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Informacije o proizvodu (EN)

HP laptop ProBook 450 G9 (9M3M6AT)



Tehnoteka je online destinacija za upoređivanje cena i karakteristika bele tehnike, potrošačke elektronike i IT uređaja kod trgovinskih lanaca i internet prodavnica u Srbiji. Naša stranica vam omogućava da istražite najnovije informacije, detaljne karakteristike i konkurentne cene proizvoda.

Posetite nas i uživajte u ekskluzivnom iskustvu pametne kupovine klikom na link:

https://tehnoteka.rs/p/hp-laptop-probook-450-g9-9m3m6at-akcija-cena/

Overview

HP ProBook 450 15.6" G9 Notebook PC



Left

1. Internal Microphones (2)
2. Webcam LED (Optional)
3. Camera Shutter
4. Combo Web/IR Camera (Optional)
5. Clickpad
6. SuperSpeed USB Type-A 5Gbps signaling rate port (USB 3.2 Gen 1)
7. Ethernet Port (RJ-45)
8. Nano Security Lock Slot (Lock sold separately)

Overview



Right

1. Power Button Key
2. Power Connector
3. SuperSpeed USB Type-C® 10Gbps signaling rate (USB Power Delivery, DisplayPort™ 1.4)
4. SuperSpeed USB Type-A 5Gbps signaling rate port (USB 3.2 Gen 1)
5. SuperSpeed USB Type-A 5Gbps signaling rate port (USB 3.2 Gen 1)
6. HDMI 2.1 Port (Cable not included)
7. Audio Combo Jack
8. External SIM (WWAN Optional Model)
9. Touch Fingerprint Sensor (Select Models)

Overview

AT A GLANCE

- Preinstalled with Windows 11 versions or FreeDOS
- Choice of 12th generation Intel® Core™ i7, i5 and i3 processors
- NVIDIA® GeForce® MX570 discrete graphics with 2 GB GDDR6 video memory
- NVIDIA® GeForce® MX570A discrete graphics with 2 GB GDDR6 video memory
- Fast and upgradeable dual channel DDR4 SODIMM memory up to 32 GB
- Choice of 39.62 cm (15.6") diagonal HD, Ultra Wide Viewing Angle FHD, Touch or Non-Touch screen
- Features redesigned quiet and responsive HP Keyboard with the HP Programmable key and backlit options
- Choice of solid state drives up to 1 TB, 2nd SSD 128GB/256GB (Optional)
- Multi-layered security with HP SureStart Gen6, HP Priva7y Camera, HP Sure View Gen4[1], HP Sure Sense G2, HP Sure Click, and Touch Fingerprint reader[2], Tamper Lock, HP Wolf Security
- Supports wireless options for connectivity on the go including gigabit-speed up to Wi-Fi® 6E and CAT16 4G/LTE WWAN
- Supports fast charging (50% in 30 minutes) with no impact on battery recharge cycles[3]
- Designed to support HP docking options
- Passed MIL-STD 810H tests[4]
- Battery options 42.75 Wh and 51.3 Wh
- Battery life up to 12 hours and 15 minutes
- Optimize your video calls with an HD camera and Temporal Noise Reduction that adjusts to the lighting in your environment.

1. HP Sure View integrated privacy screen is an optional feature that must be configured at purchase and is designed to function in landscape orientation.
2. Sold separately or as an optional feature.
3. HP notebooks up to 50% within 30 minutes when the system is off or in standby mode. Power adapter with a minimum capacity of 65 watts is required. After charging has reached 50% capacity, charging will return to normal. Charging time may vary +/-10% due to System tolerance.
4. MIL STD 810H testing is not intended to demonstrate fitness for U.S. Department of Defense contract requirements or for military use. Test results are not a guarantee of future performance under these test conditions. Accidental damage requires an optional HP Accidental Damage Protection Care Pack.

NOTE: See important legal disclosures for all listed specs in their respective features sections.

Technical Specifications

PRODUCT NAME

HP ProBook 450 15.6" G9 Notebook PC

OPERATING SYSTEM

Preinstalled

Windows 11 Pro [1]
Windows 11 Pro Education [1]
Windows 11 Home - HP recommends Windows 11 Pro for business [1]
Windows 11 Home Single Language - HP recommends Windows 11 Pro for business [1]
Windows 11 Pro (Windows 11 Enterprise or Windows 10 Enterprise available with a Volume Licensing Agreement) [1]
Windows 11 Pro (preinstalled with Windows 10 Pro Downgrade) [1,2]
FreeDOS

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. 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.

PROCESSORS

Processor [3,4,5,6]	Cores	Number of P-cores	Number of E-cores	Threads	L3 Cache	Max Turbo Frequency		Base Frequency	
						P-cores	E-cores	P-cores	E-cores
Intel® Core™ i7-1260P	12	4	8	16	18MB	4.7 GHz	3.4 GHz	2.1 GHz	1.5 GHz
Intel® Core™ i5-1240P	12	4	8	16	12MB	4.4 GHz	3.3 GHz	1.7 GHz	1.2 GHz
Intel® Core™ i7-1255U	10	2	8	12	12MB	4.7 GHz	3.5 GHz	1.7 GHz	1.2 GHz
Intel® Core™ i5-1235U	10	2	8	12	12MB	4.4 GHz	3.3 GHz	1.3 GHz	0.9 GHz
Intel® Core™ i3-1215U	6	2	4	8	10MB	4.4 GHz	3.3 GHz	1.2 GHz	0.9 GHz
Intel® Pentium® Gold 8505	5	1	4	6	8MB	4.4 GHz	3.3 GHz	1.2 GHz	0.9 GHz
Intel® Celeron® 7305	5	1	4	6	8MB	N/A	N/A	1.1 GHz	0.9 GHz

3. 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.

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

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

6. 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.

CHIPSET

Chipset is integrated with processor

GRAPHICS

Integrated

Intel® Iris® X Graphics (Core i5 and Core i7)[7]

Intel® UHD Graphics (Core i3)

Discrete

NVIDIA GeForce ®MX570 Controller

NVIDIA GeForce ®MX570A Controller

Support

Support HD decode, DX12, HDMI 2.1 [8]

7. Intel® Iris® Xᵉ Graphics capabilities require system to be configured with Intel® Core™ i5 or i7 processors and dual channel memory. Intel® Iris® Xᵉ Graphics with Intel® Core™ i5 or 7 processors and single channel memory will only function as UHD graphics.

8. HD content required to view HD images.

DISPLAY

Non-Touch

39.6 cm (15.6") diagonal FHD UWVA eDP anti-glare, low power narrow bezel bent, 400 nits, 100% sRBG for HD TNR camera (1920 x 1080) [8,9]

39.6 cm (15.6") diagonal FHD UWVA eDP+PSR anti-glare, low power narrow bezel bent, 400 nits, 100% sRGB for HD+IR camera (1920 x 1080) [8,9]

39.6 cm (15.6") diagonal FHD UWVA eDP anti-glare, narrow bezel bent, 250 nits, 45% NTSC (1920 x 1080) [8,9]

39.6 cm (15.6") diagonal FHD UWVA eDP anti-glare, narrow bezel bent, 250 nits, 45% NTSC for HD TNR camera (1920 x 1080)[8,9]

39.6 cm (15.6") diagonal FHD UWVA eDP anti-glare, narrow bezel bent, 250 nits, 45% NTSC for HD + IR camera (1920 x 1080) [8,9]

39.6 cm (15.6") diagonal FHD UWVA eDP anti-glare, narrow bezel bent, 250 nits, 45% NTSC for HD TNR camera and WWAN (1920 x 1080) [8,9]

39.6 cm (15.6") diagonal HD SVA eDP + PSR anti-glare, narrow bezel bent, 250 nits, 45% NTSC (1366 x 768) [8,9]

Technical Specifications

39.6 cm (15.6") diagonal HD SVA eDP anti-glare, narrow bezel bent, 250 nits, 45% NTSC for HD TNR camera (1366 x 768) [8,9]
39.6 cm (15.6") diagonal HD SVA eDP anti-glare, narrow bezel bent, 250 nits, 45% NTSC for HD+IR camera (1366 x 768) [8,9]
39.6 cm (15.6") diagonal HD SVA eDP anti-glare, narrow bezel bent, 250 nits, 45% NTSC for HD TNR camera and WWAN (1366 x 768) [8,9]

Touch
39.6 cm (15.6") diagonal FHD UWVA eDP + PSR anti-glare, narrow bezel bent, touch-on-panel screen, 250 nits, 45% NTSC for HD + IR camera (1920 x 1080) [8,9,10,11]
39.6 cm (15.6") diagonal FHD UWVA eDP + PSR anti-glare, narrow bezel bent touch-on-panel screen, 250 nits, 45% NTSC for HD + IR camera and WWAN (1920 x 1080) [8,9,10,11]

HDMI
Support resolutions up to 4k 60Hz

Display Size
15.6" diagonal
39.6 cm (15.6") diagonal

8. HD content required to view HD images.
9. Resolutions are dependent upon monitor capability, and resolution and color depth settings.
10. Sold separately or as an optional feature.
11. Actual brightness will be lower with touchscreen or HP Sure View.

DOCKING (Sold Separately)

Docking station model #1	HP USB-C Dock G5
Docking station model #2	HP USB-C/A Universal Dock G2
Docking station model #3	HP Thunderbolt Dock G2

For additional aftermarket options and docking specs please see page 37.

STORAGE AND DRIVES

Primary M.2 Storage
1 TB PCIe® NVMe™ M.2 TLC Solid State Drive [12]
1 TB PCIe® Gen4x4 NVMe™ M.2 SSD TLC [12,14]
512 GB PCIe® NVMe™ M.2 Value Solid State Drive [12]
256 GB PCIe® NVMe™ M.2 Value Solid State Drive [12]
128 GB PCIe® NVMe™ M.2 Value Solid State Drive [12]

Secondary M.2 Storage
256 GB PCIe® NVMe™ M.2 Value Solid State Drive [13]
128 GB PCIe® NVMe™ M.2 Value Solid State Drive [13]

12. For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 30 GB (for Windows 10 and 11) is reserved for system recovery software.
13. Second storage is only available with non-WWAN base Unit AND Primary M.2 storage.

14. Available only to HK (Hong Kong), TW(Taiwan) and CN (China).

MEMORY

Maximum Memory
32 GB DDR4-3200 MT/s SDRAM [15]

Memory
32 GB DDR4-3200 MT/s SDRAM (2 x 16 GB) [15]
16 GB DDR4-3200 MT/s SDRAM (1 x 16 GB) [15]
16 GB DDR4-3200 MT/s SDRAM (2 x 8 GB) [15]
12 GB DDR4-3200 MT/s SDRAM (1 x 4 GB + 1 x 8 GB) [15]
8 GB DDR4-3200 MT/s SDRAM (1 x 8 GB) [15]
8 GB DDR4-3200 MT/s SDRAM (2 x 4 GB) [15]
4 GB DDR4-3200 MT/s SDRAM (1 x 4 GB) [15]

Memory Slots
2 SODIMM
Both slots are accessible/upgradeable by IT or self-maintainers only.
DDR4 PC4 SODIMMS, system runs at 3200 MT/s
Supports Dual Channel Memory

15. Due to the non-industry standard nature of some third-party memory modules, we recommend HP branded memory to ensure compatibility. If you mix memory speeds, the system will perform at the lower memory speed.

NETWORKING/COMMUNICATIONS

WLAN
Intel® AX211 Wi-Fi6E +Bluetooth® 5.3 M.2 2230 160MHz CNVi WLAN Wireless Card [16]
Realtek 8852BE Wi-Fi 6 + Bluetooth® 5.3 M.2 2230 PCI-e+USB WLAN Wireless Card [17]

WWAN
Intel® XMM 7560 R+ LTE-Advanced Pro Cat 16 [18]

Miracast
Native Miracast Support

Ethernet
Realtek RTL8111HSH 10/100/1000 Integrated NIC [19]

Wake on WLAN
Support on S3 AC mode only

16. 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. Wi-Fi 6E is designed to support gigabit data rate when transferring files between two devices connected to the same router. Requires a wireless router, sold separately, that supports 80MHz and higher channels.

17. Wireless access point and Internet service required and sold separately. Availability of public wireless access points limited. Wi-Fi 6 (802.11ax) is backwards compatible with prior 802.11 specs. Wi-Fi 6™ is designed to support gigabit data rate when transferring files between two devices connected to the same router. Requires a wireless router, sold separately, that supports 80MHz and higher channels.
18. WWAN module is optional, must be configured at the factory and requires separately purchased service contract. Check with service provider for coverage and availability in your area. Connection speeds will vary due to location, environment, network conditions, and other factors. 4G LTE not available on all products, in all regions.
19. The term "10/100/1000" or "Gigabit" Ethernet indicates compatibility with IEEE standard 802.3ab for Gigabit Ethernet, and does not connote actual operating speed of 1 Gb/s. For high-speed transmission, connection to a Gigabit Ethernet server and network infrastructure is required.

AUDIO/MULTIMEDIA

Audio
2 Integrated stereo speakers
Integrated microphone (Dual Array)

Speaker Power
2W/4ohm per speaker

Camera
720p HD camera with Temporal Noise Reduction [9]
720p HD camera+IR Camera [8,10]

8. HD content required to view HD images.
10. Sold separately or as an optional feature.

Technical Specifications

KEYBOARDS/POINTING DEVICES/BUTTONS & FUNCTION KEYS

Keyboard
HP Premium Keyboard, full-size, spill resistant with numeric keypad and optional backlit [20]

Pointing Device
Clickpad with multi-touch gesture support

Function Keys
F1 - Display Switching
F2 - Blank or SureView On/Off
F3 - Brightness Down
F4 - Brightness Up
F5 - Audio Mute
F6 - Volume Down
F7 - Volume Up
F8 - Mic Mute
F9 - Blank or Backlit Toggle
F10 - Insert
F11 - Airplane Mode
F12 - Programmable key
Print Screen
Power Button (with LED)

Hidden Function Keys
Fn+R - Break
Fn+S - Sys Rq
Fn+C - Scroll Lock

20. Backlit keyboard is an optional feature.

Technical Specifications

SOFTWARE AND SECURITY

Software

HP Quick Drop[21]
HP PC Hardware Diagnostics Windows
myHP
HP Smart Support [22]
HP Connection Optimizer
HP Hotkey Support
HP Support Assistant [23]
HP Notifications
HP Power Manager
HP Privacy Settings
Buy Microsoft Office (Sold separately)

Manageability Features

HP Image Assistant Gen5 (download)
HP Manageability Integration Kit (download)[24]
HP Client Management Script Library (download)
HP Driver Packs (download)
HP Client Catalog (download)

NOTE: To enhance brightness, level go to the Intel® Graphics Command Center app, click on System and turn off the Display Power Savings function.

Security Management

HP Wolf Security of Business[25] includes:
HP Sure Click[26]
HP Sure Sense2[27]
HP Sure Start Gen7[28]
HP Tamper Lock
HP Sure Admin[29]
HP Client Security Manager Gen7 [30]

BIOS

HP BIOSphere Gen6 [31]
HP Secure Erase [32]
Absolute Persistence Module [33]
HP DriveLock & Automatic DriveLock
BIOS Update via Network
HP Wake on WLAN
TPM 2.0 Embedded Security Chip (Common Criteria EAL4+ Certified) (FIPS 140-2 Level 2 Certified)
HP Fingerprint Sensor [34]

Security

TPM

Model: Nuvoton NPCT760HAAYX
Version: 7.2.3.0
Revision: TPM 2.0
FIPS 140-2 Compliant: Yes

IPv6 Support
TBC

FirstNet Certified
No

Is the BIOS on this notebook ISO/IEC 19678:2015 (formerly NIST 800-147) compliant?: Yes
UEFI version: 2.7
Class: 3

21. 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.
22. 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.
23. HP Support Assistant requires Windows and Internet Access
24. HP Manageability Integration Kit can be downloaded from http://www.hp.com/go/clientmanagement.
25. 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 and OS requirement.
26. HP Sure Click requires Windows 10 Pro or higher or Enterprise. See https://bit.ly/2PrLT6A_SureClick for complete details.
27. HP Sure Sense is available on select HP PCs with Windows 10 Pro, Windows 10 Enterprise, Windows 11 Pro, or Windows 11 Enterprise OS.
28. HP Sure Start Gen7 is available on select HP PCs and requires Windows 10 and higher
29. HP Sure Admin requires Windows 10 or higher, 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.
30. HP Client Security Manager Gen7 requires Windows and is available on the select HP Elite and Pro PCs.
31. HP BIOSphere Gen6 features may vary depending on the platform and configuration.
32. 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™.
33. Absolute firmware module is shipped turned off and can only be activated with the purchase a license subscription and full activation of the software agent. License subscriptions can be purchased for terms ranging multiple years. Service is limited, check with Absolute for availability outside the U.S. Certain conditions apply. For full details visit: https://www.absolute.com/about/legal/agreements/absolute/.
34. HP Fingerprint Reader is an optional feature that must be configured at purchase.

Technical Specifications

POWER

Power Supply

HP Smart 65 W External AC power adapter [35]
HP Smart 65 W EM External AC power adapter [35]
HP Smart 65 W USB Type-C adapter [35]
HP Smart 45 W External AC power adapter [35]
HP Smart 45 W USB Type-C adapter [35]

Battery

HP Long Life 3-cell, 42.75 Wh Polymer [36,37]
HP Long Life 3-cell, 51.3 Wh Polymer [36,37]
Compliant with UL 1642 Standard

Power Cord

3-wire plug – 1 [35]
2-wire plug - 1 [35]

Battery life

Up to 12 hours and 15 minutes with 51whr battery (HP Long Life 3-Cell, 51 Whr Polymer, UMA graphic, Intel U15, display set up to 200 nits, 2*4G memory, 256 GB SSD) [38]
Up to 12 hours and 15 minutes with 51whr battery (HP Long Life 3-Cell, 51 Whr Polymer, UMA graphic, Intel P28, display set up to 200 nits, 2*4G memory, 256 GB SSD) [38]
Up to 10 hours and 30 minutes with 42whr battery (HP Long Life 3-Cell, 42 Whr Polymer, UMA graphic, Intel U15, display set up to 200 nits, 2*4G memory, 256 GB SSD) [38]

35. Availability may vary by country.
36. Battery is internal and not replaceable by customer. Serviceable by warranty.
37. Actual battery Watt-hours (Wh) will vary from design capacity. Battery capacity will naturally decrease with shelf life, time, usage, environment, temperature, system configuration, loaded apps, features, power management settings and other factors.
38. Windows 10 MM18 battery life will vary depending on various factors including product model, configuration, loaded applications, features, use, wireless functionality, and power management settings. The maximum capacity of the battery will naturally decrease with time and usage. See http://www.bapco.com for additional details.

Technical Specifications

WEIGHTS & DIMENSIONS

Product Weight

42.75Wh

Starting at 3.83 lb [39]

Starting at 1.74 kg [39]

51.3 Wh

Starting at 3.96 lb [39]

Starting at 1.79 kg [39]

Product Dimensions (W x D x H)

14.15 x 9.21 x 0.78 in

35.94 x 23.39 x 1.99 cm

39. Weight will vary by configuration. Does not include power adapter.

PORTS/SLOTS

1 SuperSpeed USB Type-C® 10Gbps signaling rate (USB Power Delivery, DisplayPort™ 1.4)

3 SuperSpeed USB Type-A 5Gbps signaling rate includes 1 charging, 1 powered port (USB 3.2 Gen 1)

1 HDMI 2.1 [40]

1 RJ-45

1 Headphone/microphone combo jack

1 AC power

1 External Nano SIM slot for WWAN (optional)

40. HDMI cable sold separately.

Technical Specifications

SERVICE AND SUPPORT

HP Services offers 1-year or 3-year limited warranties and 90 day software limited warranty options depending on country. Batteries have a default one year limited warranty except for Long Life batteries which will have same 1-year or 3-year limited warranty as the platform. Refer to http://www.hp.com/support/batterywarranty/ for additional battery information. On-site service and extended coverage is also available. HP Care Pack Services are optional extended service contracts that go beyond the standard limited warranties. 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/cpc.[41]

41. HP Care Packs are sold separately. Service levels and response times for HP Care Packs may vary depending on your geographic location. Service starts on date of hardware purchase. Restrictions and limitations apply. For details, visit http://www.hp.com/go/cpc. HP services are governed by the applicable HP terms and conditions of service provided or indicated to Customer at the time of purchase. Customer may have additional statutory rights according to applicable local laws, and such rights are not in any way affected by the HP terms and conditions of service or the HP Limited Warranty provided with your HP Product.

Technical Specifications

SYSTEM UNIT

Stand-Alone Power Requirements (AC Power)	
Nominal Operating Voltage	19V
Average Operating Power	U15 UMA 3.72W/U15 DSC 4.56W/U28 3.80W
Integrated graphics	Yes
Discrete Graphics	Yes, GN20-S5
Max Operating Power	Discrete < 65W UMA U15 < 45W, UMA U28 < 65W
Temperature	
Operating	32° to 95° F (0° to 35° C) (No sustained direct exposure to sunlight) (System performance may be reduced above 32°C (89.6°F))
Non-operating	-4° to 140° F (-20° to 60° C)
Relative Humidity	
Operating	10% to 90%, non-condensing
Non-operating	5% to 95% (38.7° C (101.6° F) maximum wet bulb tempera-ture; non-condensing)
Shock	
Operating	40 G, 2 ms, half-sine
Non-operating	200 G, 2 ms, half-sine
Random Vibration	
Operating	1.043 grams
Non-operating	3.5 grams
Altitude (unpressurized)	
Operating	10,000 ft (3,048 m)
Non-operating	40,000 ft (12,192 m)
Planned Industry Standard Certifications	
Regulatory Model Number	HSN-Q32C-5
CSA/UL 62368-1	Yes
FCC/ICES/CISPR/VCCI	Yes
ENERGY STAR®	Yes[42]
EPEAT®	EPEAT® Gold in the United States[43]
China CCC/SRRC	Yes
Korea KCC/KC/KES	Yes
Taiwan BSMI/NCC	Yes
CE MARKING	Yes
EAEU compliance	Yes
Saudi Arabian Compliance	Yes
Ukraine NSoC/TEC	Yes
TCO	Yes
WW RoHs	Yes
Low Blue Light	Yes

42. Configurations of the HP ProBook 450 G9 that are ENERGY STAR® qualified are identified as HP ProBook 450 G9 ENERGY STAR on HP websites and on http://www.energystar.gov.
43. Based on US EPEAT® registration according to IEEE 1680.1-2018 EPEAT®. EPEAT® status varies by country. Visit http://www.epeat.net for more information.

Technical Specifications

DISPLAYS

NOTE: All specifications represent the typical specifications provided by hp's component manufacturers; actual performance may vary either higher or lower.

1. Actual brightness will be lower with touchscreen or HP Sure View.

Panel LCD 15.6 inch FHD (1920 x 1080) Anti-Glare WLED UWVA 45percent cg 250nits eDP 1.2 w/o PSR bent Touch on Panel NWBZ	**Outline Dimensions (W x H)**	350.960 x 205.740 mm (max)
	Active Area	344.160 x 193.590 mm (typ.)
	Weight	380 g (max)
	Diagonal Size	15.6 inch
	Surface Treatment	Anti-Glare On-cell
	Touch Enabled	Yes[1]
	Contrast Ratio	600:1 (typ.)
	Refresh Rate	60 Hz
	Brightness	250 nits
	Pixel Resolution - Format	1920 x 1080 (FHD)
	Backlight	LED
	Pixel Resolution	RGB Stripe
	Color Gamut Coverage	NTSC 45%
	Color Depth	6 bits
	Viewing Angle	UWVA 85/85/85/85
	Low Blue Light	No
	Power Consumption (W, EBL@ 150nits max/ 200nits max)	2.54 (Max) / 3.12 (Max)

Panel LCD 15.6 inch FHD (1920 x 1080) Anti-Glare WLED UWVA sRGB 100percent cg 400nits eDP 1.4+PSR2 bent LP NWBZ	**Outline Dimensions (W x H)**	349.460 x 204.790 mm (max)
	Active Area	344.160 x 193.590 mm (typ.)
	Weight	325 g (max)
	Diagonal Size	15.6 inch
	Surface Treatment	Anti-Glare
	Touch Enabled	No
	Contrast Ratio	1200:1 (typ.)
	Refresh Rate	60 Hz
	Brightness	400 nits
	Pixel Resolution - Format	1920 x 1080 (FHD)
	Backlight	LED
	Pixel Resolution	RGB Stripe
	Color Gamut Coverage	sRGB 100% (NTSC 72%)
	Color Depth	8 bits
	Viewing Angle	UWVA 85/85/85/85
	Low Blue Light	No
	Power Consumption (W, EBL@ 150nits max/ 200nits max)	1.13(Max)/1.37(Max)

Technical Specifications

Panel LCD 15.6 inch FHD (1920 x 1080) Anti-Glare WLED UWVA 45percent cg 250nits eDP 1.2 w/o PSR bent NWBZ	**Outline Dimensions (W x H)**	350.960 x 205.540mm (max)
	Active Area	344.160 x 193.590 mm (typ.)
	Weight	370 g (max)
	Diagonal Size	15.6 inch
	Surface Treatment	Anti-Glare
	Touch Enabled	No
	Contrast Ratio	600:1 (typ.)
	Refresh Rate	60 Hz
	Brightness	250 nits
	Pixel Resolution - Format	1920 x 1080 (FHD)
	Backlight	LED
	Pixel Resolution	RGB Stripe
	Color Gamut Coverage	NTSC 45%
	Color Depth	6 bits (Hi FRC supportive w/ condition to enable)
	Viewing Angle	UWVA 85/85/85/85
	Low Blue Light	No
	Power Consumption (W, EBL@ 150nits max/ 200nits max)	2.62 (Max) / 3.27 (Max)

Panel LCD 15.6-in HD (1366 x 768) Anti-Glare WLED SVA 45percent cg 250nits eDP 1.2 w/o PSR NWBZ bent	**Outline Dimensions (W x H)**	350.960 x 205.540 mm (max)
	Active Area	344.230 x 193.540 mm (typ.)
	Weight	370 g (max)
	Diagonal Size	15.6 inch
	Surface Treatment	Anti-Glare
	Touch Enabled	No
	Contrast Ratio	300:1 (typ.)
	Refresh Rate	60 Hz
	Brightness	250 nits
	Pixel Resolution - Format	1366 x 768 (HD)
	Backlight	LED
	Pixel Resolution	RGB Stripe
	Color Gamut Coverage	NTSC 45%
	Color Depth	6 bits
	Viewing Angle	SVA 45/45/15/35
	Low Blue Light	No
	Power Consumption (W, EBL@ 150nits max/ 200nits max)	2.49 (Max) / 2.78 (Max)

Technical Specifications

STORAGE AND DRIVES

For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 30 GB (for Windows 10 and 11) is reserved for system recovery software.

SSD 128GB 2230 PCIe NVMe Value	**Form Factor**	M.2 2230
	Capacity	128GB
	NAND Type	Value
	Interface	PCIe NVMe Gen3
	Maximum Sequential Read	Up to 2100 MB/s
	Maximum Sequential Write	Up to 1200 MB/s
	Logical Blocks	250,069,680
	Features	Pyrite; TRIM; L1.2
SSD 256GB 2230 PCIe NVMe Value	**Form Factor**	M.2 2230
	Capacity	256 GB
	NAND Type	Value
	Interface	PCIe NVMe Gen3
	Maximum Sequential Read	up to 2500 MB/s
	Maximum Sequential Write	up to 1300 MB/s
	Logical Blocks	500,118,192
	Features	Pyrite; TRIM; L1.2
SSD 256GB 2280 PCIe NVMe Value	**Form Factor**	M.2 2280
	Capacity	256GB
	NAND Type	Value
	Interface	PCIe NVMe Gen3
	Maximum Sequential Read	Up to 2900 MB/s
	Maximum Sequential Write	Up to 1400 MB/s
	Logical Blocks	500,118,192
	Features	ATA Security; TRIM; L1.2
SSD 512GB 2280 PCIe NVMe Value	**Form Factor**	M.2 2280
	Capacity	512GB
	NAND Type	Value
	Interface	PCIe NVMe Gen3
	Maximum Sequential Read	Up to 3500 MB/s
	Maximum Sequential Write	up to 3000 MB/s
	Logical Blocks	1,000,215,216
	Features	TRIM; L1.2

Technical Specifications

SSD 1TB 2280 PCIe-4x4 NVMe Three Layer Cell	**Form Factor**	M.2 2280
	Capacity	1TB
	NAND Type	TLC
	Interface	PCIe NVMe Gen4
	Maximum Sequential Read	Up to 7,100 MB/s
	Maximum Sequential Write	Up to 5,200 MB/s
	Logical Blocks	2,000,409,264
	Features	Pyrite 2.0; TRIM; L1.2

SSD 1 TB 2280 PCIe NVMe Value	**Form Factor**	M.2 2280
	Capacity	1TB
	NAND Type	TLC
	Interface	PCIe NVMe Gen4X4
	Maximum Sequential Read	3200 MB/s ±20%
	Maximum Sequential Write	2700 MB/s ±20%
	Logical Blocks	2,000,409,264
	Features	Pyrite 2.0; TRIM; L1.2

Technical Specifications

NETWORKING/COMMUNICATIONS

Intel® AX211 Wi-Fi 6E and Bluetooth® 5.3 M.2 160MHz CNVi WW WLAN non-vPro Wireless Card [1]	**Wireless LAN Standards**	IEEE 802.11a IEEE 802.11b IEEE 802.11g IEEE 802.11n IEEE 802.11ac IEEE 802.11ax IEEE 802.11d IEEE 802.11e IEEE 802.11h IEEE 802.11i IEEE 802.11k IEEE 802.11r IEEE 802.11v
	Interoperability	Wi-Fi certified
	Frequency Band	•802.11b/g/n/ax 2.402 – 2.482 GHz •802.11a/n/ac/ax 4.9 – 4.95 GHz (Japan) 5.15 – 5.25 GHz 5.25 – 5.35 GHz 5.47 – 5.725 GHz 5.825 – 5.850 GHz 5.955 – 6.415 GHz 6.435 – 6.515 GHz 6.535 – 6.875 GHz 6.895 – 7.115 GHz
	Data Rates	•802.11b: 1, 2, 5.5, 11 Mbps •802.11g: 6, 9, 12, 18, 24, 36, 48, 54 Mbps •802.11a: 6, 9, 12, 18, 24, 36, 48, 54 Mbps •802.11n: max 300Mbps •802.11ac : 1733Mbps • 802.11ax : max 2.4Gbps
	Modulation	Direct Sequence Spread Spectrum OFDM, BPSK, QPSK, CCK, 16-QAM, 64-QAM, 256-QAM, 1024QAM
	Security[3]	•IEEE and WiFi compliant 64 / 128 bit WEP encryption for a/b/g mode only •AES-CCMP: 128 bit in hardware •802.1x authentication •WPA, WPA2: 802.1x. WPA-PSK, WPA2-PSK, TKIP, and AES. •WPA2 certification •WPA3 certification •IEEE 802.11i •WAPI
	Network Architecture	Ad-hoc (Peer to Peer)
	Models	Infrastructure (Access Point Required)
	Roaming	IEEE 802.11 compliant roaming between access points
	Output Power[2]	• 802.11b : +17dBm minimum

Technical Specifications

	• 802.11g : +16dBm minimum • 802.11a : +17dBm minimum • 802.11n HT20(2.4GHz) : +14dBm minimum • 802.11n HT40(2.4GHz) : +13dBm minimum • 802.11n HT20(5GHz) : +14dBm minimum • 802.11n HT40(5GHz) : +13dBm minimum • 802.11ac VHT80(5GHz) : +10dBm minimum • 802.11ac VHT160(5GHz) : +10dBm minimum • 802.11ax HE40(2.4GHz) : +12dBm minimum • 802.11ax HE80(5GHz) : +10dBm minimum • 802.11ax HE160(5GHz) : +10dBm minimum
Power Consumption	•Transmit mode2.0 W •Receive mode1.6 W •Idle mode (PSP)180 mW(WLAN Associated) •Idle mode50 mW(WLAN unassociated) •Connected Standby 10mW •Radio disabled8 mW
Power Management	ACPI and PCI Express compliant power management 802.11 compliant power saving mode
Receiver Sensitivity[4]	• 802.11b, 1Mbps : -93.5dBm maximum • 802.11b, 11Mbps : -84dBm maximum • 802.11a/g, 6Mbps : -86dBm maximum • 802.11a/g, 54Mbps : -72dBm maximum • 802.11n, MCS07 : -67dBm maximum • 802.11n, MCS15 : -64dBm maximum • 802.11ac, MCS0(VHT80) : -84dBm maximum • 802.11ac, MCS9(VHT80) : -59dBm maximum • 802.11ac, MCS9(VHT160) : -58.5dBm maximum • 802.11ax, MCS11(HE40): -57dBm maximum • 802.11ax, MCS11(HE80): -54dBm maximum • 802.11ax, MCS11(HE160): -53.5dBm maximum
Antenna type	High efficiency antenna with spatial diversity, mounted in the display enclosure Two embedded dual band 2.4/5 GHz antennas are provided to the card to support WLAN MIMO communications and Bluetooth communications
Form Factor	PCI-Express M.2 MiniCard
Dimensions	1. Type 2230 : 2.3 x 22.0 x 30.0 mm 2. Type 1216: 1.67 x 12.0 x 16.0 mm
Weight	1. Type 2230 : 2.8g 2. Type 1216: 1.3g
Operating Voltage	3.3v +/- 9%
Temperature	**Operating** 14° to 158° F (–10° to 70° C) **Non-operating** –40° to 176° F (–40° to 80° C)
Humidity	**Operating** 10% to 90% (non-condensing) **Non-operating** 5% to 95% (non-condensing)
Altitude	**Operating** 0 to 10,000 ft (3,048 m)

Technical Specifications

	Non-operating	0 to 50,000 ft (15,240 m)
	LED Activity	LED Amber – Radio OFF; LED OFF – Radio ON
HP Integrated Module with Bluetooth 4.0/4.1/4.2/5.0/5.1/5.2/5.3 Wireless Card		
	Bluetooth Specification	4.0/4.1/4.2/5.0/5.1/5.2/5.3 Compliant
	Frequency Band	2402 to 2480 MHz
	Number of Available Channels	Legacy: 0~79 (1 MHz/CH) BLE: 0~39 (2 MHz/CH)
	Data Rates and Throughput	Legacy: 3 Mbps data rate; throughput up to 2.17 Mbps BLE : 1 Mbps data rate; throughput up to 0.2 Mbps Legacy: Synchronous Connection Oriented links up to 3, 64 kbps, voice channels Legacy: Asynchronous Connection Less links 2178.1 kbps/177.1 kbps asymmetric (3-DH5) or 864 kbps symmetric (3-EV5)
	Transmit Power	The Bluetooth component shall operate as a Class II Bluetooth device with a maximum transmit power of + 9.5 dBm for BR and EDR.

1. 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. Wi-Fi 6E is designed to support gigabit data rate when transferring files between two devices connected to the same router. Requires a wireless router, sold separately, that supports 80MHz and higher channels.
2. The FCC has declared as of September 1, 2014 products that utilize passive scanning on channel 12/13 and are capable of transmitting must fully comply with requirements of 15.247 or otherwise disable those channels.
3. Check latest software/driver release for updates on supported security features.
4. Receiver sensitivity is measured at a packet error rate of 8% for 802.11b (CKK modulation) and a packet error rate of 10% for 802.11a/g (OFDM modulation).

Technical Specifications

Realtek RTL8852BE 802.11ax 2x2 Wi-Fi® + Bluetooth® 5.3 (802.11ax 2x2, supporting gigabit data rate) Wireless Card [1]	**Wireless LAN Standards**	IEEE 802.11a IEEE 802.11b IEEE 802.11g IEEE 802.11n IEEE 802.11ac IEEE 802.11ax IEEE 802.11d IEEE 802.11e IEEE 802.11h IEEE 802.11i IEEE 802.11k IEEE 802.11r IEEE 802.11v
	Interoperability	Wi-Fi certified modules
	Frequency Band	•802.11b/g/n/ax 2.402 – 2.482 GHz •802.11a/n/ac/ax 4.9 – 4.95 GHz (Japan) 5.15 – 5.25 GHz 5.25 – 5.35 GHz 5.47 – 5.725 GHz 5.825 – 5.850 GHz
	Data Rates	•802.11b: 1, 2, 5.5, 11 Mbps •802.11g: 6, 9, 12, 18, 24, 36, 48, 54 Mbps •802.11a: 6, 9, 12, 18, 24, 36, 48, 54 Mbps •802.11n: max 300Mbps •802.11ac: max 866.7Mbps • 802.11ax: max 1201Mbps
	Modulation	Direct Sequence Spread Spectrum BPSK, QPSK, CCK, 16-QAM, 64-QAM, 256-QAM, 1024QAM
	Security[3]	•IEEE and WiFi certified 64 / 128 bit WEP encryption for a/b/g mode only •AES-CCMP: 128 bit in hardware •802.1x authentication •WPA, WPA2: 802.1x. WPA-PSK, WPA2-PSK, TKIP, and AES. •WPA2 certification •WPA3 certification •IEEE 802.11i •WAPI
	Network Architecture	Ad-hoc (Peer to Peer)
	Models	Infrastructure (Access Point Required)
	Roaming	IEEE 802.11 compliant roaming between access points
	Output Power[2]	• 802.11b : +18.5dBm minimum • 802.11g : +17.5dBm minimum • 802.11a : +18.5dBm minimum • 802.11n HT20(2.4GHz) : +15.5dBm minimum • 802.11n HT40(2.4GHz) : +14.5dBm minimum • 802.11n HT20(5GHz) : +15.5dBm minimum

Technical Specifications

	• 802.11n HT40(5GHz) : +14.5dBm minimum • 802.11ac VHT80(5GHz) : +11.5dBm minimum • 802.11ax HE40(2.4GHz) : +10dBm minimum • 802.11ax HE80(5GHz) : +10dBm minimum
Power Consumption	•Transmit mode:2.5 W •Receive mode:2 W •Idle mode (PSP)180 mW(WLAN Associated) •Idle mode:50 mW(WLAN unassociated) •Connected Standby/Modern Standby: 10mW •Radio disabled: 8 mW
Power Management	ACPI and PCI Express compliant power management 802.11 compliant power saving mode
Receiver Sensitivity[4]	802.11b, 1Mbps: -93.5dBm maximum 802.11b, 11Mbps: -84dBm maximum 802.11a/g, 6Mbps: -86dBm maximum 802.11a/g, 54Mbps: -72dBm maximum 802.11n, MCS07: -67dBm maximum 802.11n, MCS15: -64dBm maximum 802.11ac, MCS0: -84dBm maximum 802.11ac, MCS9: -59dBm maximum •802.11ax, MCS11(HE40): -57dBm maximum •802.11ax, MCS11(HE80): -54dBm maximum
Antenna type	High efficiency antenna with spatial diversity, mounted in the display enclosure. Two embedded dual band 2.4/5 GHz antennas are provided to the card to support WLAN MIMO communications and Bluetooth communications
Form Factor	PCI-Express M.2 MiniCard
Dimensions	1. Type 2230: 2.3 x 22.0 x 30.0 mm 2. Type 1216: 1.67 x 12.0 x 16.0 mm
Weight	1. Type 2230: 2.8g 2. Type 126: 1.3g
Operating Voltage	3.3v +/- 9%
Temperature	**Operating** 14° to 158° F (–10° to 70° C) **Non-operating** –40° to 176° F (–40° to 80° C)
Humidity	**Operating** 10% to 90% (non-condensing) **Non-operating** 5% to 95% (non-condensing)
Altitude	**Operating** 0 to 10,000 ft (3,048 m) **Non-operating** 0 to 50,000 ft (15,240 m)
LED Activity	LED Amber – Radio OFF; LED Off – Radio ON

HP Integrated Module with Bluetooth 4.0/4.1/4.2/5.0/5.1/5.2/5.3 Wireless Card

Bluetooth Specification	4.0/4.1/4.2/5.0/5.1 Compliant/5.2/5.3 Compliant
Frequency Band	2402 to 2480 MHz
Number of Available Channels	Legacy: 0~79 (1 MHz/CH) BLE: 0~39 (2 MHz/CH)

Technical Specifications

Data Rates and Throughput	Legacy: 3 Mbps data rate; throughput up to 2.17 Mbps BLE: 1 Mbps data rate; throughput up to 0.2 Mbps Legacy: Synchronous Connection Oriented links up to 3, 64 kbps, voice channels Legacy: Asynchronous Connection Less links 2178.1 kbps/177.1 kbps asymmetric (3-DH5) or 864 kbps symmetric (3-EV5)
Transmit Power	The Bluetooth component shall operate as a Class II Bluetooth device with a maximum transmit power of + 4 dBm for BR and EDR.

1. Wireless access point and Internet service required and sold separately. Availability of public wireless access points limited. Wi-Fi 6 (802.11ax) is backwards compatible with prior 802.11 specs. Wi-Fi 6 is designed to support gigabit data rate when transferring files between two devices connected to the same router. Requires a wireless router, sold separately, that supports 80MHz and higher channels.
2. The FCC has declared as of September 1, 2014 products that utilize passive scanning on channel 12/13 and are capable of transmitting must fully comply with requirements of 15.247 or otherwise disable those channels.
3. Check latest software/driver release for updates on supported security features.
4. Receiver sensitivity is measured at a packet error rate of 8% for 802.11b (CKK modulation) and a packet error rate of 10% for 802.11a/g (OFDM modulation).

Intel® XMM™ 7560 R+ LTE-Advanced Pro[1]	**Technology/Operating bands**	FDD LTE: 2100 (Band 1), 1900 (Band 2), 1800 (Band 3), 1700/2100 (Band 4), 850 (Band 5), 2600 (Band 7), 900 (Band 8), 700 (Band 12 lower), 700 (Band 13 upper), 700 (Band 14 upper), 700 (Band 17 lower), 850 (Band 18 lower), 850 (Band 19 upper), 800 (Band 20), 1900 (Band 25), 850 (Band 26), 700 (Band 28), 700 (Band 29 RX only), 2300 (Band 30), 1700/2100 (Band 66), 600 (band 71). TDD LTE: 2100 (Band 34), 2600 (Band 38), 1900 (Band 39), 2400 (Band 40), 2500 (Band 41), 3500 (Band 42), 3700 (Band 43), 3700 (band 48), 5200 (Band 46 RX only) MHz; HSPA+: 2100 (Band 1), 1900 (Band 2), 1700/2100 (Band 4), 850 (Band 5), 900 (Band 8) MHz
	Wireless protocol standards	3GPP Release 12 LTE Specification DL-CAT.16, DL 100MHz BW throughput up to 978Mbps; UL-CAT.13 40MHz throughput up to 150Mbps WCDMA R99, 3GPP Release 5, 6, 7 and 8 UMTS Specification
	GPS	Standalone GPS/Beidou/Glonass, A-GPS (MS-A, MS-B)
	GPS bands	1575.42 MHz ± 1.023 MHz, GLONASS 1596-1607MHz, Beidou 1561.098 MHz
	Maximum data rates	LTE: 978 Mbps (Download), 150 Mbps (Upload) DC-HSPA+: 42 Mbps (Download), 5.76 Mbps (Upload) HSPA+: 21Mbps (Download), 5.76 Mbps (Upload)
	Maximum output power	LTE: 23 dBm in all band except B41 LTE B41 HPUE = 26dBm HSPA+: 23.5 dBm
	Maximum power consumption	LTE: 1,200 mA (peak); 900 mA (average) HSPA+: 1,100 mA (peak); 800 mA (average)
	Form Factor	M.2, 3042-S3 Key B
	Weight	6 g

Technical Specifications

Dimensions (Length x Width x Thickness)	42 x 30 x 2.3 mm
eSIM	Support

1. Mobile Broadband is an optional feature. Connection requires wireless data service contract, network support, and is not available in all areas. Contact service provider to determine the coverage area and availability. Connection speeds will vary due to location, environment, network conditions, and other factors. 4G LTE not available on all products or in all countries.

Realtek RTL8111HSH 10/100/1000 Integrated NIC	**Ethernet Features**	10 Mbit/s operation (10BASE-T; IEEE 802.3i; IEEE 802.3 clauses 13-14) 100 Mbit/s operation (100BASE-TX; IEEE 802.3u; IEEE 802.3 clauses 21-30) 1000 Mbit/s operation (1000BASE-T; IEEE 802.3ab; IEEE 8023 clauses 40) Auto-Negotiation (Automatic Speed Selection) Full Duplex Operation at all Speeds, Half Duplex operation at 10 and 100 Mbit/s
	Power Management	ACPI compliant – multiple power modes Situation-sensitive features reduce power consumption Advanced link down power saving for reducing link down power consumption
	Performance Features	TCP/IP/UDP Checksum Offload (configurable) Protocol Offload (ARP & NS) Large send offload and Giant send offload Receiving Side Scaling Jumbo Frame 9K
	Manageability	Wake-on-LAN from modern standby or sleep state (Magic Packet and Microsoft Wake-Up Frame); Wake-on-LAN from off (Magic Packet only) PXE 2.1 Remote Boot Statistics Gathering (SNMP MIB II, Ethernet-like MIB, Ethernet MIB (802.3x, clause 30)) Comprehensive diagnostic and configuration software suite Virtual Cable Doctor for Ethernet cable status
	Interface	PCIe + SMBus
	NIC Device Driver Name	Realtek PCIe GBE Ethernet Family Controller

Technical Specifications

POWER

AC Adapter 45 Watt nPFC Standard USB type C Straight 1.8m	**Dimensions**	94.0 mm x 40.0 mm x 26.5 mm
	Weight	192.5g +/-10%
	Input	100-240 VAC
	Input Efficiency	Average Efficiency of 25%, 50%, 75%, 100% load condition with 115Vac/230Vac Spec: 5V: 81.5% 9V: 86.7% 12V: 87.41% 15V: 87.8%
	Input frequency range	47 to 63 Hz
	Input AC current	Max. 1.4 A at 90 Vac
	Output	
	Output power	5V/15W 9V/27W 12V/36W 15V/45W
	DC output	5V/9V/12V/15V
	Hold-up time	5ms at 115 Vac input
	Output current limit	<5.0A
	Connector	USB Type-C
	Environmental Design	
	Operating temperature	32° to 95° F (0° to 35° C)
	Non-operating (storage) temperature	-4° to 185° F (-20° to 85° C)
	Altitude	0 to 16,400 ft (0 to 5000m)
	Humidity	20% to 95%
	Storage Humidity	10% to 95%
	EMI and Safety Certifications	Eg. *CE Mark - full compliance with LVD and EMC directives *Worldwide safety standards - IEC60950, EN60950, UL60950, Class1, SELV; Agency approvals - C-UL-US, NORDICS, DENAN, EN55022 Class B, FCC Class B, CISPR22 Class B, CCC, NOM-1 NYCE. *MTBF - over 200,000 hours at 25°C ambient condition.

AC Adapter 45 Watt Smart nPFC Standard Barrel 4.5mm Right Angle 1.8m	**Dimensions**	95 x 45 x 26.5 mm
	Weight	unit: 200g +/- 10g
	Input	100-240 VAC
	Input Efficiency	87.74 % at 115 Vac and 88.4 % at 230Vac
	Input frequency range	47 ~ 63 Hz
	Input AC current	Max. 1.4 A at 90 Vac
	Output	
	Output power	45W
	DC output	19.5V
	Hold-up time	5ms at 115 Vac input

Technical Specifications

	Output current limit	<8.0A
	Connector	4.5mm Barrel Type
	Environmental Design	
	Operating temperature	32° to 95° F (0° to 35° C)
	Non-operating (storage) temperature	-4° to 185° F (-20° to 85° C)
	Altitude	0 to 16,400 ft (0 to 5000m)
	Humidity	20% to 95%
	Storage Humidity	10% to 95%
	EMI and Safety Certifications	Eg: *CE Mark - full compliance with LVD and EMC directives * Worldwide safety standards - IEC60950-1 and/or IEC62368-1, EN60950-1 and/or EN62368-1, UL60950-1 and/or UL62368-1, Class1, SELV; Agency approvals - C-UL-US, NORDICS, DENAN, EN55032 Class B, FCC Class B, CISPR32 Class B, CCC, NOM-001 NYCE. * MTBF - over 200,000 hours at 25°C ambient condition.
AC Adapter 65 Watt nPFC Standard USB type C Straight 1.8m	**Dimensions**	90.0 x 51 x 28.5mm
	Weight	unit: 250g +/- 10g
	Input	100-240 VAC
	Input Efficiency	Average Efficiency of 25%, 50%, 75%, 100% load condition with 115Vac/230Vac Spec: 5V: 81.5% 9V: 86.7% 12V: 88% 15V: 88% 20V: 89%
	Input frequency range	47 ~ 63Hz
	Input AC current	1.6 A at 90 VAC and maximum load
	Output	
	Output power	5V/15W 9V/27W 12V/60W 15V/60W 20V/65W
	DC output	5V/9V/12V/15V/20V
	Hold-up time	5ms at 115 Vac input
	Output current limit	<8.0A
	Connector	USB Type-C
	Environmental Design	
	Operating temperature	32° to 95° F (0° to 35° C)
	Non-operating (storage) temperature	-4° to 185° F (-20° to 85° C)
	Altitude	0 to 16,400 ft (0 to 5000m)
	Humidity	20% to 95%

Technical Specifications

Storage Humidity	10% to 95%
EMI and Safety Certifications	Eg: *CE Mark - full compliance with LVD and EMC directives * Worldwide safety standards - IEC60950-1 and/or IEC62368-1, EN60950-1 and/or EN62368-1, UL60950-1 and/or UL62368-1 , Class1, SELV; Agency approvals - C-UL-US, NORDICS, DENAN, EN55032 Class B, FCC Class B, CISPR32 Class B, CCC, NOM-001 NYCE. * MTBF - over 200,000 hours at 25°C ambient condition.

AC Adapter 65 Watt Smart nPFC EM Barrel 4.5mm New EM	**Dimensions**	102 x 55 x 30mm
	Weight	unit: 250g +/- 10g
	Input	100-240 VAC
	Input Efficiency	88.0 % at 115 Vac and 89.0 % at 230Vac
	Input frequency range	47 ~ 63 Hz
	Input AC current	Max. 1.7 A at 90 Vac
	Output	
	Output power	65W
	DC output	19.5V
	Hold-up time	5ms at 115 Vac input
	Output current limit	<11.0A
	Connector	4.5mm Barrel Type
	Environmental Design	
	Operating temperature	32ºF to 95ºF (0ºto 35ºC)
	Non-operating (storage) temperature	-4ºF to 185ºF (-20ºto 85ºC)
	Altitude	0 to 16,400 ft (0 to 5000m)
	Humidity	20% to 95%
	Storage Humidity	10% to 95%
	EMI and Safety Certifications	Eg: *CE Mark - full compliance with LVD and EMC directives * Worldwide safety standards - IEC60950-1 and/or IEC62368-1, EN60950-1 and/or EN62368-1, UL60950-1 and/or UL62368-1 , Class1, SELV; Agency approvals - C-UL-US, NORDICS, DENAN, EN55032 Class B, FCC Class B, CISPR32 Class B, CCC, NOM-001 NYCE. * MTBF - over 200,000 hours at 25°C ambient condition.

Technical Specifications

AC Adapter 65 Watt Smart nPFC Standard Barrel 4.5mm Right Angle 1.8m	**Dimensions**	90 x 51 x 28.5mm
	Weight	230g +/-10%
	Input	100-240 VAC
	Input Efficiency	88.0 % at 115 Vac and 89.0 % at 230 Vac
	Input frequency range	47 ~ 63 Hz
	Input AC current	Max. 1.7 A at 90 Vac
	Output	
	Output power	65W
	DC output	19.5V
	Hold-up time	5 ms at 115 Vac input
	Output current limit	<11.0A
	Connector	4.5mm Barrel Type
	Environmental Design	
	Operating temperature	32ºF to 95ºF (0ºto 35ºC)
	Non-operating (storage) temperature	-4ºF to 185ºF (-20ºto 85ºC)
	Altitude	0 to 16,400 ft (0 to 5000m)
	Humidity	20% to 95%
	Storage Humidity	10% to 95%
	EMI and Safety Certifications	Eg: *CE Mark - full compliance with LVD and EMC directives * Worldwide safety standards - IEC60950-1 and/or IEC62368-1, EN60950-1 and/or EN62368-1, UL60950-1 and/or UL62368-1, Class1, SELV; Agency approvals - C-UL-US, NORDICS, DENAN, EN55032 Class B, FCC Class B, CISPR32 Class B, CCC, NOM-001 NYCE. * MTBF - over 200,000 hours at 25°C ambient condition.

RH 42Whr Long Life Polymer Fast Charge 3 cell Battery	**Weight**	0.18 kg (0.397 lb)
	Cells/Type	3cell Lithium-Ion Polymer cell / 545974
	Energy	
	Voltage	11.4V
	Amp-hour capacity	3.752Ah
	Watt-hour capacity	42.75Wh
	Temperature	
	Operating (Charging)	32˚ to 113˚ F (0˚ to 45˚ C)
	Operating (Discharging)	14˚ to 122˚ F (-10˚ to 60˚ C)
	Optional Travel Battery Available	No

Technical Specifications

RH 51Whr Long Life Polymer Fast Charge 3 cell Battery	**Weight**	0.2025 kg (0.446 lb)
	Cells/Type	3cell Lithium-Ion Polymer cell / 566075
	Energy	
	Voltage	11.58V
	Amp-hour capacity	4.431Ah
	Watt-hour capacity	51.3Wh
	Temperature	
	Operating (Charging)	32˚ to 113˚ F (0˚ to 45˚ C)
	Operating (Discharging)	14˚ to 122˚ F (-10˚ to 60˚ C)
	Optional Travel Battery Available	No

Technical Specifications

AUDIO

HD Stereo Codec	ALC3247-CG
Audio I/O Ports	Headset: CTIA only and Headphone-out
Internal Speaker Amplifier	ALC 3247 has Embedded Class-D 2W Stereo Amplifier
Multi-streaming Capable	Playback multi-streaming can be enabled in the audio control panel to allow independent audio. Following MSFT Behavior
Sampling	DAC:44.1k/48kHz ADC:48kHz
Wavetable Syntheses	NA
Analog Audio	Support 3.5mm Headset: CTIA only and Headphone-out
# of Channels on Line-Out	NA
Internal Speaker	Yes

FINGERPRINT READER

Sensor vendor	Elan efsa80ST
Sensor type	Capacitive
DPI resolution	508 dpi
Scan area	80*80 pixels
False Rejection Rate	<3%
False Acceptance Rate	1/100K
Mobile Voltage Operation	2.7V to 3.6V
Operating Temperature	-4 – 175°F (-20° ~ +80°C)
Current Consumption Image	50mA peak
Low Latency Wait For Finger	900uA
Capture Rate	30 frame/sec
ESD Resistance	+15KV
Detection Matrix	80*80 pixels/ 508 dpi / 4*4mm sensor area

Technical Specifications

ENVIRONMENTAL DATA

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 Speaker • 10% 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)	5.21 W	5.17 W	5.41 W
Normal Operation (Long idle)	0.91 W	1.01 W	0.92 W
Sleep	0.91 W	1.01 W	0.92 W
Off	0.29 W	0.31 W	0.29 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)	17.8 BTU/hr	17.7 BTU/hr	18.5 BTU/hr
Normal Operation (Long idle)	3.1 BTU/hr	3.5 BTU/hr	3.1 BTU/hr
Sleep	3.1 BTU/hr	3.5 BTU/hr	3.1 BTU/hr
Off	1 BTU/hr	1.1 BTU/hr	1 BTU/hr

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	*__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	2.6	15.4	
Fixed Disk – Random writes	2.7	15.6	
Optical Drive – Sequential reads	3.2	29.8	
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 93.3% recycle-able when properly disposed of at end of life.		
Packaging Materials	**External:**	PAPER/Corrugated	0.295 g
		PAPER/Molded Pulp	0.192 g
	Internal:	PLASTIC/Polyethylene low density - LDPE	0.010 g
	The plastic packaging material contains at least 0.0% recycled content.		
	The corrugated paper packaging materials contains at least 60.6% 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 **Error! Hyperlink reference not valid.** HP RoHS position statement.		
Material Usage	This product does not contain any of the following substances in excess of regulatory limits (refer to the HP General Specification for the Environment at http://www.hp.com/hpinfo/globalcitizenship/environment/supplychain/gen_specifications.html		

	): • Asbestos • Certain Azo Colorants • Certain Brominated Flame Retardants – may not be used as flame retardants in plastics • Cadmium • Chlorinated Hydrocarbons • Chlorinated Paraffins • Bis(2-Ethylhexyl) phthalate (DEHP) • Benzyl butyl phthalate (BBP) • Dibutyl phthalate (DBP) • Diisobutyl phthalate (DIBP) • Formaldehyde • Halogenated Diphenyl Methanes • Lead carbonates and sulfates • Lead and Lead compounds • Mercuric Oxide Batteries • Nickel – finishes must not be used on the external surface designed to be frequently handled or carried by the user. • Ozone Depleting Substances • Polybrominated Biphenyls (PBBs) • Polybrominated Biphenyl Ethers (PBBEs) • Polybrominated Biphenyl Oxides (PBBOs) • Polychlorinated Biphenyl (PCB) • Polychlorinated Terphenyls (PCT) • Polyvinyl Chloride (PVC) – except for wires and cables, and certain retail packaging has been voluntarily removed from most applications. • Radioactive Substances • Tributyl Tin (TBT), Triphenyl Tin (TPT), Tributyl Tin Oxide (TBTO)
Packaging Usage	HP follows these guidelines to decrease the environmental impact of product packaging: • Eliminate the use of heavy metals such as lead, chromium, mercury and cadmium in packaging materials. • Eliminate the use of ozone-depleting substances (ODS) in packaging materials. • Design packaging materials for ease of disassembly. • Maximize the use of post-consumer recycled content materials in packaging materials. • Use readily recyclable packaging materials such as paper and corrugated materials. • Reduce size and weight of packages to improve transportation fuel efficiency. • Plastic packaging materials are marked according to ISO 11469 and DIN 6120 standards.
End-of-life Management and Recycling	HP offers end-of-life HP product return and recycling programs in many geographic areas. To recycle your product, please go to: http://www.hp.com/go/reuse-recycle or contact your nearest HP sales office. Products returned to HP will be recycled, recovered or disposed of in a responsible manner. The EU WEEE directive (2002/95/EC) requires manufacturers to provide treatment information for each product type for use by treatment facilities. This information (product disassembly instructions) is posted on the Hewlett Packard web site at: http://www.hp.com/go/recyclers. These instructions may be used by recyclers and other WEEE treatment facilities as well as HP OEM customers who integrate and re-sell HP equipment.

Technical Specifications

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

COUNTRY OF ORIGIN

China

Options and Accessories (sold separately and availability may vary by country)

DOCKING (Sold Separately)

Docking station model #1	HP USB-C Dock G5
Total number of supported displays (incl. the notebook display)	3
Max. resolutions supported	Dual 5K@ 30Hz + 1 4K UHD (multi-function mode) 5120x2880 Highest resolution with dual displays is two 8K@ 60Hz host in High Resolution mode.
Dock Connectors	1xHDMI, 2xDP
Technical limitations	Highest resolution with dual displays is two 8K@ 60Hz host in High Resolution mode. Three maximum displays supported are two 5K@ 30 Hz on DP ports plus one 4K UHD@ 30 Hz on HDMI in Multi-function mode The highest resolution for a non-Thunderbolt host in Multi-function mode is a single 5K dual cable (using both DP ports) + (1) 4K on HDMI port .
Docking station model #2	HP USB-C/A Universal Dock G2
Total number of supported displays (incl. the notebook display)	3
Max. resolutions supported	Triple 4K UHD@ 60Hz 3840x2160
Dock Connectors	1xHDMI, 2xDP
Technical limitations	The best resolution for dual or triple displays is 4K UHD@ 60Hz. For use with the USB-A adapter that comes in the box the maximum number of displays supported is (2) 4k x 60 Hz on the Type-A Gen 1 connection from the host
Docking station model #3	HP Thunderbolt Dock G2
Total number of supported displays (incl. the notebook display)	4
Max. resolutions supported	Dual 4K @30Hz or dual 4K UHD @ 60Hz is supported Single 8K@ 60Hz for Thunderbolt hosts or USB-C hosts DP 1.4 with DSC in high res mode.
Dock Connectors	2xDP, 1xVGA, 1xTB, 1xUSB-C alt-mode
Technical limitations	Thunderbolt Hosts: Maximum of (4) displays with maximum resolution of 5K@ 30Hz running Thunderbolt host. Maximum resolution possible is dual 8K displays @ 60Hz running Thunderbolt host or running a non-Thunderbolt host in high resolution mode @30Hz Non-Thunderbolt hosts: The highest resolution for dual displays running a non-Thunderbolt host in multi-function mode is (1) 5K dual cable (using both DP ports) +(1) 4K on USB-C DP port Non-Thunderbolt hosts support (3) displays with a maximum resolution of (2) 5K single cable + (1) 4K UHD @ 60 Hz in high resolution mode. In multi-function mode the maximum resolution for (3) displays is (2) 5K single cable @ 30Hz + (1) 4K UHD @ 30Hz.

Options and Accessories (sold separately and availability may vary by country)

Category	Description	Part Number
Audio/Video	HP Wired USB-A Stereo Headset	428K6AA
	HP Wired 3.5mm Stereo Headset	428K7AA
Cases	HP Business Slim 17.3 Top Load	2UW02AA
	HP Executive 15.6 Backpack	6KD07AA
	HP Executive 15.6 Top Load	6KD06AA
	HP Executive 17.3 Backpack	6KD05AA
	HP Executive 17.3 Top Load	6KD08AA
	HP Executive Leather 15.6 Top Load	6KD09AA
	HP Prelude G2 15.6 Backpack	1E7D6AA
	HP Prelude G2 15.6 Top Load	1E7D7AA
	HP Prelude Pro Recycled 15.6 Backpack	1X644AA
	HP Prelude Pro Recycled 15.6 Top Load	1X645AA
	HP Renew Business 17.3 Laptop Backpack	3E2U5AA
	HP Renew Business 17.3 Laptop Bag	3E2U6AA
	HP Renew Business 15.6 Laptop Bag	3E5F8AA
Docking	HP Thunderbolt 120W G2 Dock	2UK37AA
	HP Thunderbolt 120W G2 Dock w/Audio	3YE87AA
	HP Thunderbolt 120W G4 Dock	4J0A2AA
	HP Thunderbolt 230W G2 Dock w/Combo Cable	3TR87AA
	HP Thunderbolt 280W G4 Dock w/Combo Cable	4J0G4AA
	HP USB-C/A 120W G2 Universal Dock	5TW13AA
	HP USB-C Dock G5	5TW10AA
Hub	HP USB-C Mini Dock	1PM64AA
	HP Universal USB-C Multiport Hub	50H55AA
	HP USB-C Travel Dock G2	7PJ38AA
	HP USB-C to USB-A Hub	Z6A00AA
Adapter	HP HDMI to DVI Adapter	F5A28AA
	HP HDMI to VGA Adapter	H4F02AA
	HP USB-C to DisplayPort Adapter	N9K78AA
	HP USB-C to HDMI 2.0 Adapter	1WC36AA
	HP USB-C to USB 3.0 Adapter	N2Z63AA
	HP USB-C to VGA Adapter	N9K76AA
Keyboard/Combo	HP 975 USB+BT Dual-Mode Wireless Keyboard	3Z726AA
	HP 455 Programmable Wireless Keyboard	4R177AA
	HP 125 WD USB Keyboard	266C9AA
	HP 320K WD USB Keyboard	9SR37AA
	HP 655 Wireless Keyboard and Mouse Combo	4R009AA
	HP 225 Wired Mouse and Keyboard Combo	286J4AA

Options and Accessories (sold separately and availability may vary by country)

	HP 235 Wireless Mouse and Keyboard Combo	1Y4D0AA
	HP Slim Wireless Keyboard and Mouse	T6L04AA
	HP Wired Desktop 320MK Mouse and Keyboard	9SR36AA
	HP Wireless Rechargeable 950MK Mouse and Keyboard	3M165AA
Mouse	HP USB Premium Wireless Mouse	1JR31AA
	HP 435 Multi-Device Wireless Mouse	3B4Q5AA
	HP 125 USB-A Wired Mouse	265A9AA
	HP 128 USB Laser Wired Mouse	265D9AA
	HP 320M USB-A Wired Mouse	9VA80AA
	HP Creator USB-A+Bluetooth 935 Wireless Mouse Black	1D0K8AA
	HP USB-A+Bluetooth Multi-Device 635 Wireless Mouse Black	1D0K2AA
	HP USB-A+Bluetooth Travel Bluetooth Mouse	6SP30AA
Power	HP 65W USB-C Auto Chevy AC Power Adapter	5TQ76AA
	HP 45W 4.5 mm Smart AC Power Adapter	H6Y88AA
	HP 45W USB-C G2 Zeus AC Power Adapter	1HE07AA
	HP 45W USB-C LC Dali AC Power Adapter	1MZ01AA
	HP 65W 4.5 mm LC Smart non-EM India Ony AC Power Adapter	3FF84AA#ACJ
	HP 65W 4.5 mm Smart AC Power Adapter	H6Y89AA
	HP 65W 4.5 mm wDongle 7.4 mm Slim AC Power Adapter	H6Y82AA
	HP 65W USB-C Hades AC Power Adapter	1HE08AA
	HP 65W USB-C LC AC Power Adapter	1P3K6AA
Commodity	HP USB DVD-Writer EXT ODD	F2B56AA
	HP Nano Keyed Cable Lock	1AJ39AA
	HP Nano Master Keyed Cable Lock	1AJ40AA
	HP SureKey Standard/Nano/Wedge Cable Lock	6UW42AA

Summary of Changes

Date of change:	Version History:	Updated	Description of change:
March 28, 2022	V1 to V2	Added	Environmental Data
April 11, 2022	V2 to V3	Added	Reference for USB ports
June 15, 2022	V3 to V4	Added	Added note in Manageability Feature
June 22, 2022	V4 to V5	Updated	Discrete in Graphics section
July 19, 2022	V5 to V6	Added	Input value in Power section
August 8, 2022	V6 to V7	Updated	DisplayPort™ in At a Glance and Ports/Slots section
September 7, 2022	V7 to V8	Removed	Tile App
October 20, 2022	V8 to V9	Updated	Bluetooth version
December 8, 2022	V9 to V10	Updated	Windows OS
January 12, 2023	V10 to V11	Added	HP Client Security Manager in Software and Security section
January 20, 2023	V11 to V12	Updated	Operating System
March 7, 2023	V12 to V13	Updated	Networking and communications section and content updates
May 18, 2023	V13 to V14	Updated	Storage and Drives section
April 24, 2024	V14 to V15	Updated	Memory Section

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