 4 port (40Gbps) [1] PCIe, choose of: 1 Dual SuperSpeed USB Std-A 10Gbps

HD Integrated Audio	Yes
Flash ROM	Yes
CPU Fan Header	Yes
Memory Fan Header	None
Chassis Fan Header	None
Front PCI Fan Header	None
Front Control Panel/Speaker Header	Yes
CMOS Battery Holder - – ithium	Yes
Integrated Trusted Platform Module	Integrated TPM 2.0 Convertible to FIPS 140-2 Certified mode The TPM module disabled where restricted by law
Power Supply Headers	DC Jack for adapter
Power Switch, Power LED & Hard Drive LED Header	Yes
Clear Password Jumper	None
Keyboard/Mouse	USB
Power Supply	280W 89% Average Efficiency

System Configurations

System Technical Specifications

HP Z2 Mini G1i Configuration #1	**Processor Info**	Intel Core Ultra 5 10C 3.3GHz LGA 65 W
	Memory Info	1x 16GB DDR5 NECC
	Graphics Info	1x NVIDIA RTX A400
	Disks/Optical/Floppy	1x 256GB PCIe-4x4 2280 Value M.2 SSD
	Power Supply	280W

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)	12.16		12.09		13.87	
	Windows short Idle (S0)	16.81		15.63		16.75	
	Windows Busy Typ (S0)	70.40		77.8		72.83	
	Windows Busy Max (S0)	92.5		95.28		96.51	
	Sleep (S3)	2.53	2.19	2.73	2.53	2.19	2.73
	Off (S5)	0.8	0.73	0.83	0.8	0.73	0.83
	Zero Power Mode (EuP)	0.16		0.18		0.15	

Heat Dissipation (Btu/hr)		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	41.49		41.25		47.33	
	Windows short Idle (S0)	57.36		52.41		57.15	
	Windows Busy Typ (S0)	240.21		265.46		248.51	
	Windows Busy Max (S0)	315.62		325.11		329.31	
	Sleep (S3)	8.63	7.47	9.32	8.63	7.47	9.32
	Off (S5)	2.73	2.49	2.83	2.73	2.49	2.83
	Zero Power Mode (EuP)	0.55		0.61		0.51	

HP Z2 Mini G1i Configuration #2	**Processor Info**	Intel Core Ultra 7 20C 2.4GHz LGA 65W
	Memory Info	1x 32GB DDR5 NECC
	Graphics Info	1x NVIDIA RTX A1000
	Disks/Optical/Floppy	1x 1TB 2280 PCIe-4x4 Val M.2 SSD
	Power Supply	280W

System Technical Specifications

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)	12.24		11.29		11.59	
	Windows short Idle (S0)	13.43		14.45		13.97	
	Windows Busy Typ (S0)	124.25		176.88		126.66	
	Windows Busy Max (S0)	156.46		240.1		273.1	
	Sleep (S3)	1.82	1.72	1.75	1.82	1.72	1.75
	Off (S5)	0.66	0.67	0.67	0.66	0.67	0.67
	Zero Power Mode (EuP)	0.16		0.19		0.15	

Heat Dissipation (Btu/hr)		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	41.76		38.52		39.55	
	Windows short Idle (S0)	45.83		49.31		47.67	
	Windows Busy Typ (S0)	423.96		603.54		432.18	
	Windows Busy Max (S0)	533.86		819.26		931.86	
	Sleep (S3)	6.21	5.87	5.97	6.21	5.87	5.97
	Off (S5)	2.25	2.29	2.29	2.25	2.29	2.29
	Zero Power Mode (EuP)	0.55		0.65		0.51	

HP Z2 Mini G1i Configuration #3	**Processor Info**	Intel Core Ultra 9K 24C 3.7GHz LGA 125W					
	Memory Info	2x 48GB DDR5 NECC					
	Graphics Info	1x NVIDIA RTX 4000 SFF Ada					
	Disks/Optical/Floppy	2x 4TB 2280 PCIe-4x4 OPAL2 M.2 SSD					
	Power Supply	280W					
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)	16.23		15.94		16.22	
	Windows short Idle (S0)	17.44		17.69		19.21	

System Technical Specifications

	Windows Busy Typ (S0)	257.82		258.04		262.74	
	Windows Busy Max (S0)	327.4		308		315.7	
	Sleep (S3)	1.88	2.05	2.99	2.26	2.79	2.35
	Off (S5)	0.77	0.69	0.75	0.72	0.74	0.71
	Zero Power Mode (EuP)	0.16		0.19		0.16	

Heat Dissipation (Btu/hr)		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	55.38		54.39		55.34	
	Windows short Idle (S0)	59.51		60.36		65.55	
	Windows Busy Typ (S0)	879.72		880.47		896.51	
	Windows Busy Max (S0)	1,117.14		1,050.94		1,077.21	
	Sleep (S3)	6.41	6.99	10.20	7.71	9.52	8.02
	Off (S5)	2.63	2.35	2.56	2.46	2.52	2.42
	Zero Power Mode (EuP)	0.55		0.65		0.55	

Operating Voltage Range	90-264VAC
Rated Voltage Range	100-240VAC
Rated Line Frequency	50-60 Hz
Operating Line Frequency Range	47-63 Hz
Rated Input Current	4A
Heat Dissipation	Typical: 896.51 btu/hr (225.92 kcal/hr) Maximum: 1117.14 btu/hr (281.519 kcal/hr)
ENERGY STAR® certified (Config Dependent)	Yes
CECP Compliant @ 220V	Yes
FEMP Standby Power Compliant	Yes, with Wake-on-LAN disabled: <1W in S4/S5 - Power Off
Built-in Self Test (BIST)	No
LED	
Surge Tolerant Full	Yes

System Technical Specifications

Ranging Power Supply (withstands power surges up to 2000V)	
ErP Lot 6- Tier 1 Compliance @ 230V (<1W in S5 - –ower Off)	Yes
ErP Lot 6- Tier 2 Compliance @ 230V (<0.5W in S5 - –ower Off)	Yes

Declared Noise Emissions (Entry-level, Mid-level, and High-end configurations; tested on floor)

System Configuration (Entry-level)	**Processor Info**	Intel Core Ultra9 285/65W
	Memory Info	Hynix DDR5 6400 48GB x2
	Graphics Info	NA
	Disks/Optical	PHISON PSEIN004TP87MC0(4TB) x2
	Power Supply	280W

Declared Noise Emissions		**Sound Power** (LWAd, bels)	**Deskside Sound Pressure** (LpAm, decibels)
	Idle	2.6	15.8
	Hard drive Operating (Drive Random Seek)	3.8	28.2
	Hard drive Operating (Active mode)	N/A	N/A

System Configuration (Mid-end)	**Processor Info**	Intel Core Ultra9 285/65W
	Memory Info	Hynix DDR5 6400 48GB x2
	Graphics Info	NVIDIA RTX2000
	Disks/Optical	PHISON PSEIN004TP87MC0(4TB) x2
	Power Supply	280W

Declared Noise Emissions		**Sound Power** (LWAd, bels)	**Deskside Sound Pressure** (LpAm, decibels)
	Idle	2.9	18
	Hard drive Operating	3.8	28.2

System Technical Specifications

	(Drive Random Seek)		
	Hard drive Operating (Active mode)	N/A	N/A

System Configuration (High-end)	**Processor Info**	Intel Core Ultra9 285/125W
	Memory Info	Hynix DDR5 6400 48GB x2
	Graphics Info	NVIDIA RTX4000
	Disks/Optical	PHISON PSEIN004TP87MC0(4TB) x2
	Power Supply	280W

Declared Noise Emissions		**Sound Power** (LWAd, bels)	**Deskside Sound Pressure** (LpAm, decibels)
	Idle	3	17.9
	Hard drive Operating (Drive Random Seek)	3.7	27.5
	Hard drive Operating (Active mode)	N/A	N/A

Environmental Requirements	**Temperature**	Operating: 5° to 35° C (40° to 95° F) Non-operating: -40° to 60° C (-40° to 140° F) Maximum rate of change: 10°C/hr
	Humidity	Operating: 8% to 85% RH, non-condensing, 35° C maximum wet bulb Non-operating: 8% to 90% 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, 2ms Non-operating: ½-sine: 165 cm/s, 2-3ms square: 422 cm/s, 30g Vibration Operating random: 0.5g (rms), 5-300 Hz, up to 0.00025g²/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 replacment storage and memory information)
Optical Drive	None
Hard Drives	None
Expansion Cards	M.2 module requires a screwdriver to be serviced and replaced. An option card requires a screwdriver to service and replace.
Processor Socket	Tool-less, except for the processor heatsink and fan
Blue User Touch Points	Yes, on internal chassis mechanisms
Color-coordinated Cables and Connectors	Yes
Memory	Tool-less
System Board	Screw-In
Dual Color Power and SSD LED	The Power LED is on the front of the system, and the SSD LED is located on the rear of the system (inside)
Dual Function Front Power Switch	Yes, causes a fail-safe power off when held for 4 seconds (default) or 15 seconds (can be configured by F10 BIOS setup\Advanced\System Options\Power button override)
Cable Lock Support	Yes, Kensington Cable Lock (optional): Locks top cover and secures chassis from theft 3 mm x 7 mm slot at rear of system
Solenoid Lock and Hood Sensor	Only Hood Sensor(optional)
Rear Port Control Cover	None
Power-On Password	Yes, prevents an unauthorized person from booting up the workstation
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
Access Panel Key Lock	The Kensington lock slot on the chassis serves this purpose
Integrated Chassis Handles	None
Power Supply	None
PCI Card Retention	None
Setup Password	Yes, prevents an unauthorized person from changing the workstation configuration

Service, Support, and Warranty

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

NOTE 1: Terms and conditions may vary by country. Certain restrictions and exclusions apply.
NOTE 2: On-site service may be provided pursuant to a service contract between HP and an authorized HP third-party provider, and is not available in certain countries. Global service response times are based on commercially reasonable best effort and may vary by country.
NOTE 3: Technical telephone support applies only to HP-configured, HP and HP-qualified, third-party hardware and software. Toll-free calling and 24x7 support service may not be available in some countries. HP Care Pack Services extend service contracts beyond the standard warranties. Service starts from date of hardware purchase. To choose the right level of service for your HP product, use the HP Care Pack Services Lookup Tool at: http://www.hp.com/go/lookuptool. Service levels and response times for HP Care Packs may vary depending on your geographic location.

Certification and Compliance

Environmental Sustainability questions concerning:

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

Please contact sustainability@hp.com

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

- Declarations of Conformity (for self-service, go to https://www.hp.com/uk-en/certifications/technical/regulations-certificates.html?jumpid=ex_r135_uk/en/any/corp/hpuk-mu_chev/certificates)
- GS Certificates
- Product Safety Certificates (UL, CB, BIS, etc.)
- EMC Certificates, Declarations of Conformity, or Certificates of Conformity (CE, FCC, ICES, etc.)
- CCC Certificates
- Ergonomics
-

Please contact techregshelp@hp.com

System Technical Specifications

BIOS

BIOS 64-bit Services	BIOS supports 64-bit Operating systems.
PCI 3.0 Support	Full BIOS support for PCI Express through industry standard interfaces
ATAPI	ATAPI Removable Media Device BIOS Specification Version 1.0.
WMI Support	WMI is Microsoft's implementation of Web-Based Enterprise Management (WBEM) for Windows. WMI is fully compliant with the Distributed Management Task Force (DMTF) Common Information Model (CIM) and WBEM specifications.
BIOS Power On	Users can define a specific date and time for the system to power on.
ROM Based Computer Setup Utility (F10)	Review and customize system configuration settings controlled by the BIOS.
System/Emergency ROM Flash Recovery with Video	Recovers system BIOS in corrupted Flash ROM.
Replicated Setup	Saves BIOS settings to USB flash device in human readable file (HpSetup.txt). BiosConfigurationUtility.exe utility can then replicate these settings on machines being deployed without entering Computer Configuration Utility (F10 Setup).
Boot Control	Disables the ability to boot from removable media on supported devices.
Memory Change Alert	Alerts management console if memory is removed or changed.
Thermal Alert	Monitors the temperature state within the chassis. Three modes: • NORMAL – normal temperature ranges. • ALERTED – excessive temperatures are detected. Raises a flag so action can be taken to avoid shutdown or provide for a smoother system shutdown. • SHUTDOWN – excessive temperatures are encountered. Automatically shuts down the computer without warning before hardware component damage occurs
Remote ROM Flash	Provides secure, fail-safe ROM image management from a central network console.
ACPI (Advanced Configuration and Power Management Interface)	Allows the system to enter and resume from low power modes (sleep states). Enables an operating system to control system power consumption based on the dynamic workload. Makes it possible to place individual cards and peripherals in a low-power or powered-off state without affecting other elements of the system. Supports ACPI 6.0 for full compatibility with 64-bit operating systems.
Ownership Tag	A user-defined string stored in non-volatile memory that is displayed in the BIOS splash screen.
Remote Wakeup/Remote Shutdown	System administrators can power on, restart, and power off a client computer from a remote location.
Instantly Available PC (Suspend to RAM - –CPI sleep state Modern Standby)	Allows for very low power consumption with quick resume time.
Remote System Installation via F12 (PXE 2.1) (Remote Boot from	Allows a new or existing system to boot over the network and download software, including the operating system.

System Technical Specifications

Server)	
ROM revision levels	Reports the system BIOS revision level in Computer Configuration Utility (F10 Setup). Version is available through an industry standard interface (SMBIOS and WMI) so that management SW applications can use and report this information.
System board revision level	Allows management SW to read revision level of the system board. Revision level is digitally encoded into the HW and cannot be modified.
Start-up Diagnostics (Power-on Self-Test)	Assesses system health at boot time with selectable levels of testing.
Auto Setup when new hardware installed	System automatically detects addition of new hardware.
Keyboard-less Operation	The system can be booted without a keyboard.
Localized ROM Setup	Common BIOS image supports System Configuration Utility (F10 Setup) menus in 15 languages with local keyboard mappings.
Asset Tag	The user or MIS to set a unique tag string in non-volatile memory.
Per-slot Control	Allows I/O slot parameters (option ROM enable/disable, bus latency) to be configured individually
Adaptive Cooling	Control parameters are set according to detected hardware configuration for optimal acoustics.
Pre-boot Diagnostics	(Pre-video) critical errors are reported via beeps and blinks on the power LED.
UEFI Specification Revision	2.9
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 (Both 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 (Nuvoton NPCT760HACYX or Infineon SLB9672). Common Criteria EAL4+ certified.

	FIPS 140-2 Certification TCG TPM Certified products list: http://www.trustedcomputinggroup.org/certification/tpm-certified-products/
UHCI	Universal Host Controller Interface Design Guide, Revision 1.1
USB	Universal Serial Bus Revision 1.1 Specification Universal Serial Bus Revision 2.0 Specification Universal Serial Bus Revision 3.1 Specification Universal Serial Bus Revision 3.2 Specification
SMBIOS	System Management BIOS Reference Specification, Version 3.8
	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

- Product Carbon Footprint
- At least 5% ocean bound plastic in the speaker[1]
- At least 25% ITE-Derived closed loop plastic[2]
- At least 65% post-consumer recycled plastic[2]
- At least 25% recycled metal[3]
- Low Halogen[4]
- 100% of HP paper-based packaging is from recycled or certified sustainable sources[5]
- 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	**115VAC, 60Hz**	**230VAC, 50Hz**	**100VAC, 50Hz**

System Technical Specifications

(in accordance with US ENERGY STAR® test method)			
Normal Operation (Sort idle)	8.94 W	9.07 W	9.13 W
Normal Operation (Long idle)	6.14 W	5.85 W	5.80 W
Sleep	3.80 W	3.75 W	3.82 W
Off	0.70 W	0.69 W	0.69 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)	31 BTU/hr	31 BTU/hr	31 BTU/hr
Normal Operation (Long idle)	21 BTU/hr	20 BTU/hr	20 BTU/hr
Sleep	13 BTU/hr	13 BTU/hr	13.1 BTU/hr
Off	2.4 BTU/hr	2 BTU/hr	2.4 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	3.0	17.9
Fixed Disk – Random	3.7	27.5

writes			
Optical Drive – Sequential reads	3.8		29.3

Longevity and Upgrading

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

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

Additional Information

- This product is in compliance with the Restrictions of Hazardous Substances (RoHS) directive - 2011/65/EC.
- This HP product is designed to comply with the Waste Electrical and Electronic Equipment (WEEE) Directive – 2002/96/EC.
- This product is in compliance with California Proposition 65 (State of California; Safe Drinking Water and Toxic Enforcement Act of 1986).
- This product is in compliance with the IEEE 1680 (EPEAT) standard at the Gold level, see www.epeat.net
- Plastics parts weighing over 25 grams used in the product are marked per ISO11469 and ISO1043.
- This product is 95.9% recycle-able when properly disposed of at end of life.

Packaging Materials

External:	PAPER/Corrugated	674 g
	PAPER/Molded Pulp	284 g
	OTHER/other	17 g

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

The corrugated paper packaging materials contains at least 91.0% recycled content.

RoHS Compliance

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

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

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

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

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 https://h20195.www2.hp.com/v2/GetDocument.aspx?docname=c05998906):

- 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.

System Technical Specifications

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: https://h20195.www2.hp.com/V2/GetDocument.aspx?docname=c05403198 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: HP Product Disassembly Instruction Website. 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:

- Sustainable Impact Report
  - https://h20195.www2.hp.com/v2/GetDocument.aspx?docname=c06040843
- Eco-label certifications
  - https://www.hp.com/us-en/sustainable-impact/document-reports.html#filters_documents_reports-=document_type-type_energy_star,type_epeat,type_tcoISO
- ISO 14001 certificates
  - https://h20195.www2.hp.com/v2/GetDocument.aspx?docname=c04777932

footnotes

1. Percentage of ocean-bound plastic contained in each component varies by product. Ocean Bound plastic is expressed as a percentage of the total weight plastic. Ocean Bound plastic is based on the definition set by the UL2809 standard.
2. Recycled plastic is expressed as a percentage of the total weight plastic. Post-consumer recycled is based on the definition set in the EPEAT standard for computers, IEEE 1680.1-2018 standard.
3. Recycled metal is expressed as a percentage of the total weight of the metal according to ISO 14021 definitions for metal parts over 25 grams.
4. External power supplies, WWAN modules, power cords, cables and peripherals excluded. Service parts obtained after purchase may not be Low Halogen.
5. HP paper and fiber-based packaging for PCs, displays, home and office print, and supplies is reported by suppliers as recycled or certified, with a minimum of 97% by volume verified by HP. Packaging is the box that comes with the product and all paper-based materials inside the box. Packaging for personal systems accessories and spare parts is not included. Plastic cushions are made from >90% recycled plastic.

Manageability

Intel® Active Management Technology (AMT)

Intel® Active Management Technology (AMT) [1]
An advanced set of remote management features and functionality providing IT administrators the latest and most effective tools to remotely discover, heal, and protect networked client systems

	regardless of the system's health or power state. Intel® AMT includes the following advanced management functions: • Power Management (on, off, reset, graceful shutdown, sleep and hibernate) • Hardware Inventory (includes BIOS and firmware revisions) • Serial Over LAN (SOL) • USB Redirect (Media Redirection) • ME Wake-on-LAN (WOL) • Ipv6 Support • Host Base set-up and configuration • Management Engine (ME) firmware roll back
HP Image Assistant	Visit: http://ftp.hp.com/pub/caps-softpaq/cmit/HPIA.html
System Software Manager	For questions or support for SSM, please visit: http://www.hp.com/go/ssm

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

Technical Specifications - Storage Drives

STORAGE

HP Z Turbo Drv PCIE-5X4 1TB TLC PCIe SSD	**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 5.0 x4 electrical
	Operating Temperature	32° to 158° F (0° to 70° C)
	Performance	
	Sequential Read	12000 MB/s*
	Sequential Write	10000 MB/s*
	Random Read	1500K IOPS*
	Random Write	1300K IOPS*
	End Subtitle	

*Actual performance may vary.

HP Z Turbo Drv PCIE-5X4 2TB TLC PCIe SSD	**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 5.0 x4 electrical
	Operating Temperature	32° to 158° F (0° to 70° C)
	Performance	
	Sequential Read	12000 MB/s*
	Sequential Write	11000 MB/s*
	Random Read	1500K IOPS*
	Random Write	1300K IOPS*
	End Subtitle	

*Actual performance may vary.

HP Z Turbo Drv PCIE Gen5x4 1TB TLC PCIe SED OPAL2	**Capacity**	1TB
	Protocol	PCIe
	Form Factor	M.2 in native Slot on motherboard
	Controller	NVMe

Technical Specifications - Storage Drives

	NAND Type	3D TLC
	Endurance	300TBW (TB Written)
	Reliability	1.5M Hours
	Interface	PCI Express 5.0 x4 electrical
	Operating Temperature	32° to 158° F (0° to 70° C)
	Performance	
	Sequential Read	12000 MB/s*
	Sequential Write	10000 MB/s*
	Random Read	1500K IOPS*
	Random Write	1300K IOPS*
	End Subtitle	
	Self-Encrypting Drive Support	OPAL2

*Actual performance may vary.

HP Z Turbo Drv PCIE Gen5x4 2TB TLC PCIe SED OPAL2	**Capacity**	2TB
	Protocol	PCIe
	Form Factor	M.2 in native Slot on motherboard
	Controller	NVMe
	NAND Type	3D TLC
	Endurance	600TBW (TB Written)
	Interface	PCI Express 5.0 x4 electrical
	Operating Temperature	32° to 158° F (0° to 70° C)
	Performance	
	Sequential Read	12000 MB/s*
	Sequential Write	11000 MB/s*
	Random Read	1500K IOPS*
	Random Write	1300K IOPS*
	End Subtitle	
	Self-Encrypting Drive Support	OPAL2

*Actual performance may vary.

HP Z Turbo Drv PCIE-4X4 512GB TLC PCIe SSD	**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

Technical Specifications - Storage Drives

	Operating Temperature	32° to 158° F (0° to 70° C)
	Performance	
	Sequential Read	6400MB/s*
	Sequential Write	3400MB/s*
	Random Read	600K IOPS*
	Random Write	600K IOPS*
	End Subtitle	

*Actual performance may vary.

HP Z Turbo Drv PCIE-4X4 1TB TLC PCIe SSD	**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 158° F (0° to 70° C)
	Performance	
	Sequential Read	6500MB/s*
	Sequential Write	5000MB/s*
	Random Read	800K IOPS*
	Random Write	800K IOPS*
	End Subtitle	

*Actual performance may vary.

HP Z Turbo Drv PCIE-4X4 2TB TLC PCIe SSD	**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 158° F (0° to 70° C)
	Performance	
	Sequential Read	6500MB/s*
	Sequential Write	5000MB/s*
	Random Read	800K IOPS*
	Random Write	800K IOPS*
	End Subtitle	

Technical Specifications - Storage Drives

*Actual performance may vary.

HP Z Turbo Drv PCIE-4X4 4TB TLC PCIe SSD	**Capacity**	4TB
	Protocol	PCIe
	Form Factor	M.2 in native Slot on motherboard
	Controller	NVMe
	NAND Type	3D TLC
	Endurance	600TBW (TB Written)
	Reliability	1.5M Hours
	Interface	PCI Express 4.0 x4 electrical
	Operating Temperature	32° to 158° F (0° to 70° C)
	Performance	
	Sequential Read	6500MB/s*
	Sequential Write	5000MB/s*
	Random Read	800K IOPS*
	Random Write	800K IOPS*
	End Subtitle	

*Actual performance may vary.

HP Z Turbo Drv PCIE Gen4x4 512GB TLC PCIe SED OPAL2	**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 158° F (0° to 70° C)
	Performance	
	Sequential Read	6400MB/s*
	Sequential Write	3400MB/s*
	Random Read	600K IOPS*
	Random Write	600K IOPS*
	End Subtitle	
	Self-Encrypting Drive Support	OPAL2

*Actual performance may vary.

HP Z Turbo Drv PCIE Gen4x4 1TB TLC PCIe SED OPAL2	**Capacity**	1TB

Technical Specifications - Storage Drives

	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	6500MB/s*
	Sequential Write	5000MB/s*
	Random Read	800K IOPS*
	Random Write	800K IOPS*
	End Subtitle	
	Self-Encrypting Drive Support	OPAL2

*Actual performance may vary.

HP Z Turbo Drv PCIE Gen4x4 2TB TLC PCIe SED OPAL2	**Capacity**	2TB
	Protocol	PCIe
	Form Factor	M.2 in native Slot on motherboard
	Controller	NVMe
	NAND Type	3D TLC
	Endurance	600TBW (TB Written)
	Interface	PCI Express 4.0 x4 electrical
	Operating Temperature	32° to 158° F (0° to 70° C)
	Performance	
	Sequential Read	6500MB/s*
	Sequential Write	5000MB/s*
	Random Read	800K IOPS*
	Random Write	800K IOPS*
	End Subtitle	
	Self-Encrypting Drive Support	OPAL2

*Actual performance may vary.

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

Technical Specifications - Storage Drives

	Endurance	600TBW (TB Written)
	Interface	PCI Express 4.0 x4 electrical
	Operating Temperature	32° to 158° F (0° to 70° C)
	Performance	
	Sequential Read	6500MB/s*
	Sequential Write	5000MB/s*
	Random Read	800K IOPS*
	Random Write	800K IOPS*
	End Subtitle	
	Self-Encrypting Drive Support	OPAL2

*Actual performance may vary.

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*
	End Subtitle	

*Actual performance may vary.

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*

Technical Specifications - Storage Drives

	Random Read	380K IOPS*
	Random Write	430K IOPS*
	End Subtitle	

*Actual performance may vary.

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*
	End Subtitle	

*Actual performance may vary.

512GB TLC PCIE Gen3x4 SED FIPS 140-2	**Capacity**	512GB
	Protocol	PCIe
	Form Factor	M.2 in native Slot on motherboard
	Controller	NVMe
	NAND Type	3D TLC
	Endurance	320 TBW (TB Written)
	Reliability	1.5M Hours
	Interface	PCI Express 3.0 x4 electrical
	Operating Temperature	32° to 158° F (0° to 70° C)
	Performance	
	Sequential Read	up to 3400MB/s [1]
	Sequential Write	up to 2500MB/s [1]
	Random Read	420K IOPS [1]
	Random Write	635K IOPS[1]
	End Subtitle	
	Self-Encrypting Drive Support	OPAL2/FIPS 140-2

*Actual performance may vary.

1TB TLC PCIE Gen3x4 SED FIPS	**Capacity**	1TB

Technical Specifications - Storage Drives

140-2		
	Protocol	PCIe
	Form Factor	M.2 in native Slot on motherboard
	Controller	NVMe
	NAND Type	3D TLC
	Endurance	1620 TBW (TB Written)
	Reliability	1.5M Hours
	Interface	PCI Express 3.0 x4 electrical
	Operating Temperature	32° to 158° F (0° to 70° C)
	Performance	
	Sequential Read	3400MB/s* [1]
	Sequential Write	3000MB/s* [1]
	Random Read	720K IOPS* [1]
	Random Write	690K IOPS* [1]
	End Subtitle	
	Self-Encrypting Drive Support	OPAL2/FIPS 140-2

*Actual performance may vary.

2TB TLC PCIE Gen3x4 SED FIPS 140-2	**Capacity**	2TB
	Protocol	PCIe
	Form Factor	M.2 in native Slot on motherboard
	Controller	NVMe
	NAND Type	3D TLC
	Endurance	3140 TBW (TB Written)
	Interface	PCI Express 3.0 x4 electrical
	Operating Temperature	32° to 158° F (0° to 70° C)
	Performance	
	Sequential Read	3400MB/s*
	Sequential Write	3000MB/s*
	Random Read	720K IOPS*
	Random Write	690K IOPS*
	End Subtitle	
	Self-Encrypting Drive Support	OPAL2/FIPS 140-2

*Actual performance may vary.

Citadel 512GB TLC PCIE Gen3x4 Advence FIPS 140-2	**Capacity**	512GB
	Protocol	PCIe
	Form Factor	M.2 in native Slot on motherboard
	Controller	NVMe
	NAND Type	3D TLC
	Endurance	320 TBW (TB Written)

Technical Specifications - Storage Drives

	Reliability	1.5M Hours
	Interface	PCI Express 3.0 x4 electrical
	Operating Temperature	32° to 158° F (0° to 70° C)
	Performance	
	Sequential Read	up to 3400MB/s [1]
	Sequential Write	up to 2500MB/s [1]
	Random Read	420K IOPS [1]
	Random Write	635K IOPS[1]
	End Subtitle	
	Self-Encrypting Drive Support	OPAL2/FIPS 140-2

*Actual performance may vary.

Citadel 1TB TLC PCIE Gen3x4 Advence FIPS 140-2	**Capacity**	1TB
	Protocol	PCIe
	Form Factor	M.2 in native Slot on motherboard
	Controller	NVMe
	NAND Type	3D TLC
	Endurance	1620 TBW (TB Written)
	Reliability	1.5M Hours
	Interface	PCI Express 3.0 x4 electrical
	Operating Temperature	32° to 158° F (0° to 70° C)
	Performance	
	Sequential Read	3400MB/s* [1]
	Sequential Write	3000MB/s* [1]
	Random Read	720K IOPS* [1]
	Random Write	690K IOPS* [1]
	End Subtitle	
	Self-Encrypting Drive Support	OPAL2/FIPS 140-2

*Actual performance may vary.

Citadel 2TB TLC PCIE Gen3x4 Advence FIPS 140-2	**Capacity**	2TB
	Protocol	PCIe
	Form Factor	M.2 in native Slot on motherboard
	Controller	NVMe
	NAND Type	3D TLC
	Endurance	3140 TBW (TB Written)
	Interface	PCI Express 3.0 x4 electrical
	Operating Temperature	32° to 158° F (0° to 70° C)
	Performance	
	Sequential Read	3400MB/s*
	Sequential Write	3000MB/s*

Technical Specifications - Storage Drives

Random Read	720K IOPS*
Random Write	690K IOPS*
End Subtitle	
Self-Encrypting Drive Support	OPAL2/FIPS 140-2

*Actual performance may vary.

Technical Specifications - Graphics

NVIDIA® RTX™ A400 4GB	**Form Factor**	Half Height Single Slot (2.7" Height x 6.4" Length)
	Graphics Controller	Max Power: 50 Watts Cooling Solution: Active fan heatsink
	Bus Type	PCI Express 4.0 x 8
	Memory	4GB GDDR6 Memory Bandwidth: 96 GB/s Memory Width: 64-bit
	Connectors	4x Mini DisplayPort 1.4a
	Max simultaneous displays	4x 4096 x 2160 @ 120 Hz 4x 5120 x 2880 @ 60 Hz 2x 7680 x 4320 @ 60 Hz
	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™ A1000 8GB	**Form Factor**	Half Height Single Slot (2.7" Height x 6.4" Length)
	Graphics Controller	Max Power: 50 Watts Cooling Solution: Active fan heatsink
	Bus Type	PCI Express 4.0 x 8
	Memory	8GB GDDR6 Memory Bandwidth: 96 GB/s Memory Width: 128-bit
	Connectors	4x Mini DisplayPort 1.4a
	Max simultaneous displays	4x 4096 x 2160 @ 120 Hz 4x 5120 x 2880 @ 60 Hz 2x 7680 x 4320 @ 60 Hz
	Available Graphics Drivers	Windows 10 64-bit Windows 11 64-bit Linux® 64-bit (selected Enterprise distributions) HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html

Technical Specifications - Graphics

NVIDIA® RTX™ 2000 Ada 16GB	**Form Factor**	Half Height Dual Slot (2.7" Height x 6.7" Length)
	Graphics Controller	Max Power: 70 Watts Cooling Solution: Active fan heatsink
	Bus Type	PCI Express 4.0 x 8
	Memory	16GB GDDR6 Memory Bandwidth: 224 GB/s Memory Width: 128-bit
	Connectors	4x Mini DisplayPort 1.4a
	Max simultaneous displays	4x 4096 x 2160 @ 120 Hz 4x 5120 x 2880 @ 60 Hz 2x 7680 x 4320 @ 60 Hz
	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™ 4000 SFF Ada 20GB	**Form Factor**	Half Height Dual Slot (2.7" Height x 6.7" Length)"
	Graphics Controller	Max Power: 70 Watts Cooling Solution: Active fan heatsink
	Bus Type	PCI Express 4.0 x 16
	Memory	20GB GDDR6 Memory Bandwidth: 280 GB/s Memory Width: 160-bit
	Connectors	4x DisplayPort 1.4a
	Max simultaneous displays	4x 4096 x 2160 @ 120 Hz 4x 5120 x 2880 @ 60 Hz 2x 7680 x 4320 @ 60 Hz
	Available Graphics Drivers	Windows 10 64-bit Windows 11 64-bit Linux® 64-bit (selected Enterprise distributions)

HP qualified drivers may be preloaded or available from the HP support Web site:
http://welcome.hp.com/country/us/en/support.html

Technical Specifications - Networking and Communications

NETWORKING / COMMUNICATION

Integrated Intel® I219LM PCIe GbE Controller (Intel® vPro™ with Intel® AMT 19.0)	**Connector**	RJ-45
	Cabling	Twin Axial Cabling up to 10m
	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 (not supported for the 1000BASE-T transceiver)
	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 12.0 support, Circuit Breaker, VLAN, Multicast Listener Discovery (MLD)
	Notes	**NOTE1:** NDIS driver limitation and Wind11 OS, I219 switch to NDIS Driver and it only support IPV4 wake from MSC, if using IPV6 can't wake up from MSC. **NOTE2:** S4 can't wake up limitation on the NDIS Driver known issue.

HP 1-Port 1GbE Flex IO NIC	**Connector**	RJ-45 (Single Port)
	Cabling	Twisted Pair Cabling, up to 100 meter, 2.5GbE on CAT 5e UTP and up, 1GbE/10Mbps on CAT 5 UTP and up
	Controller	Realtek 8153 Ethernet Controller
	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) 802.1P Layer 2 Priority Encoding 802.3az (Energy Efficient Ethernet)
	Bus Architecture	USB
	Power Requirement	3.8 Watts
	Boot ROM Support	Yes

Technical Specifications - Networking and Communications

	Network Transfer Mode	Full-duplex; Half-duplex
	Network Transfer Rate	1000BASE-T Full-Duplex 100BASE-TX Full-Duplex 100BASE-TX Half-Duplex 10BASE-T Full-Duplex 10BASE-T Half-Duplex
HP 2.5GbE LAN Flex Port	**Connector**	RJ-45 (Single Port)
	Cabling	Twisted Pair Cabling, up to 100 meter, 2.5GbE on CAT 5e UTP and up, 2.5Gbe/1GbE/10Mbps on CAT 5 UTP and up
	Controller	I226
	Data Rates Supported	10/100/1000Mbps and 2.5Gbps BASE-T
	Compliance	IEEE: 802.3 (Ethernet Interface for 2500BASE-T, 1000BASE-T, 100BASE-TX, and 10BASE-TE) 802.1AS-Rev 802.1Q (Virtual LAN) 802.1Qav 802.1Qbu 802.1Qbv 1588 802.1AS-REV 802.1p/Q 802.3br 802.3az (Energy Efficient Ethernet) 802.3x (Ethernet Flow Control) 802.3z CB Certification (International Safety) NRTL UL Certification (North America Safety) FCC Class B (USA) CE (European Union) ICES-003 Class B (Canada) BSMI (Taiwan) VCCI (Japan) KCC (Korea) CTICK (Australia/New Zealand) UKCA (UK) UL (Safety) RoHS (Restricted or Hazardous Substances)
	Bus Architecture	PCIe-based interface for active state operation (S0 state) and SMBus for host and management traffic (Sx and low power states)
	Power Requirement	2.5W
	Network Transfer Mode	Full-duplex; Half-duplex
	Network Transfer Rate	2500BASE-T Full-Duplex 1000BASE-T Full-Duplex 100BASE-TX Full-Duplex 100BASE-TX Half-Duplex 10BASE-T Full-Duplex 10BASE-T Half-Duplex
HP 10GBase-T Flex IO	**Connector**	RJ-45 (Single Port)
	Cabling	10GbE over Category 6a (or better) up to 100m 5GbE over Category 5e (or better) up to 100m
	Controller	Marvell AQC113C
	Data Rates Supported	10/100/1000 Mbps and 2.5/5/10 Gbps
	Compliance	802.3-2018 Clauses 55 and 126 802.3az (Energy Efficient Ethernet) 1588

		v2 (Precision Clock Synchronization) NBASE-T™ Alliance PHY Specification CB Certification (International Safety) NRTL UL Certification (North America Safety) FCC Class B (USA) CE (European Union) ICES-003 Class B (Canada) BSMI (Taiwan) VCCI (Japan) KCC (Korea) CTICK (Australia/New Zealand) UKCA (UK) UL (Safety) RoHS (Restricted or Hazardous Substances)
	Bus Architecture	PCIe-based interface for active state operation (S0 state) and SMBus for host and management traffic (Sx and low power states)
	Power Requirement	6.5W
	Network Transfer Mode	Full duplex; Half-duplex
	Network Transfer Rate	10G BASE-T 5G BASE-T 2.5G BASE-T 2.5GBASE-T 1000BASE-T 100BASE-TX 10BASE-T Te
	Notes	**NOTE 1:** Modern standby feature was not support & Suggest Customer use Onboard Lan for Wake event instead of FLEX IO MSC Wake The HP 10GBase-T Flex IO NIC can't support MSC (modern standby)/ S4/S5 wake, suggestion customer can use Onboard Lan RDP wake to replace the MSC Wake instead of FLEX IO MSC Wake & Not support. **NOTE 2:** Known issue with connection by FLEX IO module of LAN Cable, sometimes will auto resume in S4/S5 risk or User can manually disabled 10GBase-T FLOEX Wake function by changing the driver (Device Manager) this setting for “Wake from power off state” in Advanced.
HP Flex 1GbE Fiber LC Single Port	**Connector**	1 LC Optical Fiber Port (Little Connector)
	Cabling	Optical Multi Mode Fiber OM2 or better
	Controller	AT-29M2
	Data Rates Supported	1GbE
	Compliance	IEEE 802.3 IEEE 802.3u IEEE 802.3ab IEEE 802.1q VLAN Tagging IEEE 802.1AS IEEE 1588 CB Certification (International Safety) NRTL UL Certification (North America Safety) FCC Class B (USA) CE (European Union) ICES-003 Class B (Canada) BSMI (Taiwan) VCCI (Japan) KCC (Korea) CTICK (Australia/New Zealand) UKCA (UK) UL (Safety) RoHS (Restricted or Hazardous Substances)

Technical Specifications - Networking and Communications

	Bus Architecture	USB 3.1 interface,, USB 2.0 interface,
	Power Requirement	Requires 3.3V (integrated regulators for core Vdc)
	Power Requirement	Up to 3W
Intel® Wi-Fi 6E* AX211 802.11ax, BT 5.3, M.2	**WLAN Standards**	IEEE 802.11a, b, d, e, g, h, i, k, n, r, u, v, w, ac, ax; Fine Timing Measurement based on 802.11-2016, 802.11az HW readiness
	Antenna	2x2 Dual-Band
	Bluetooth Standards	5.3
	Operating Temperature	32° to 122° F (0° to 50° C)
	Interface	M.2 CNVio2
	Dimensions	M.2 2230
	Kit Contents	Not Available

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

Intel® Wi-Fi 7 BE200 802.11be, BT 5.4, M.2	**WLAN Standards**	IEEE 802.11a, b, d, e, g, h, i, k, n, r, u, v, w, ac, ax, be; Fine Timing Measurement based on 802.11-2016, 802.11az HW readiness
	Antenna	2x2 Dual-Band
	Bluetooth Standards	5.4
	Operating Temperature	32° to 122° F (0° to 50° C)
	Interface	M.2: PCIe, USB
	Dimensions	"M.2 2230
	Kit Contents	"Not Available

Wireless access point and Internet service required and sold separately. Availability of public wireless access points limited. Wi-Fi 7 (802.11BE)
functionality requires Windows 11 24H2, select Intel® processor, and a Wi-Fi 7 router, sold separately.
Wi-Fi 7 is backward compatible with prior 802.11 specs. Available in countries where Wi-Fi 7 is supported.

Date of change	Version History		Description of change
April 7, 2025	From v1 to v2	Changed	Social and Environmental Responsibility, Graphics sections
May 27, 2025	From v2 to v3	Changed	NETWORKING / COMMUNICATION section
June 1, 2025	From v3 to v4	Changed	Format