

### Overview

### HP ZBook Firefly 14 Inch G8 Mobile Workstation



#### Right

1. 4.5mm AC Power connector
2. Battery Charging LED
3. HDMI 2.0 (HDMI cable not included)
4. (2) USB Type-C® with Thunderbolt™ 4
5. Nano SIM card slot (optional)<sup>1</sup>
6. Speakers
7. Clickpad
8. Dual point stick with buttons
9. HP Premium Keyboard
10. HD Camera (select models only)
11. IR Camera (select models only)
12. HP Privacy Camera Shutter
13. Multi array microphone
14. Webcam LED
15. Power button (on keyboard)
16. Fingerprint sensor (optional)

<sup>1</sup>All units have a SIM card slot and icon but units that do not support WWAN are shipped with a non-removable SIM slot plug

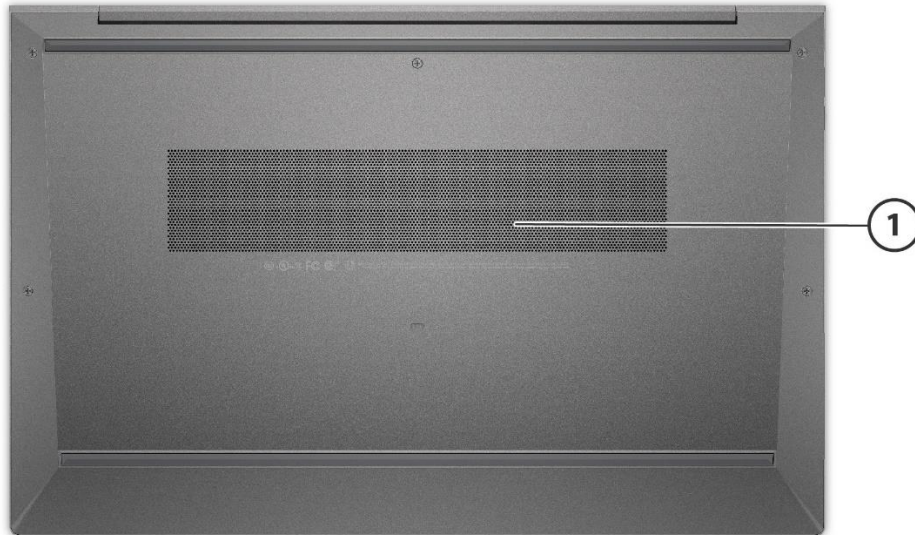
### Overview



#### Left

1. Nano security lock slot (cable lock sold separately)
2. (1) USB 3.1 Gen 1 Type A charging port
3. (1) USB 3.1 Gen 1 Type A
4. Headphone/microphone combo jack
5. HP Smart Card Reader (optional)

### Overview



### Bottom

1. Fan Venting
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### Overview

#### At A Glance

- Work anywhere without compromising on performance or security with Windows 10 Pro<sup>1</sup>, powered by HP's collaboration and connectivity technology.
- Open large files and run apps simultaneously for speedy multitasking and productivity with the next generation NVIDIA® T500 graphics with 4GB of video memory.
- Bring your ideas to life quickly and effectively with the latest 11th gen quad core Intel® Core™ processors<sup>2</sup> with up to 4.7 GHz of acceleration when you need it most.<sup>3</sup>
- Strenuously tested to meet ISV certification and deliver superb performance and support with leading software providers, including Autodesk.<sup>4</sup>
- Instantly protect against visual hacking with HP Sure View Reflect<sup>6</sup> and defend against firmware and malware attacks with HP Sure Start Gen<sup>7</sup>, HP Sure Sense<sup>8</sup>, and HP Tamper Lock<sup>9</sup> intrusion detection sensor.
- Built with the environment in mind, this ZBook includes recycled ocean-bound plastics<sup>10</sup>, plastic-free packaging, a reduction in hazardous material and ultra-efficient power consumption.
- The keyboard has been re-imagined with rubber domes, power button, and a quiet clickpad for a more comfortable, intuitive, and quiet experience.
- Choice of modern viewing experiences:
  - 14" diagonal, FHD (1920 x 1080), IPS, anti-glare, 400 nits, low power 100% sRGB
  - 14" diagonal, FHD (1920 x 1080), IPS, anti-glare, 250 nits, 45% NTSC
  - 14" diagonal, FHD (1920 x 1080), IPS, anti-glare, 1000 nits, 72% NTSC, HP Sure View Reflect integrated privacy screen
  - 14" diagonal, FHD (1920 x 1080), IPS, anti-glare, 500 nits, 100% DCI-P3, HP DreamColor panel
  - 14" diagonal, FHD (1920 x 1080), touch, IPS, anti-glare, 250 nits 100% sRGB
- Designed for ultimate durability, this ZBook undergoes 19 brutal MIL-STD 810H<sup>11</sup> tests to help ensure this PC keeps rolling through your workday.
- Plug in to greater connectivity at your desktop with the HP Thunderbolt Dock for lightning-fast Thunderbolt™ 3<sup>12</sup> transfers and the flexibility to run up to two external 4K displays.<sup>13,14</sup>
- Work without limits in any location with up to 2TB<sup>15</sup> of local PCIe storage.
- 170 degree clamshell hinges lay almost flat, for easy collaboration and comfortable viewing at every angle.
- No need to risk riding someone else's network when you have your own. Optional 4G LTE<sup>16</sup> or 5G<sup>18</sup> leverages the SIM card from your wireless provider for enhanced security.
- A completely revamped standby system means you're ready to work the moment inspiration strikes. With no sleep mode and no off mode, the modern standby keeps your rig connected and on demand whenever you need it.
- Improve connectivity while on Wi-Fi® with HP Extended Range Wireless LAN that allows greater distance from transmission point and fast data throughput at shorter ranges.<sup>17</sup>

<sup>1</sup>Not all features are available in all editions or versions of Windows. Systems may require upgraded and/or separately purchased hardware, drivers, software or BIOS update to take full advantage of Windows functionality. Windows 10 is automatically updated, which is always enabled. ISP fees may apply and additional requirements may apply over time for updates. See <http://www.windows.com>.

<sup>2</sup>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.

<sup>3</sup>Intel® Turbo Boost technology requires a PC with a processor with Intel Turbo Boost capability. Intel Turbo Boost performance varies depending on hardware, software and overall system configuration. See [www.intel.com/technology/turboboost](http://www.intel.com/technology/turboboost) for more information.

<sup>4</sup>Autodesk software sold separately.

<sup>6</sup>HP Sure View Reflect integrated privacy screen is an optional feature that must be configured at purchase and operates in landscape orientation.

<sup>7</sup>HP Sure Start Gen6 is available 2021 on select HP PCs and requires Windows 10.

<sup>8</sup>HP Sure Sense requires Windows 10 Pro or Enterprise. See product specifications for availability.

<sup>10</sup>Speaker enclosure component made with 5% ocean bound plastic as of 2/3/2020.

<sup>11</sup>Testing is not intended to demonstrate fitness of U.S. Department of Defense (DoD) contract requirements or for military use.

### Overview

Test results are not a guarantee of future performance under these test conditions. Accidental damage requires an optional HP Accidental Damage Protection Care Pack.

<sup>12</sup>HP Thunderbolt Dock with Thunderbolt™ 3 (120W) sold separately.

<sup>13</sup>External displays sold separately.

<sup>14</sup>Optional hybrid graphics is required to run up to two external 4K displays.

<sup>15</sup>For hard drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 30GB (for Windows 10) of system disk is reserved for system recovery software.

<sup>16</sup>4G LTE requires separately purchased service contract, and configuration at purchase. 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.

<sup>17</sup>Based on internal testing vs. previous generation product with 802.11ac wireless LAN module.

<sup>18</sup>WWAN modules for 5G ready platforms are optional features that can be configured at purchase or added later by the customer. 5G module supports AT&T and T-Mobile networks in the U.S. Module designed for 5G networks as carriers deploy Evolved-Universal Terrestrial Radio Access New Radio Dual Connectivity (EN-DC) with both 100Mhz of 5G NR and LTE channel bandwidth, using 256QAM 4x4 as defined by 3GPP, requires activation and separately purchased service contract. Check with service provider for coverage and availability in your area. Connection, upload and download speeds will vary due to network, location, environment, network conditions, and other factors. 5G not available on all products, in all regions. Backwards compatible to 4G LTE and 3G HSPA technologies. 5G module planned to be available in select countries, where carrier supported.

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

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### Features

#### OPERATING SYSTEM

<b>Preinstalled OS</b>	Windows 10 Pro 64 - HP recommends Windows 10 Pro for business. <sup>1</sup> Windows 10 Home 64 <sup>1</sup> Windows 10 Home Single Language 64 <sup>1</sup> Windows 10 Pro 64 <sup>1</sup> FreeDOS 3.0
<b>Web support OS</b>	Windows 10 Enterprise 64 <sup>1</sup>
<b>Supported Version</b>	For testing information on newer versions of Windows 10, please see: <a href="https://support.hp.com/document/c05195282">https://support.hp.com/document/c05195282</a> .

<sup>1</sup> Not all features are available in all editions or versions of Windows. Systems may require upgraded and/or separately purchased hardware, drivers, software or BIOS update to take full advantage of Windows functionality. Windows 10 is automatically updated, which is always enabled. ISP fees may apply and additional requirements may apply over time for updates. See <http://www.windows.com>.

<sup>2</sup> Tested and documented only.

Note: HP tested Windows 10, version 1809 on this platform. For testing information on newer versions of Windows 10, please see <https://support.hp.com/document/c05195282>.

#### PROCESSOR

11<sup>th</sup> Generation Intel® Core™ i7-1185G7 (3 GHz base frequency, up to 4.80 GHz with Intel® Turbo Boost Technology, 12 MB cache, 4 cores) supporting Intel® vPro® technology<sup>1,2,3,4,5</sup>

11<sup>th</sup> Generation Intel® Core™ i7-1165G7 (2.80 GHz base frequency, up to 4.70 GHz with Intel® Turbo Boost Technology, 12 MB cache, 4 cores)<sup>1,2,3,4</sup>

11<sup>th</sup> Generation Intel® Core™ i5-1145G7 (2.60 GHz base frequency, up to 4.40 GHz with Intel® Turbo Boost Technology, 8 MB cache, 4 cores) supporting Intel® vPro® technology<sup>1,2,3,4,5</sup>

11<sup>th</sup> Generation Intel® Core™ i5-1135G7 (2.40 GHz base frequency, up to 4.20 GHz with Intel® Turbo Boost Technology, 8 MB cache, 4 cores)<sup>1,2,3,4</sup>

<sup>1</sup> 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.

<sup>2</sup> Processor speed denotes maximum performance mode; processors will run at lower speeds in battery optimization mode.

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

<sup>4</sup> 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>.

<sup>5</sup> For full Intel® vPro® functionality, Windows 10 Pro 64 bit, a vPro supported processor, vPro enabled chipset, vPro enabled wired LAN and/or WLAN card and TPM 2.0 are required. Some functionality requires additional 3rd party software in order to run. See <http://intel.com/vpro>

### Features

#### CHIPSET

Integrated in System on Chip (SOC)

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#### GRAPHICS

##### Integrated

Intel® Iris® Xe Graphics<sup>1, 3, 5, 6</sup>

##### Discrete

NVIDIA® T500 (4 GB GDDR6 dedicated)<sup>2, 4</sup>

<sup>1</sup> UHD content required to view UHD images.

<sup>2</sup> Both UMA & Discrete configurations support 3 independent displays when on the HP Thunderbolt Dock G2 (120W) (sold separately) - Max. resolution = 2.5K @60Hz (DP1) & 2.5K @60Hz (DP2) & FHD (VGA) OR 4K @60Hz (one DP Port) & 4K @60Hz (Type-C output port using a Type C-to-DP adapter).

<sup>3</sup> Support HD decode, DX12, HDMI 2.0b, HDCP 2.3 via DP up to 4K @ 60Hz and via HDMI up to 4096x2304 @ 60Hz

<sup>4</sup> HDMI cable Sold Separately

<sup>5</sup> Shared video memory (UMA) uses part of the total system memory for video performance. System memory dedicated to video performance is not available for other use by other programs.

<sup>6</sup> 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.

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#### DISPLAY

##### Non-touch

- 14" diagonal, FHD (1920 x 1080), IPS, anti-glare, 400 nits, low power 100% sRGB<sup>3,4</sup>
- 14" diagonal, FHD (1920 x 1080), IPS, anti-glare, 250 nits, 45% NTSC<sup>3,4</sup>
- 14" diagonal, FHD (1920 x 1080), IPS, anti-glare, 1000 nits, 72% NTSC, HP Sure View Reflect integrated privacy screen<sup>1,3,4,5</sup>
- 14" diagonal, FHD (1920 x 1080), IPS, anti-glare, 500 nits, 100% DCI-P3, HP DreamColor panel<sup>3,4,6</sup>

##### Touch

- 14" diagonal, FHD (1920 x 1080), touch, IPS, anti-glare, 250 nits, 45% NTSC<sup>3,4,5</sup>

<sup>1</sup> HP Sure View Reflect is optional and must be configured at purchase.

<sup>3</sup> Sold separately or as an optional feature.

<sup>4</sup> Resolutions are dependent upon monitor capability, and resolution and color depth settings.

<sup>5</sup> Actual brightness will be lower with HP Sure View Reflect or touch screen.

<sup>6</sup> HP DreamColor display available in 2Q of 2021.

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### Features

#### STORAGE AND DRIVES\*

##### PCIe® NVMe™ M.2 2280 Storage

256 GB PCIe® Gen3 x4 NVMe™ M.2 2280 TLC Self Encrypting (SED) Solid State Drive (SSD)  
512 GB PCIe® Gen3 x4 NVMe™ M.2 2280 TLC Self Encrypting (SED) Solid State Drive (SSD)  
256 GB PCIe® Gen3 x4 NVMe™ M.2 2280 TLC Solid State Drive (SSD)  
512 GB PCIe® Gen3 x4 NVMe™ M.2 2280 TLC Solid State Drive (SSD)  
1 TB PCIe® Gen3 x4 NVMe™ M.2 2280 TLC Solid State Drive (SSD)  
2 TB PCIe® Gen3 x4 NVMe™ M.2 2280 TLC Solid State Drive (SSD)  
256 GB PCIe® Gen3 x4 NVMe™ M.2 2280 TLC Value Solid State Drive (SSD)  
128 GB PCIe® Gen3 x2 NVMe™ M.2 2280 TLC Solid State Drive (SSD)

##### Intel® Optane™ Memory H10 with Solid State Storage

512 GB PCIe® Gen3 x4 NVMe™ M.2 2280 QLC Solid State Drive (SSD) + 32 GB Intel® Optane™ Memory<sup>1,2</sup>

<sup>2</sup> Intel® Optane™ memory system acceleration does not replace or increase the DRAM in your system.

\* For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 35GB of disk is reserved for system recovery software.

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#### DRIVE CONTROLLERS

M.2 Storage Bay (PCIe NVMe)

PCIe® Gen3 x4 lanes NVMe™ Solid State Drive

RAID:

Not supported

#### MEMORY

##### Maximum Memory for configuration without discrete graphics

64 GB DDR4-3200 non-ECC SDRAM<sup>1</sup>  
2 DDR4 SODIMMS  
Supports Dual Channel Memory<sup>3</sup>

##### Maximum Memory for configuration with discrete graphics

32 GB DDR4-3200 non-ECC SDRAM<sup>2</sup>  
Memory soldered Down  
Supports Dual Channel Memory

<sup>1</sup> 64GB memory configurations is only available on configurations without discrete graphics.

<sup>2</sup> Soldered down memory is a requirement on configurations that have discrete graphics.

<sup>3</sup> 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.



### Features

#### NETWORKING/COMMUNICATIONS

##### WLAN

Intel® Wi-Fi 6 AX201 (2x2) and Bluetooth® 5 combo, non-vPro®<sup>1</sup>

<sup>1</sup>Wireless access point and Internet service required and sold separately. Availability of public wireless access points limited. The specifications for Wi-Fi 6 (802.11ax WLAN) are draft specifications and are not final. If the final specifications differ from the draft specifications, it may affect the ability of the notebook to communicate with other 802.11ax WLAN devices. Only available in countries where 802.11ax is supported.

##### WWAN\*

Intel® XMM™ 7360 LTE Advanced CAT 9<sup>1</sup>  
Qualcomm® Snapdragon™ X55 5G Modem<sup>2</sup>

<sup>1</sup> WWAN is an optional feature and requires factory configuration with the appropriate panel (identified at point of purchase) and 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, and in all regions.

\*WWAN capabilities can be configured at the time of purchase by select a panel that indicates it is “for WWAN”. “For WWAN” panels include the antenna required to support the 4G LTE or 5G module. The 4G LTE or 5G module does not need to be selected at the time of purchase; furthermore, the supported 4G LTE or 5G module can be purchased at a later time and the unit can be upgraded with the 4G LTE or 5G module at a later time.

<sup>2</sup> 5G module is an optional feature that must be configured at purchase. AT&T and T-Mobile networks supported in the U.S. Module designed for 5G networks as carriers deploy Evolved-Universal Terrestrial Radio Access New Radio Dual Connectivity (ENDC) with both 100Mhz of 5G NR and LTE channel bandwidth, using 256QAM 4x4 as defined by 3GPP, requires activation and separately purchased service contract. Check with service provider for coverage and availability in your area. Connection, upload and download speeds will vary due to network, location, environment, network conditions, and other factors. 5G not available on all products, in all regions. Backwards compatible to 4G LTE and 3G HSPA technologies. 5G module planned to be available in select countries, where carrier supported.

##### Optional Near Field Communication (NFC) module

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#### AUDIO/MULTIMEDIA

##### Audio

Audio by Bang & Olufsen, dual stereo speakers, HP World Facing Microphone dual array digital microphone, functions keys for volume up and down, combo microphone/headphone jack, HD audio

##### Camera<sup>1,2</sup>

720p HD webcam with IR  
720p HD webcam

<sup>1</sup> HD content required to view HD images.

<sup>2</sup> Windows Hello face authentication utilizes a camera specially configured for near infrared (IR) imaging to authenticate and unlock Windows devices as well as unlock your Microsoft Passport.

### Features

#### KEYBOARDS/POINTING DEVICES/BUTTONS & FUNCTION KEYS

##### Keyboard

HP Premium Quiet Keyboard, full-size, spill-resistant, backlit, with DuraKeys, clickpad with image sensor and glass surface, multi-touch gestures and taps enabled

HP Premium Quiet Keyboard, full-size, spill-resistant, with DuraKeys, clickpad with image sensor and glass surface, multi-touch gestures and taps enabled

##### Pointing Devices

Dual pointstick; Clickpad with multi-touch gestures enabled, taps enabled as default; Microsoft Precision Touchpad Default Gestures Support

#### SOFTWARE AND SECURITY

##### Software

Bing search for IE11

Buy Office

HP Hotkey Support

HP Noise Cancellation Software

HP Performance Advisor (download only)<sup>9</sup>

HP Recovery Manager

HP ZCentral Remote Boost Software (download only)<sup>2</sup>

HP Support Assistant<sup>1</sup>

Native Miracast support<sup>5</sup>

HP Connection Optimizer<sup>10</sup>

HP PC Hardware Diagnostics UEFI

HP PC Hardware Diagnostics Windows

HP Privacy Settings

HP Programmable Key

HP QuickDrop<sup>21</sup>

HP Touchpoint Customizer

myHP

Tile™<sup>22</sup>

HP Smart Support<sup>24</sup>

##### Security Management

Absolute persistence module<sup>7</sup>

HP Device Access Manager

HP FingerPrint Sensor

HP Manageability Integration Kit SCCM Gen6<sup>12</sup>

HP Power On Authentication

HP Support Assistant<sup>8</sup>

Nano Security lock slot<sup>13</sup>

Trusted Platform Module TPM 2.0 Embedded Security Chip

Master Boot Record security

Pre-boot authentication

Microsoft Defender<sup>11</sup>

HP Client Security Manager Gen7<sup>18</sup>

HP BIOSphere Gen6<sup>6</sup>

HP Sure Recover Gen4<sup>14</sup>

HP Sure Recover with Embedded Reimaging Gen4<sup>15</sup>

HP Sure Start Gen7<sup>6,16</sup>

HP Secure Erase<sup>17</sup>

HP Sure Sense<sup>19</sup>

HP Sure Admin<sup>23</sup>

HP Sure Click

### Features

HP Sure Run Gen3  
HP Sure View Reflect  
HP Image Assistant Gen4.6  
HP Proactive Security (DaaS)  
MS Bitlocker Encryption  
Self-Encrypting Drives  
HP Tamper Lock  
HP TPM Configuration Utility  
Secured-core PC capable<sup>20</sup>

Fingerprint reader (select models)

**For more information on HP Client Security Software Suite, refer to <http://www.hp.com/go/clientsecurity>.**

<sup>1</sup> HP Support Assistant - Requires Windows and Internet Access.

<sup>2</sup> HP ZCentral Remote Boost does not come preinstalled on Z Workstations but can be downloaded and run on all Z desktop and laptops without license purchase. With non-Z sender devices, purchase of perpetual individual license or perpetual floating license per simultaneously executing versions and purchase of ZCentral Remote Boost Software Support is required. RGS requires Windows, RHEL (7 or 8), UBUNTU 18.04 LTS, or HP ThinPro 7 operating systems. MacOS (10.13 or newer) operating system is only supported on the receiver side. Requires network access. The software is available for download at [hp.com/ZCentralRemoteBoost](http://hp.com/ZCentralRemoteBoost).

<sup>5</sup> Miracast is a wireless technology your PC can use to project your screen to TVs, projectors, and streaming media players that also support Miracast. You can use Miracast to share what you're doing on your PC and present a slide show. For more information:

<http://windows.microsoft.com/en-us/windows-8/project-wireless-screen-miracast>.

<sup>6</sup> HP BIOSphere Gen6 is available on select HP Pro, Elite and ZBook PCs. See product specifications for details. Features may vary depending on the platform and configurations.

<sup>7</sup> Absolute agent is shipped turned off, and will be activated when customers activate a purchased subscription. Subscriptions can be purchased for terms ranging multiple years. Service is limited, check with Absolute for availability outside the U.S. The Absolute Recovery Guarantee is a limited warranty. Certain conditions apply. For full details visit:

<http://www.absolute.com/company/legal/agreements/computrace-agreement>. Data Delete is an optional service provided by Absolute Software. If utilized, the Recovery Guarantee is null and void. In order to use the Data Delete service, customers must first sign a Pre-Authorization Agreement and either obtain a PIN or purchase one or more RSA SecurID tokens from Absolute Software.

<sup>9</sup> HP Performance Advisor Software - HP Performance Advisor is ready and waiting to help you get the most out of your HP Workstation from day one—and every day after. Learn more or download at: <https://www8.hp.com/us/en/workstations/performance-advisor.html>

<sup>10</sup> HP Connection Optimizer requires Windows 10.

<sup>11</sup> Microsoft Defender Opt in and internet connection required for updates.

<sup>12</sup> HP Manageability Integration Kit can be downloaded from <http://www.hp.com/go/clientmanagement>.

<sup>13</sup> Nano Security lock slot is Lock sold separately.

<sup>14</sup> HP Sure Recover Gen4: See product specifications for availability. Requires an open, wired network connection. You must back up important files, data, photos, videos, etc. before using HP Sure Recover to avoid loss of data.

<sup>15</sup> HP Sure Recover with Embedded Reimaging Gen3 is an optional feature which must be configured at purchase with a base unit that has the On System Recovery (OSR) module. See product specifications for availability. You must back up important files, data, photos, videos, etc. before use to avoid loss of data. HP Sure Recover with Embedded Reimaging (Gen1) does not support platforms with Intel® Optane™.

<sup>16</sup> HP Sure Start Gen6 is available on select HP PCs with Intel processors. See product specifications for availability.

<sup>17</sup> 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™.

<sup>18</sup> HP Client Security Manager Gen7 requires Windows and is available on select HP Pro, Elite and ZBook PCs. See product specifications for details.

<sup>19</sup> HP Sure Sense requires Windows 10. See product specifications for availability.

<sup>20</sup> Secured-core PC requires an Intel® vPro® or AMD Ryzen™ Pro processor. Requires 8 GB or more system memory. Secured-core PC functionality can be enabled from the factory.

<sup>21</sup> Requires Internet access and Windows 10 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.

<sup>22</sup> Some features require

optional subscription to Tile Premium. Tile application for Windows 10

available for download from the Windows Store. Mobile phone app available for download from App Store and Google Play. Requires iOS 11 and greater or Android 6.0 and greater see <https://support.thetileapp.com/hc/en-us/articles/200424778>

for more information. HP Tile will function as long as the PC has battery power.

### Features

<sup>23</sup> HP Sure Admin requires Windows 10, 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.

<sup>24</sup> HP Smart Support is available to commercial customers through your HP Service Representative and HP Factory Configuration Services; or it can be downloaded at: <http://www.hp.com/smart-support>. HP Smart Support automatically collects the telemetry necessary upon initial boot of the product to deliver device-level configuration data and health insights.

### Features

#### POWER

##### Power Supply

Up to 14 hours<sup>1</sup>

HP Long Life 3-cell, 53 Wh Li-ion polymer<sup>2,4</sup>

HP Smart 65 W External AC Power Adapter<sup>3</sup>

HP Smart 45 W External AC Power Adapter

Supports battery fast charge: approximately 50% in 30 minutes

<sup>1</sup> Battery life will vary depending on the 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 MobileMark18 battery benchmark <https://bapco.com/products/mobilemark-2018/> for additional details.

<sup>2</sup> Supports HP Fast Charge Technology

<sup>3</sup> 45W Power Adapter is not available with Discrete Graphics Configurations.

<sup>4</sup> 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.

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#### ENVIRONMENTAL

ENERGY STAR® certified and EPEAT® Gold registered configurations available <sup>1</sup>

Low halogen<sup>2</sup>

<sup>1</sup> Based on US EPEAT® registration according to IEEE 1680.1-2018 EPEAT®. Status varies by country. Visit [www.epeat.net](http://www.epeat.net) for more information.

<sup>2</sup> External power supplies, power cords, cables and peripherals are not low halogen. Service parts obtained after purchase may not be low halogen.

### Features

#### WEIGHTS & DIMENSIONS

**Dimensions (w x d x h)**

32.3 x 21.46 x 1.79 cm

12.73 x 8.45 x 0.71 in

**Weights**

Starting at 1.35kg (2.98 lb)

Weight varies by configuration and components.

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#### PORTS/SLOTS

**Left side**

1 headphone/microphone combo

1 SuperSpeed USB Type-A 5Gbps signaling rate [USB 3.1 Gen 1 Type A]

1 SuperSpeed USB Type-A 5Gbps signaling rate (charging) [USB 3.1 Gen 1 Type A charging]

1 Smart card reader (optional)

**Right side**

1 4.5mm AC power connector

1 HDMI 2.0b

2 Thunderbolt™ 4 with USB4™ Type-C® 40Gbps signaling rate\* (USB Power Delivery, DisplayPort™ 1.4, HP Sleep and Charge\*\*) [USB Type-C® with Thunderbolt™ 4]

1 SIM Card Slot (optional)

\*SuperSpeed USB 20Gbps signaling rate is not available directly from the port.

\*\*HP Sleep and Charge requires USB Type-A/Type-C charging protocol standard cable or dongle with external device for full functionality.

#### SERVICE AND SUPPORT

3-year limited warranty options available, 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. Optional<sup>1</sup> HP Care Pack Services are extended service contracts which go beyond your 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>.

<sup>1</sup>Sold separately or as an optional feature. 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. 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. Consult your local HP Customer Support Center for details.

### Technical Specifications – System Unit

#### SYSTEM UNIT

<b>Stand-Alone Power Requirements (AC Power)</b>	<b>Nominal Operating Voltage</b>	19.5V	
	<b>Average Operating Power(idle)</b>	<b>WIN10</b>	System in idle mode UMA 2.3W DIS 2.6W
	<b>Integrated graphics</b>	Yes	
	<b>Discrete Graphics</b>	Yes	
	<b>Max Operating Power</b>	Discrete < 65W UMA < 45W	
<b>Temperature</b>	<b>Operating</b>	32° to 95° F (0° to 35° C) (Not Writing Optical)	
	<b>Non-operating</b>	-4° to 140° F (-20° to 60° C) (writing optical)	
<b>Relative Humidity</b>	<b>Operating</b>	10% to 90%, non-condensing	
	<b>Non-operating</b>	5% to 95%, 101.6° F (38.7° C) maximum wet bulb temperature	
<b>Shock</b>	<b>Operating</b>	40 G, 2 ms, half-sine	
	<b>Non-operating</b>	200 G, 2 ms, half-sine	
<b>Random Vibration</b>	<b>Operating</b>	0.75 grms	
	<b>Non-operating</b>	1.50 grms	
<b>Maximum Altitude (unpressurized)</b>	<b>Operating</b>	-50 to 10,000 ft (-15.24 to 3,048 m)	
	<b>Non-operating</b>	-50 to 40,000 ft (-15.24 to 12,192 m)	
<b>Planned Industry Standard Certifications</b>	<b>UL</b>	Yes	
	<b>CSA</b>	Yes	
	<b>FCC Compliance</b>	Yes	
	<b>ENERGY STAR®</b>	Select models <sup>1</sup>	
	<b>EPEAT®</b>	EPEAT® Gold in United States <sup>2</sup>	
	<b>ICES</b>	Yes	
	<b>Australia / NZ A-Tick Compliance</b>	Yes	
	<b>CCC</b>	Yes	
	<b>Japan VCCI Compliance</b>	Yes	
	<b>KCC</b>	Yes	
	<b>BSMI</b>	Yes	
	<b>CE Marking Compliance</b>	Yes	
	<b>MIL STD 810H</b>	Yes, 19 tests	
	<b>BNCI or BELUS</b>	Yes	
	<b>CIT</b>	Yes	
<b>GOST</b>	Yes		
<b>Saudi Arabian Compliance (ICCP)</b>	Yes		
<b>SABS</b>	Yes		

<sup>1</sup>Configurations of the HP ZBook Firefly 14 Inch G8 Mobile Workstation that are ENERGY STAR® qualified are identified as HP ZBook Firefly 14 Inch G8 Mobile Workstation ENERGY STAR on HP websites and on <http://www.energystar.gov>.

<sup>2</sup>Based on US EPEAT® registration according to IEEE 1680.1-2018 EPEAT®. Status varies by country. Visit [www.epeat.net](http://www.epeat.net) for more information.

### Technical Specifications – Displays

#### DISPLAYS

<b>14" diagonal, FHD (1920 x 1080), IPS, anti-glare, 250 nits, 45% NTSC</b>	<b>Outline Dimensions (W x H)</b>	316.17 x 186.4 mm (max) (w/ PCB)		
	<b>Active Area</b>	309.37 x 174.02 mm (typ.)		
	<b>Weight</b>	300 g (max)		
	<b>Diagonal Size</b>	14.0 inch		
	<b>Thickness</b>	3.0 mm/ 5.0 mm (PCB) (max)		
	<b>Interface</b>	eDP 1.2		
	<b>Surface Treatment</b>	Anti-Glare		
	<b>Touch enabled</b>	No		
	<b>Contrast Ratio</b>	600:1 (typ.)		
	<b>Refresh Rate</b>	60 Hz		
	<b>Brightness</b>	250 nits		
	<b>Pixel Resolution</b>	<b>Pitch</b>	1920 x 1080 (FHD)	
		<b>Format</b>	RGB Stripe	
	<b>Backlight</b>	LED		
	<b>PPI</b>	157		
	<b>Color Gamut Coverage</b>	NTSC 45%		
	<b>Color Depth</b>	6 bits (Hi FRC supportive w/ condition to enable)		
<b>Viewing Angle</b>	UWVA 85/85/85/85			

<b>14" diagonal, FHD (1920 x 1080), touch, IPS, anti-glare, 250 nits, 45% NTSC</b>	<b>Outline Dimensions (W x H)</b>	316.17 x 186.4 mm (max) (w/ PCB)		
	<b>Active Area</b>	309.37 x 174.02 mm (typ.)		
	<b>Weight</b>	305 g (max)		
	<b>Diagonal Size</b>	14.0 inch		
	<b>Thickness</b>	3.0 mm/ 5.0 mm (PCB) (max)		
	<b>Interface</b>	eDP 1.2		
	<b>Surface Treatment</b>	Anti-Glare On-cell touch		
	<b>Touch enabled</b>	Yes		
	<b>Contrast Ratio</b>	600:1 (typ.)		
	<b>Refresh Rate</b>	60 Hz		
	<b>Brightness</b>	250 nits*		
	<b>Pixel Resolution</b>	<b>Pitch</b>	1920 x 1080 (FHD)	
		<b>Format</b>	RGB Stripe	
	<b>Backlight</b>	LED		
	<b>PPI</b>	157		
	<b>Color Gamut Coverage</b>	NTSC 45%		
	<b>Color Depth</b>	6 bits (Hi FRC supportive w/ condition to enable)		
<b>Viewing Angle</b>	UWVA 85/85/85/85			

\*Actual brightness will be lower with Sure View or touchscreen.



### Technical Specifications – Displays

<b>14" diagonal, FHD (1920 x 1080), IPS, anti-glare, 400 nits, low power, 100% sRGB</b>	<b>Outline Dimensions (W x H)</b>	315.07 x 186.6 mm (max)		
	<b>Active Area</b>	309.37 X 174.02 mm (typ.)		
	<b>Weight</b>	200 g (max)		
	<b>Diagonal Size</b>	14.0 inch		
	<b>Thickness</b>	2.0 mm/4.0 mm (w/PCB) (max)		
	<b>Interface</b>	eDP 1.4		
	<b>Surface Treatment</b>	Anti-Glare		
	<b>Touch enabled</b>	No		
	<b>Contrast Ratio</b>	1200:1 (typ.)		
	<b>Refresh Rate</b>	60 Hz		
	<b>Brightness</b>	400 nits		
	<b>Pixel Resolution</b>	<b>Pitch</b>	1920 x 1080 (FHD)	
		<b>Format</b>	RGB Stripe	
	<b>Backlight</b>	LED		
	<b>PPI</b>	157		
	<b>Color Gamut Coverage</b>	sRGB 100% (NTSC 72%)		
	<b>Color Depth</b>	8 bits		
<b>Viewing Angle</b>	UWVA 85/85/85/85			

<b>14" diagonal, FHD (1920 x 1080), IPS, anti-glare, 1000 nits, 72% NTSC, HP Sure View Reflect integrated privacy screen</b>	<b>Outline Dimensions (W x H)</b>	314.612 x 185.33 mm (max.)		
	<b>Active Area</b>	309.312 x 173.99 mm		
	<b>Weight</b>	230 g (max.)		
	<b>Diagonal Size</b>	14.0"		
	<b>Thickness</b>	3.9 mm (max.)		
	<b>Interface</b>	eDP 1.4 + PSR		
	<b>Panel Technology</b>	IPS		
	<b>Surface Treatment</b>	Anti-glare (AG)		
	<b>Touch Enabled</b>	No		
	<b>Contrast Ratio</b>	1500:1 (typ.)		
	<b>Refresh Rate</b>	60 Hz		
	<b>Brightness</b>	1000 nits*		
	<b>Pixel Resolution</b>	<b>Pitch</b>	1920 x 1080 (FHD)	
		<b>Format</b>	RGB	
	<b>Backlight</b>	LED		
	<b>PPI</b>	157		
	<b>Color Gamut Coverage</b>	100% sRGB		
<b>Color Depth</b>	8 bits			
<b>Viewing Angle</b>	UWVA 85/85/85/85			

\*Actual brightness will be lower with Sure View or touchscreen.

### Technical Specifications – Displays

<b>14" diagonal, FHD (1920 x 1080), IPS, anti-glare, 500 nits, 100% DCI-P3, HP DreamColor panel</b>	<b>Outline Dimensions (W x H)</b>	314.61 x 185.39 mm (max)	
	<b>Active Area</b>	309.312 x 173.988 mm (typ.)	
	<b>Weight</b>	200 g (max)	
	<b>Diagonal Size</b>	14.0 inch	
	<b>Thickness</b>	2.0 mm/ 3.8 mm (w/ PCB) (max)	
	<b>Interface</b>	eDP 1.4 + PSR 2	
	<b>Surface Treatment</b>	Anti-glare (AG)	
	<b>Touch Enabled</b>	No	
	<b>Contrast Ratio</b>	1400:1 (typ.)	
	<b>Refresh Rate</b>	60 Hz	
	<b>Brightness</b>	500 nits (typ.)	
	<b>Pixel Resolution</b>	<b>Pitch</b>	1920 x 1080 (FHD)
		<b>Format</b>	RGB
	<b>Backlight</b>	LED	
	<b>PPI</b>	157	
	<b>Color Gamut Coverage</b>	DCI-P3 100 (typ.)	
<b>Color Depth</b>	8 bits + 2 FRC		
<b>Viewing Angle</b>	UWVA 85/85/85/85		

### Technical Specifications – Storage

#### STORAGE AND DRIVES

##### 128 GB PCIe® Gen3 x2 NVMe™ M.2 2280 TLC Solid State Drive (SSD)

<b>Form Factor</b>	M.2 2280	
<b>Drive Weight</b>	0.02 lb (10 g)	
<b>Capacity</b>	128 GB	
<b>NAND Type</b>	TLC	
<b>Height</b>	0.09 in (2.3 mm)	
<b>Width</b>	0.87 in (22 mm)	
<b>Interface</b>	PCIe® Gen3 x2 NVMe™	
<b>Performance</b>	<b>Maximum Sequential Read</b>	<b>Maximum Sequential Write</b>
	Up to 1400 ~ 2100 MB/s	Up to 800 ~ 1200 MB/s
<b>Logical Blocks</b>	250,069,680	
<b>Operating Temperature</b>	32° to 158°F (0° to 70°C) [ambient temp]	
<b>Features</b>	ATA Security (Option); TRIM; L1.2	

**Note:** For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 35 GB (for Windows 10) is reserved for system recovery software.

##### 1 TB PCIe® Gen3 x4 NVMe™ M.2 2280 TLC Solid State Drive (SSD)

<b>Form Factor</b>	M.2 2280	
<b>Drive Weight</b>	0.02 lb (10 g)	
<b>Capacity</b>	1 TB	
<b>NAND Type</b>	TLC	
<b>Height</b>	0.09 in (2.3 mm)	
<b>Width</b>	0.87 in (22 mm)	
<b>Interface</b>	PCIe® Gen3 x4 NVMe™	
<b>Performance</b>	<b>Maximum Sequential Read</b>	<b>Maximum Sequential Write</b>
	Up to 3100 ~ 3500 MB/s	Up to 2700 ~ 3037 MB/s
<b>Logical Blocks</b>	2,000,409,264	
<b>Operating Temperature</b>	32° to 158°F (0° to 70°C) [ambient temp]	
<b>Features</b>	ATA Security; TRIM; L1.2	

**Note:** For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 35 GB (for Windows 10) is reserved for system recovery software.

##### 256 GB PCIe® Gen3 x4 NVMe™ M.2 2280 TLC Solid State Drive (SSD)

<b>Form Factor</b>	M.2 2280	
<b>Drive Weight</b>	0.02 lb (10 g)	
<b>Capacity</b>	256 GB	
<b>NAND Type</b>	TLC	
<b>Height</b>	0.09 in (2.3 mm)	
<b>Width</b>	0.87 in (22 mm)	
<b>Interface</b>	PCIe® Gen3 x4 NVMe™	
<b>Performance</b>	<b>Maximum Sequential Read</b>	<b>Maximum Sequential Write</b>
	Up to 2800 ~ 3500 MB/s	Up to 1600 ~ 2200 MB/s
<b>Logical Blocks</b>	500,118,192	
<b>Operating Temperature</b>	32° to 158°F (0° to 70°C) [ambient temp]	
<b>Features</b>	ATA Security; TRIM; L1.2	

### Technical Specifications – Storage

**Note:** For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 35 GB (for Windows 10) is reserved for system recovery software.

**256 GB PCIe® Gen3 x2 NVMe™ M.2 2280 TLC Value Solid State Drive (SSD)**

<b>Form Factor</b>	M.2 2280	
<b>Drive Weight</b>	0.02 lb (10 g)	
<b>Capacity</b>	256 GB	
<b>NAND Type</b>	Value TLC	
<b>Height</b>	0.09 in (2.3 mm)	
<b>Width</b>	0.87 in (22 mm)	
<b>Interface</b>	PCIe® NVMe™ Gen3 x2	
<b>Performance</b>	<b>Maximum Sequential Read</b>	<b>Maximum Sequential Write</b>
	Up to 2100 ~ 2400 MB/s	Up to 950 ~ 1400 MB/s
<b>Logical Blocks</b>	500,118,192	
<b>Operating Temperature</b>	32° to 158°F (0° to 70°C) [ambient temp]	
<b>Features</b>	ATA Security (Option); TRIM; L1.2	

**Note:** For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 35 GB (for Windows 10) is reserved for system recovery software.

**256 GB PCIe® Gen3 x4 NVMe™ M.2 2280 TLC Self Encrypting (SED) Solid State Drive (SSD)**

<b>Form Factor</b>	M.2 2280	
<b>Drive Weight</b>	0.02 lb (10 g)	
<b>Capacity</b>	256 GB	
<b>NAND Type</b>	TLC	
<b>Height</b>	0.09 in (2.3 mm)	
<b>Width</b>	0.87 in (22 mm)	
<b>Interface</b>	PCIe® Gen3 x4 NVMe™	
<b>Performance</b>	<b>Maximum Sequential Read</b>	<b>Maximum Sequential Write</b>
	Up to 2800 ~ 3500 MB/s	Up to 1663 ~ 2200 MB/s
<b>Logical Blocks</b>	500,118,192	
<b>Operating Temperature</b>	32° to 158°F (0° to 70°C) [ambient temp]	
<b>Features</b>	ATA Security (Option); TCG Opal 2.0; TRIM; L1.2	

**Note:** For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 35 GB (for Windows 10) is reserved for system recovery software.

**2 TB PCIe® Gen3 x4 NVMe™ M.2 2280 TLC Solid State Drive (SSD)**

<b>Form Factor</b>	M.2 2280	
<b>Drive Weight</b>	0.02 lb (10 g)	
<b>Capacity</b>	2 TB	
<b>NAND Type</b>	TLC	
<b>Height</b>	0.09 in (2.3 mm)	
<b>Width</b>	0.87 in (22 mm)	
<b>Interface</b>	PCIe® Gen3 x4 NVMe™	
<b>Performance</b>	<b>Maximum Sequential Read</b>	<b>Maximum Sequential Write</b>
	Up to 3100 ~ 3500 MB/s	Up to 2800 ~ 3000 MB/s
<b>Logical Blocks</b>	3,907,029,168	
<b>Operating Temperature</b>	32° to 158°F (0° to 70°C) [ambient temp]	

### Technical Specifications – Storage

	<b>Features</b>	ATA Security; TRIM; L1.2 <b>Note:</b> For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 35 GB (for Windows 10) is reserved for system recovery software.		
<b>512 GB PCIe® Gen3 x4 NVMe™ M.2 2280 TLC Self Encrypting (SED) Solid State Drive (SSD)</b>	<b>Form Factor</b>	M.2 2280		
	<b>Drive Weight</b>	0.02 lb (10 g)		
	<b>Capacity</b>	512 GB		
	<b>NAND Type</b>	TLC		
	<b>Height</b>	0.09 in (2.3 mm)		
	<b>Width</b>	0.87 in (22 mm)		
	<b>Interface</b>	PCIe® Gen3 x4 NVMe™		
	<b>Performance</b>	<b>Maximum Sequential Read</b>	<b>Maximum Sequential Write</b>	
		Up to 3100 ~ 3500 MB/s	Up to 2400 ~ 2956 MB/s	
		<b>Logical Blocks</b>	1,000,215,215	
	<b>Operating Temperature</b>	32° to 158°F (0° to 70°C) [ambient temp]		
	<b>Features</b>	ATA Security; TRIM; L1.2 <b>Note:</b> For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 35 GB (for Windows 10) is reserved for system recovery software.		
<b>512 GB PCIe® Gen3 x2 NVMe™ M.2 2280 TLC Value Solid State Drive (SSD)</b>	<b>Form Factor</b>	M.2 2280		
	<b>Drive Weight</b>	0.02 lb (10 g)		
	<b>Capacity</b>	512 GB		
	<b>NAND Type</b>	Value TLC		
	<b>Height</b>	0.09 in (2.3 mm)		
	<b>Width</b>	0.87 in (22 mm)		
	<b>Interface</b>	PCIe® Gen3 x2 NVMe™		
	<b>Performance</b>	<b>Maximum Sequential Read</b>	<b>Maximum Sequential Write</b>	
		Up to 1500 ~ 2400 MB/s	Up to 1000 ~ 1750 MB/s	
		<b>Logical Blocks</b>	1,000,215,215	
	<b>Operating Temperature</b>	32° to 158°F (0° to 70°C) [ambient temp]		
	<b>Features</b>	ATA Security (Option); TRIM; L1.2 <b>Note:</b> For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 35 GB (for Windows 10) is reserved for system recovery software.		
<b>512 GB PCIe® Gen3 x4 NVMe™ M.2 2280 QLC Solid State Drive (SSD) + 32 GB Intel® Optane™ Memory</b>	<b>Form Factor</b>	M.2 2280		
	<b>Drive Weight</b>	0.02 lb (10 g)		
	<b>Capacity</b>	512 GB		
	<b>NAND Type</b>	QLC+3D XPoint		
	<b>Height</b>	0.09 in (2.3 mm)		
	<b>Width</b>	0.87 in (22 mm)		
	<b>Interface</b>	PCIe® Gen3 x4 NVMe™		
	<b>Performance</b>	<b>Maximum Sequential Read</b>	<b>Maximum Sequential Write</b>	
		Up to 2400 MB/s	Up to 1300 MB/s	
		<b>Logical Blocks</b>	1,000,215,215	
	<b>Operating Temperature</b>	32° to 158°F (0° to 70°C) [ambient temp]		

### Technical Specifications – Storage

<b>512 GB PCIe® Gen3 x4 NVMe™ M.2 2280 TLC Self Encrypting (SED) Solid State Drive (SSD)</b>	<b>Features</b>	ATA Security; TRIM; L1.2 <b>Note:</b> For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 35 GB (for Windows 10) is reserved for system recovery software.		
	<b>Form Factor</b>	M.2 2280		
	<b>Drive Weight</b>	0.02 lb (10 g)		
	<b>Capacity</b>	512 GB		
	<b>NAND Type</b>	TLC		
	<b>Height</b>	0.09 in (2.3 mm)		
	<b>Width</b>	0.87 in (22 mm)		
	<b>Interface</b>	PCIe® Gen3 x4 NVMe™		
	<b>Performance</b>	<b>Maximum Sequential Read</b>	<b>Maximum Sequential Write</b>	
		Up to 3100 ~ 3500 MB/s	Up to 2400 ~ 2956 MB/s	
	<b>Logical Blocks</b>	1,000,215,215		
	<b>Operating Temperature</b>	32° to 158°F (0° to 70°C) [ambient temp]		
<b>Features</b>	ATA Security (Option); TCG Opal 2.0; TRIM; L1.2 <b>Note:</b> For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 35 GB (for Windows 10) is reserved for system recovery software.			

### Technical Specifications – Networking

#### NETWORKING/COMMUNICATION

<b>Intel® Wi-Fi 6 AX201 (2x2) and Bluetooth® 5 combo*</b>	<b>Wireless LAN Standards</b>	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
	<b>Interoperability</b>	Wi-Fi certified
	<b>Frequency Band</b>	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
	<b>Data Rates</b>	• 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: MCS 0 ~ MCS 15, (20MHz, and 40MHz) • 802.11ac : MCS0 ~ MCS9, (1SS, and 2SS) (20MHz, 40MHz, ,80MHz & 160MHz) • 802.11ax : MCS0 ~ MCS11, (1SS and 2SS) (20MHz, 40MHz, ,80MHz & 160MHz)
	<b>Modulation</b>	Direct Sequence Spread Spectrum OFDM, BPSK, QPSK, CCK, 16-QAM, 64-QAM, 256-QAM, 1024QAM
	<b>Security<sup>1</sup></b>	<ul style="list-style-type: none"><li>• IEEE and WiFi compliant 64 / 128 bit WEP encryption for a/b/g mode only</li><li>• AES-CCMP: 128 bit in hardware</li><li>• 802.1x authentication</li><li>• WPA, WPA2: 802.1x. WPA-PSK, WPA2-PSK, TKIP, and AES.</li><li>• WPA2 certification</li><li>• WPA3 certification</li><li>• IEEE 802.11i</li><li>• WAPI</li></ul>
	<b>Network Architecture Models</b>	Ad-hoc (Peer to Peer) Infrastructure (Access Point Required)
	<b>Roaming</b>	IEEE 802.11 compliant roaming between access points
	<b>Output Power<sup>2</sup></b>	<ul style="list-style-type: none"><li>• 802.11b : +18.5dBm minimum</li><li>• 802.11g : +17.5dBm minimum</li><li>• 802.11a : +18.5dBm minimum</li><li>• 802.11n HT20(2.4GHz) : +15.5dBm minimum</li><li>• 802.11n HT40(2.4GHz) : +14.5dBm minimum</li><li>• 802.11n HT20(5GHz) : +15.5dBm minimum</li></ul>

### Technical Specifications – Networking

	<ul style="list-style-type: none"> <li>• 802.11n HT40(5GHz) : +14.5dBm minimum</li> <li>• 802.11ac VHT80(5GHz) : +11.5dBm minimum</li> <li>• 802.11ac VHT160(5GHz) : +11.5dBm minimum</li> <li>• 802.11ax HT40(2.4GHz) : +10dBm minimum</li> <li>• 802.11ax VHT160(5GHz) : +10dBm minimum</li> </ul>				
<b>Power Consumption</b>	<ul style="list-style-type: none"> <li>• Transmit mode 2.0 W</li> <li>• Receive mode 1.6 W</li> <li>• Idle mode (PSP) 180 mW (WLAN Associated)</li> <li>• Idle mode 50 mW (WLAN unassociated)</li> <li>• Connected Standby 10mW</li> <li>• Radio disabled 8 mW</li> </ul>				
<b>Power Management</b>	ACPI and PCI Express compliant power management 802.11 compliant power saving mode				
<b>Receiver Sensitivity<sup>3</sup></b>	<ul style="list-style-type: none"> <li>•802.11b, 1Mbps : -93.5dBm maximum</li> <li>•802.11b, 11Mbps : -84dBm maximum</li> <li>• 802.11a/g, 6Mbps : -86dBm maximum</li> <li>• 802.11a/g, 54Mbps : -72dBm maximum</li> <li>• 802.11n, MCS07 : -67dBm maximum</li> <li>• 802.11n, MCS15 : -64dBm maximum</li> <li>• 802.11ac, MCS0 : -84dBm maximum</li> <li>• 802.11ac, MCS9 : -59dBm maximum</li> <li>•802.11ax, MCS11(HT40): -59dBm maximum</li> <li>•802.11ax, MCS11(VHT160): -58.5dBm maximum</li> </ul>				
<b>Antenna Type</b>	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				
<b>Form Factor</b>	PCI-Express M.2 MiniCard with CNVi Interface				
<b>Dimensions</b>	<ol style="list-style-type: none"> <li>1. Type 2230 : 2.3 x 22.0 x 30.0 mm</li> <li>2. Type 1216: 1.67 x 12.0 x 16.0 mm</li> </ol>				
<b>Weight</b>	<ol style="list-style-type: none"> <li>1. Type 2230 : 2.8g</li> <li>2. Type 126: 1.3g</li> </ol>				
<b>Operating Voltage</b>	3.3v +/- 9%				
<b>Temperature</b>	<table border="0"> <tbody> <tr> <td>Operating</td> <td>14° to 158° F (-10° to 70° C)</td> </tr> <tr> <td>Non-operating</td> <td>-40° to 176° F (-40° to 80° C)</td> </tr> </tbody> </table>	Operating	14° to 158° F (-10° to 70° C)	Non-operating	-40° to 176° F (-40° to 80° C)
Operating	14° to 158° F (-10° to 70° C)				
Non-operating	-40° to 176° F (-40° to 80° C)				
<b>Humidity</b>	<table border="0"> <tbody> <tr> <td>Operating</td> <td>10% to 90% (non-condensing)</td> </tr> <tr> <td>Non-operating</td> <td>5% to 95% (non-condensing)</td> </tr> </tbody> </table>	Operating	10% to 90% (non-condensing)	Non-operating	5% to 95% (non-condensing)
Operating	10% to 90% (non-condensing)				
Non-operating	5% to 95% (non-condensing)				
<b>Altitude</b>	<table border="0"> <tbody> <tr> <td>Operating</td> <td>0 to 10,000 ft (3,048 m)</td> </tr> <tr> <td>Non-operating</td> <td>0 to 50,000 ft (15,240 m)</td> </tr> </tbody> </table>	Operating	0 to 10,000 ft (3,048 m)	Non-operating	0 to 50,000 ft (15,240 m)
Operating	0 to 10,000 ft (3,048 m)				
Non-operating	0 to 50,000 ft (15,240 m)				
<b>LED Activity</b>	LED Amber – Radio Off; LED Off – Radio ON				
<b>HP Integrated Module with Bluetooth 4.0/4.1/4.2/5.0/5.1 Wireless Technology</b>					
<b>Frequency Band</b>	2402 to 2480 MHz				
<b>Number of Available Channels</b>	Legacy : 0~79 (1 MHz/CH) BLE : 0~39 (2 MHz/CH)				
<b>Data Rates and Throughput</b>	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				



### Technical Specifications – Networking

<b>Transmit Power</b>	Legacy : Asynchronous Connection Less links 2178.1 kbps/177.1 kbps asymmetric (3-DH5) or 864 kbps symmetric (3-EV5) The Bluetooth component shall operate as a Class II Bluetooth device with a maximum transmit power of + 9.5 dBm for BR and EDR.
<b>Power Consumption</b>	Peak (Tx): 330 mW Peak (Rx): 230 mW Selective Suspend: 17 mW
<b>Bluetooth Software Supported</b>	Microsoft Windows Bluetooth Software
<b>Link Topology</b>	
<b>Power Management</b>	Microsoft Windows ACPI, and USB Bus Support
<b>Certifications</b>	FCC (47 CFR) Part 15C, Section 15.247 & 15.249
<b>Power Management</b>	ETS 300 328, ETS 300 826
<b>Certifications</b>	Low Voltage Directive IEC950 UL, CSA, and CE Mark
<b>Bluetooth Profiles Supported</b>	BT4.1-ESR 5/6/7 Compliance LE Link Layer Ping LE Dual Mode LE Link Layer LE Low Duty Cycle Directed Advertising LE L2CAP Connection Oriented Channels Train Nudging & Interlaced Scan BT4.2 ESR08 Compliance LE Secure Connection- Basic/Full LE Privacy 1.2 –Link Layer Privacy LE Privacy 1.2 –Extended Scanner Filter Policies LE Data Packet Length Extension FAX Profile (FAX) Basic Imaging Profile (BIP)2 Headset Profile (HSP) Hands Free Profile (HFP) Advanced Audio Distribution Profile (A2DP)

\* 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. The specifications for Wi-Fi 6 are draft specifications and are not final. If the final specifications differ from the draft specifications, it may affect the ability of the notebook to communicate with other 802.11ax WLAN devices. Only available in countries where 802.11ax is supported.

**Intel® Wi-Fi 6 AX201 (2x2) and Bluetooth® 5 combo\***

#### 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

### Technical Specifications – Networking

<b>Interoperability</b>	Wi-Fi certified
<b>Frequency Band</b>	802.11b/g/n/ax <ul style="list-style-type: none"><li>• 2.402 – 2.482 GHz</li></ul> 802.11a/n/ac/ax <ul style="list-style-type: none"><li>• 4.9 – 4.95 GHz (Japan)</li><li>• 5.15 – 5.25 GHz</li><li>• 5.25 – 5.35 GHz</li><li>• 5.47 – 5.725 GHz</li><li>• 5.825 – 5.850 GHz</li></ul>
<b>Data Rates</b>	<ul style="list-style-type: none"><li>• 802.11b: 1, 2, 5.5, 11 Mbps</li><li>• 802.11g: 6, 9, 12, 18, 24, 36, 48, 54 Mbps</li><li>• 802.11a: 6, 9, 12, 18, 24, 36, 48, 54 Mbps</li><li>• 802.11n: MCS 0 ~ MCS 15, (20MHz, and 40MHz)</li><li>• 802.11ac : MCS0 ~ MCS9, (1SS, and 2SS) (20MHz, 40MHz, ,80MHz &amp; 160MHz)</li><li>• 802.11ax : MCS0 ~ MCS11, (1SS and 2SS) (20MHz, 40MHz, ,80MHz &amp; 160MHz)</li></ul>
<b>Modulation</b>	Direct Sequence Spread Spectrum OFDM, BPSK, QPSK, CCK, 16-QAM, 64-QAM, 256-QAM , 1024QAM
<b>Security<sup>1</sup></b>	<ul style="list-style-type: none"><li>• IEEE and WiFi compliant 64 / 128 bit WEP encryption for a/b/g mode only</li><li>• AES-CCMP: 128 bit in hardware</li><li>• 802.1x authentication</li><li>• WPA, WPA2: 802.1x. WPA-PSK, WPA2-PSK, TKIP, and AES.</li><li>• WPA2 certification</li><li>• WPA3 certification</li><li>• IEEE 802.11i</li><li>• WAPI</li></ul>
<b>Network Architecture Models</b>	Ad-hoc (Peer to Peer) Infrastructure (Access Point Required)
<b>Roaming</b>	IEEE 802.11 compliant roaming between access points
<b>Output Power<sup>2</sup></b>	<ul style="list-style-type: none"><li>• 802.11b : +18.5dBm minimum</li><li>• 802.11g : +17.5dBm minimum</li><li>• 802.11a : +18.5dBm minimum</li><li>• 802.11n HT20(2.4GHz) : +15.5dBm minimum</li><li>• 802.11n HT40(2.4GHz) : +14.5dBm minimum</li><li>• 802.11n HT20(5GHz) : +15.5dBm minimum</li><li>• 802.11n HT40(5GHz) : +14.5dBm minimum</li><li>• 802.11ac VHT80(5GHz) : +11.5dBm minimum</li><li>• 802.11ac VHT160(5GHz) : +11.5dBm minimum</li><li>• 802.11ax HT40(2.4GHz) : +10dBm minimum</li><li>• 802.11ax VHT160(5GHz) : +10dBm minimum</li></ul>
<b>Power Consumption</b>	<ul style="list-style-type: none"><li>• Transmit mode :2.0 W</li><li>• Receive mode :1.6 W</li><li>• Idle mode (PSP) 180 mW (WLAN Associated)</li><li>• Idle mode :50 mW (WLAN unassociated)</li><li>• Connected Standby/Modern Standby: 10mW</li><li>• Radio disabled: 8 mW</li></ul>
<b>Power Management</b>	ACPI and PCI Express compliant power management 802.11 compliant power saving mode
<b>Receiver Sensitivity<sup>3</sup></b>	<ul style="list-style-type: none"><li>•802.11b, 1Mbps : -93.5dBm maximum</li><li>•802.11b, 11Mbps : -84dBm maximum</li></ul>

### Technical Specifications – Networking

	<ul style="list-style-type: none"> <li>• 802.11a/g, 6Mbps : -86dBm maximum</li> <li>• 802.11a/g, 54Mbps : -72dBm maximum</li> <li>• 802.11n, MCS07 : -67dBm maximum</li> <li>• 802.11n, MCS15 : -64dBm maximum</li> <li>• 802.11ac, MCS0 : -84dBm maximum</li> <li>• 802.11ac, MCS9 : -59dBm maximum</li> <li>• 802.11ax, MCS11(HT40): -59dBm maximum</li> <li>• 802.11ax, MCS11(VHT160): -58.5dBm maximum</li> </ul>
<b>Antenna Type</b>	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
<b>Form Factor</b>	PCI-Express M.2 MiniCard with CNVi Interface
<b>Dimensions</b>	1. Type 2230 : 2.3 x 22.0 x 30.0 mm 2. Type 1216: 1.67 x 12.0 x 16.0 mm
<b>Weight</b>	1. Type 2230 : 2.8g 2. Type 126: 1.3g
<b>Operating Voltage</b>	3.3v +/- 9%
<b>Temperature</b>	Operating 14° to 158° F (-10° to 70° C) Non-operating -40° to 176° F (-40° to 80° C)
<b>Humidity</b>	Operating 10% to 90% (non-condensing) Non-operating 5% to 95% (non-condensing)
<b>Altitude</b>	Operating Non-operating 0 to 10,000 ft (3,048 m) 0 to 50,000 ft (15,240 m)
<b>LED Activity</b>	LED Amber – Radio OFF; LED White – Radio ON
<b>HP Integrated Module with Bluetooth 4.0/4.1/4.2/5.0/5.1 Wireless Technology</b>	
<b>Frequency Band</b>	2402 to 2480 MHz
<b>Number of Available Channels</b>	Legacy : 0~79 (1 MHz/CH) BLE : 0~39 (2 MHz/CH)
<b>Data Rates and Throughput</b>	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)
<b>Transmit Power</b>	The Bluetooth component shall operate as a Class II Bluetooth device with a maximum transmit power of + 9.5 dBm for BR and EDR.
<b>Power Consumption</b>	Peak (Tx): 330 mW Peak (Rx): 230 mW Selective Suspend: 17 mW
<b>Bluetooth Software Supported</b>	Microsoft Windows Bluetooth Software
<b>Link Topology</b>	
<b>Power Management</b>	Microsoft Windows ACPI, and USB Bus Support
<b>Certifications</b>	FCC (47 CFR) Part 15C, Section 15.247 & 15.249

### Technical Specifications – Networking

#### Power Management Certifications

ETS 300 328, ETS 300 826  
Low Voltage Directive IEC950  
UL, CSA, and CE Mark

#### Bluetooth Profiles Supported

BT4.1-ESR 5/6/7 Compliance  
LE Link Layer Ping  
LE Dual Mode  
LE Link Layer  
LE Low Duty Cycle Directed Advertising  
LE L2CAP Connection Oriented Channels  
Train Nudging & Interlaced Scan  
BT4.2 ESR08 Compliance  
LE Secure Connection- Basic/Full  
LE Privacy 1.2 –Link Layer Privacy  
LE Privacy 1.2 –Extended Scanner Filter Policies  
LE Data Packet Length Extension  
FAX Profile (FAX)  
Basic Imaging Profile (BIP)2  
Headset Profile (HSP)  
Hands Free Profile (HFP)  
Advanced Audio Distribution Profile (A2DP)

#### Security & Manageability

Intel® vPro™ support with appropriate Intel® chipset components

\* 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. The specifications for Wi-Fi 6 are draft specifications and are not final. If the final specifications differ from the draft specifications, it may affect the ability of the notebook to communicate with other 802.11ax WLAN devices. Only available in countries where 802.11ax is supported.

#### Intel® XMM™ 7360 LTE-Advanced CAT9 \*

##### 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), 1400 (Band 11), 700 (Band 12 lower), 700 (Band 13 upper), 700 (Band 17 lower), 850 (Band 18 lower), 850 (Band 19 upper), 800 (Band 20), 1400 (Band 21), 850 (Band 26), 700 (Band 28), 700 (Band 29 RX only), 2300 (Band 30), 1700/2100 (Band 66).  
TDD LTE: 2600 (Band 38), 1900 (Band 39), 2400 (Band 40), 2500 (Band 41).  
HSPA+: 2100 (Band 1), 1900 (Band 2), 1700/2100 (Band 4), 850 (Band 5), 900 (Band 8) MHz

##### Wireless protocol standards

3GPP Release 11 LTE Specification CAT.9, DL 60MHz BW throughput up to 450Mbps; UL 20MHz throughput up to 50Mbps  
WCDMA R99, 3GPP Release 5, 6, 7 and 8 UMTS Specification

##### GPS

Standalone, 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: 450 Mbps (Download), 50 Mbps (Upload)  
DC-HSPA+: 42 Mbps (Download), 5.76 Mbps (Upload)  
HSPA+: 21Mbps (Download), 5.76 Mbps (Upload)

##### Maximum output power

LTE: 23 dBm  
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

### Technical Specifications – Networking

<b>Weight</b>	5.8 g
<b>Dimensions</b> (Length x Width x Thickness)	42 x 30 x 2.3 mm

\* 4G LTE requires separately purchased service contract, and configuration at purchase. 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.

#### Qualcomm® Snapdragon™ X55 5G Modem\*

<b>Technology/Operating bands</b>	<b><u>WCDMA/HSDPA/HSUPA/HSPA+ operating bands:</u></b> Band 1: 1920 to 1980 MHz (UL), 2110 to 2170 MHz (DL) Band 2: 1850 to 1910 MHz (UL), 1930 to 1990 MHz (DL) Band 4: 1710 to 1755 MHz (UL), 2110 to 2155 MHz (DL) Band 5: 824 to 849 MHz (UL), 869 to 894 MHz (DL) Band 6: 830 to 840 MHz (UL), 875 to 885 MHz (DL) Band 8: 880 to 915 MHz (UL), 925 to 960 MHz (DL) Band 9: 1750 to 1785 MHz (UL), 1845 to 1880 MHz (DL) Band 19: 830 to 845 MHz (UL), 875 to 890 MHz (DL) <b><u>LTE FDD/TDD operating bands:</u></b> Band 1: 1920 to 1980 MHz (UL), 2110 to 2170 MHz (DL) Band 2: 1850 to 1910 MHz (UL), 1930 to 1990 MHz (DL) Band 3: 1710 to 1785 MHz (UL), 1805 to 1880 MHz (DL) Band 4: 1710 to 1755 MHz (UL), 2110 to 2155 MHz (DL) Band 5: 824 to 849 MHz (UL), 869 to 894 MHz (DL) Band 7: 2500 to 2570 MHz (UL), 2620 to 2690 MHz (DL) Band 8: 880 to 915 MHz (UL), 925 to 960 MHz (DL) Band 12: 699 to 716 MHz (UL), 729 to 746 MHz (DL) Band 13: 777 to 787 MHz (UL), 746 to 756 MHz (DL) Band 14: 788 to 798 MHz (UL), 758 to 768 MHz (DL) Band 17: 704 to 716 MHz (UL), 734 to 746 MHz (DL) Band 18: 815 to 830 MHz (UL), 860 to 875 MHz (DL) Band 19: 830 to 845 MHz (UL), 875 to 890 MHz (DL) Band 20: 832 to 862 MHz (UL), 791 to 821 MHz (DL) Band 25: 1850 to 1915 MHz (UL), 1930 to 1995 MHz (DL) Band 26: 814 to 849 MHz (UL), 859 to 894 MHz (DL) Band 28: 703 to 748 MHz (UL), 758 to 803 MHz (DL) Band 29: 717 to 728 MHz (DL) Band 30: 2305 to 2315 MHz (UL) 2350 to 2360 MHz (DL) Band 32: 1452 to 1496 MHz (DL) Band 34: 2010 to 2025 MHz (UL/DL) Band 38: 2570 to 2620 MHz (UL/DL) Band 39: 1880 to 1920 MHz (UL/DL) Band 40: 2300 to 2400 MHz (UL/DL) Band 41: 2496 to 2690 MHz (UL/DL) Band 42: 3400 to 3600 MHz (UL/DL) Band 46: 5150 to 5925 MHz (DL) Band 48: 3550 to 3700 MHz (UL/DL) Band 66: 1710 to 1800 MHz (UL), 2110 to 2200 MHz (DL) Band 71: 663 to 698 MHz (UL), 617 to 652 MHz (DL) <b><u>5G NR Sub 6GHz</u></b> n1: 1920 to 1980 MHz (UL), 2110 to 2170 MHz (DL) n2: 1850 to 1910 MHz (UL), 1930 to 1990 MHz (DL) n3: 1710 to 1785 MHz (UL), 1805 to 1880 MHz (DL)
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### Technical Specifications – Networking

n5: 824 to 849 MHz (UL), 869 to 894 MHz (DL)  
 n7: 2500 to 2570 MHz (UL), 2620 to 2690 MHz (DL)  
 n8: 880 to 915 MHz (UL), 925 to 960 MHz (DL)  
 n12: 699 to 716 MHz (UL), 729 to 746 MHz (DL)  
 n20: 832 to 862 MHz (UL), 791 to 821 MHz (DL)  
 n28: 703 to 748 MHz (UL), 758 to 803 MHz (DL)  
 n41: 2496 to 2690 MHz (UL/DL)  
 n66: 1710 to 1800 MHz (UL), 2110 to 2200 MHz (DL)  
 n71: 663 to 698 MHz (UL), 617 to 652 MHz (DL)  
 n77: 3300 to 4200 MHz (UL/DL)  
 n78: 3300 to 3800 MHz (UL/DL)  
 n79: 4400 to 5000 MHz (UL/DL)

#### Wireless protocol standards

##### **5G NR Air Interface**

l 3GPP Rel15 5G NR sub-6

##### **LTE Rel14**

20 layers and 2 Gbps downlink (DL) throughput – 4 × 4 MIMO across 5x CA  
 200 Mbps uplink (UL) throughput – 40 MHz ULCA and 256 QAM

##### **WCDMA**

R99, 3GPP Release 5, 6, 7 and 8 UMTS Specification

#### GPS

Standalone, A-GPS (MS-A, MS-B)

#### GPS Bands

GPS: L1 (1575.42MHz); L5 (1176MHz)

GLONASS: L1 (1602MHz)

BeidouB1(1561.098MHz)

Galileo E1 (1575.42); E5a (1176MHz)

#### Maximum Data Rates

5G sub 6G : 3.8 Gbps

LTE: ue-CategoryDL 20, (DL : 2 Gbps )

ue-CategoryUL 13 , (UL: 150Mbps)

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

5G Sub 6 : 2500 mA

LTE: 1,300 mA (peak); 1100 mA (average)

HSPA+: 1,100 mA (peak); 800 mA (average)

#### Form Factor

M.2, 3042-S3 Key B

#### Weight

8 g

#### Dimensions

42 mm × 30 mm × 2.6 mm

(Length x Width x Thickness)

\* WWAN modules for 5G ready platforms are optional features that can be configured at purchase or added later by the customer. 5G module supports AT&T and T-Mobile networks in the U.S. Module designed for 5G networks as carriers deploy Evolved-Universal Terrestrial Radio Access New Radio Dual Connectivity (ENDC) with both 100Mhz of 5G NR and LTE channel bandwidth, using 256QAM 4x4 as defined by 3GPP, requires activation and separately purchased service contract. Check with service provider for coverage and availability in your area. Connection, upload and download speeds will vary due to network, location, environment, network conditions, and other factors. 5G not available on all products, in all regions. Backwards compatible to 4G LTE and 3G HSPA technologies. 5G module planned to be available in select countries, where carrier supported.

#### Near Field Communications Controller (optional)

**Dimensions (L x W x H)**      Module 25 mm by 10 mm by 2.0 mm

**Chipset**                              NPC300

### Technical Specifications – Networking

<b>System interface</b>	I2C	
<b>NFC RF standards</b>	ISO/IEC 14443 A ISO/IEC 14443 B ISO/IEC 15693 ISO/IEC 18092 ECMA-340 NFCIP-1 Target and Initiator ECMA-320 NFCIP-2	
<b>NFC Forum Support</b>	Tag Type 1, Type 2, Type3 and Type 4, NFCIP-1 and NFCIP-2	
<b>Reader (PCD-VCD) Mode(1)</b>	ISO/IEC 14443 A ISO/IEC 14443 B ISO/IEC 15693 MIFARE 1K MIFARE 4K MIFARE DESFire FeliCa Jewel and Topaz cards	
<b>Card Emulation (PICC-VICC) Mode(1)</b>	ISO/IEC 14443 A ISO/IEC 14443 B and B' MIFARE FeliCa	
<b>Frequency</b>	13.56 MHz	
<b>NFC Modes Supported</b>	Reader/Writer, Peer-to-Peer	
<b>Raw RF Data Rates</b>	106, 212, 424, 848 kbps	
<b>Operating temperature</b>	0°C to 70°C	
<b>Storage temperature</b>	-20°C to 125°C	
<b>Humidity</b>	10-90% operating 5-95% non-operating	
<b>Supply Operating voltage</b>	4.35 to 5.25 Volts	
<b>I/O Voltage</b>	1.8V or 3.3V	
<b>Power Consumption</b>	<b>Booster enable, VCC_BOOST = 5V) Mode Power Consumption, Typical</b>	<b>VBAT= 3.3V, Polling</b> 7.3 mA <b>Detected Test Tag Type 1</b> Total 283.8 mA Net Module 236.8 mA <b>Detected Test Tag Type 2</b> Total 288.8 mA Net Module 241.8 mA <b>Detected Test Tag Type 3</b> Total 287.7 mA Net Module 240.7 mA <b>Detected Test Tag Type 4</b> Total 282.3 mA Net Module 235.3 mA
<b>Antenna</b>	Antenna connector, 0.5mm pitch, 7 connector FPC. Antenna matching is external to module.	

### Technical Specifications – Power

#### POWER

<b>AC Adapter 45 Watt Smart nPFC Standard Barrel 4.5mm Right Angle 1.8m</b>	<b>Dimensions</b>	95x45x26.8mm	
	<b>Weight</b>	unit: 200g +/- 10g	
	<b>Input</b>	<b>Input Efficiency</b>	87.74 % at 115 Vac and 88.4 % at 230Vac
		<b>Input frequency range</b>	47 ~ 63 Hz
	<b>Output</b>	<b>Input AC current</b>	Max. 1.4 A at 90 Vac
		<b>Output power</b>	45W
		<b>DC output</b>	19.5V
		<b>Hold-up time</b>	5ms at 115 Vac input
		<b>Output current limit</b>	<8.0A
	<b>Connector</b>	4.5mm Barrel Type	
	<b>Environmental Design</b>	<b>Operating temperature</b>	32° to 95° F (0° to 35° C)
		<b>Non-operating (storage) temperature</b>	-4° to 185° F (-20° to 85° C)
		<b>Altitude</b>	0 to 16,400 ft (0 to 5,000 m)
		<b>Humidity</b>	20% to 95%
<b>Storage Humidity</b>		10% to 95%	
<b>EMI and Safety Certifications</b>	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.		

<b>AC Adapter 45 Watt Smart nPFC Standard Barrel 4.5mm Right Angle 1.8m 2prong</b>	<b>Dimensions</b>	95x45x26.8mm	
	<b>Weight</b>	unit: 200g +/- 10g	
	<b>Input</b>	<b>Input Efficiency</b>	87.74 % at 115 Vac and 88.4 % at 230Vac
		<b>Input frequency range</b>	47 to 63 Hz
	<b>Output</b>	<b>Input AC current</b>	Max. 1.4 A at 90 Vac
		<b>Output power</b>	45W
		<b>DC output</b>	19.5V
		<b>Hold-up time</b>	5ms at 115 Vac input
		<b>Output current limit</b>	<8.0A
	<b>Connector</b>	4.5mm Barrel Type	
	<b>Environmental Design</b>	<b>Operating temperature</b>	32° to 95° F (0° to 35° C)



### Technical Specifications – Power

<b>Non-operating (storage) temperature</b>	-4° to 185° F (-20° to 85° C)
<b>Altitude</b>	0 to 16,400 ft (0 to 5000m)
<b>Humidity</b>	20% to 95%
<b>Storage Humidity</b>	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.

<b>AC Adapter 65 Watt nPFC Slim USB Type-C® Straight 1.8m</b>	<b>Dimensions</b>	88x53.5x21mm	
	<b>Weight</b>	unit: 220g +/- 10g	
	<b>Input</b>	<b>Input Efficiency</b>	81.5% min at 115 Vac/ 230Vac @ 5V/3A 86.7% min at 115 Vac/ 230Vac @ 9V/3A 88% min at 115 Vac/ 230Vac @ 12V/5A 89% min at 115 Vac/ 230Vac @ 15V/4.33A 89% min at 115 Vac/ 230Vac @ 20V/3.25A
		<b>Input frequency range</b>	47 ~ 63 Hz
	<b>Output</b>	<b>Input AC current</b>	1.6 A at 90 VAC and maximum load
		<b>Output power</b>	65W
		<b>DC output</b>	5V/9V/12V/15V/20V
		<b>Hold-up time</b>	5ms at 115 Vac input
		<b>Output current limit</b>	<8.0A
	<b>Connector</b>	USB Type C®	
<b>Environmental Design</b>	<b>Operating temperature</b>	32° to 95° F (0° to 35° C)	
	<b>Non-operating (storage) temperature</b>	-4° to 185° F (-20° to 85° C)	
	<b>Altitude</b>	0 to 16,400 ft (0 to 5000m)	
	<b>Humidity</b>	5% to 95%	
	<b>Storage Humidity</b>	5% to 95%	
<b>EMI and Safety Certifications</b>	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 100,000 hours at 25°C ambient condition.		

### Technical Specifications – Power

<b>AC Adapter 65 Watt nPFC Standard USB Type-C® Straight 1.8m</b>	<b>Dimensions</b>	90.0x51x28.5mm	
	<b>Weight</b>	unit: 250g +/- 10g	
	<b>Input</b>	<b>Input Efficiency</b> 81.5% min at 115 Vac/ 230Vac @ 5V/3A 86.7% min at 115 Vac/ 230Vac @ 9V/3A 88% min at 115 Vac/ 230Vac @ 12V/5A 89% min at 115 Vac/ 230Vac @ 15V/4.33A 89% min at 115 Vac/ 230Vac @ 20V/3.25A	
	<b>Output</b>	<b>Input frequency range</b>	47 ~ 63 Hz
		<b>Input AC current</b>	1.6 A at 90 VAC and maximum load
		<b>Output power</b>	65W
		<b>DC output</b>	5V/9V/12V/15V/20V
		<b>Hold-up time</b>	5ms at 115 Vac input
	<b>Connector</b>	<b>Output current limit</b>	8.0A Max.
	<b>Environmental Design</b>	USB TYPE C®	
		<b>Operating temperature</b>	32° to 95° F (0° to 35° C)
		<b>Non-operating (storage) temperature</b>	-4° to 185° F (-20° to 85° C)
		<b>Altitude</b>	0 to 16,400 ft (0 to 5000m)
		<b>Humidity</b>	20% to 95%
	<b>EMI and Safety Certifications</b>	<b>Storage Humidity</b>	10% to 95%
Eg:			
"CE Mark - full compliance with LVD and EMC directives			
*Worldwide safety standards -IEC60950, EN60950, UL60950, UL62368, 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.			
<b>AC Adapter 65 Watt Smart nPFC EM Barrel 4.5mm New Emerging Market</b>	<b>Dimensions</b>	102x55x30mm	
	<b>Weight</b>	unit: 250g +/- 10g	
	<b>Input</b>	<b>Input Efficiency</b> 88.0 % at 115 Vac and 89.0 % at 230Vac	
	<b>Output</b>	<b>Input frequency range</b>	47 ~ 63 Hz
		<b>Input AC current</b>	Max. 1.7 A at 90 Vac
		<b>Output power</b>	65W
		<b>DC output</b>	19.5V
		<b>Hold-up time</b>	5ms at 115 Vac input
	<b>Connector</b>	<b>Output current limit</b>	<11.0A
	<b>Environmental Design</b>	4.5mm Barrel Type	
		<b>Operating temperature</b>	32°F to 95°F (0°to 35°C)
		<b>Non-operating (storage) temperature</b>	-4°F to 185°F (-20°to 85°C)
		<b>Altitude</b>	0 to 16,400 ft (0 to 5,000 m)

### Technical Specifications – Power

		<b>Humidity</b>	20% to 95%
		<b>Storage Humidity</b>	10% to 95%
	<b>EMI and Safety Certifications</b>	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.	
<b>AC Adapter 65 Watt Smart nPFC Standard Barrel 4.5mm Right Angle 1.8m</b>	<b>Dimensions</b>	90x51x28.5mm	
	<b>Weight</b>	unit: 230g +/- 10g	
	<b>Input</b>	<b>Input Efficiency</b>	88.0 % at 115 Vac and 89.0 % at 230Vac
		<b>Input frequency range</b>	47 ~ 63 Hz
		<b>Input AC current</b>	Max. 1.7 A at 90 Vac
	<b>Output</b>	<b>Output power</b>	65W
		<b>DC output</b>	19.5V
		<b>Hold-up time</b>	5ms at 115 Vac input
		<b>Output current limit</b>	<11.0A
	<b>Connector</b>	4.5mm Barrel Type	
	<b>Environmental Design</b>	<b>Operating temperature</b>	32° to 95° F (0° to 35° C)
		<b>Non-operating (storage) temperature</b>	-4° to 185° F (-20° to 85° C)
		<b>Altitude</b>	0 to 16,400 ft (0 to 5,000 m)
		<b>Humidity</b>	20% to 95%
		<b>Storage Humidity</b>	10% to 95%
	<b>EMI and Safety Certifications</b>	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.	
<b>3 Cell 53 Wh HP Long Life Battery*; supporting HP Fast Charge</b>	<b>Dimensions (H x W x L)</b>	7.3 x 52.9 x 267.11 mm ( 0.287 x 2.082 x 10.516 inch)	
	<b>Weight</b>	0.205kg (0.45 lb)	
	<b>Cells/Type</b>	3cell Lithium-Ion Polymer cell / 645180	
	<b>Energy</b>	<b>Voltage</b>	11.55V
		<b>Amp-hour capacity</b>	4.59Ah
		<b>Watt-hour capacity</b>	53Wh
	<b>Temperature</b>	<b>Operating (Charging)</b>	32° to 122° F (0° to 50° C)
		<b>Operating (Discharging)</b>	14° to 140° F (-10° to 60° C)
	<b>Fuel Gauge LED</b>	NA	
	<b>Warranty</b>	Depends on system offering	

### Technical Specifications – Power

**Optional Travel Battery Available** No

\*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.

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### Technical Specifications – Environmental

#### 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®
- EPEAT® Gold registered in the United States. See <http://www.epeat.net> for registration status in your country.

##### Sustainable Impact Specifications

- 40% post-consumer recycled plastic<sup>4</sup>
- Low halogen<sup>1</sup>
- Outside Box and corrugated cushions are 100% sustainably sourced and recyclable<sup>3</sup>
- Molded Paper Pulp Cushion inside box is 100% sustainably sourced and recyclable<sup>5</sup>
- Bulk packaging available
- Ocean-Bound Plastic in speaker enclosure<sup>2</sup>

##### 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, 60Hz
Normal Operation (Short idle)	TBD	TBD	TBD
Normal Operation (Long idle)	TBD	TBD	TBD
Sleep	TBD	TBD	TBD
Off	TBD	TBD	TBD

##### 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, 60Hz
Normal Operation (Short idle)	TBD	TBD	TBD
Normal Operation (Long idle)	TBD	TBD	TBD
Sleep	TBD	TBD	TBD
Off	TBD	TBD	TBD

\*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 <sub>WAd</sub> , bels)	Sound Pressure (L <sub>pAm</sub> , decibels)
Typically Configured – Idle	TBD	TBD
Fixed Disk – Random writes	TBD	TBD

##### Longevity and Upgrading

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

### Technical Specifications – Environmental

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

#### Batteries

This battery(s) in this product comply with EU Directive 2006/66/EC

Batteries used in the product do not contain:

Mercury greater the 1ppm by weight

Cadmium greater than 20ppm by weight

Battery description: CR2032 (coin cell)

Battery type: Lithium

#### 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](http://www.epeat.net)
- Plastics parts weighing over 25 grams used in the product are marked per ISO11469 and ISO1043.
- This product contains 7.8% post-consumer recycled plastic (by wt.)
- This product is 96.1% recycle-able when properly disposed of at end of life.

#### Packaging Materials

**External:** PAPER/Cardboard & misc TBD

**Internal:** PLASTIC/EPE (Expanded Polyethylene) TBD

PLASTIC/Polyethylene low density TBD

PLASTIC/Polypropylene TBD

The plastic packaging material contains at least 50% recycled content.

The corrugated paper packaging materials contains at least 70% recycled content.

#### 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/pdf/gse.pdf>):

- Asbestos
- Certain Azo Colorants
- Certain Brominated Flame Retardants – may not be used as flame retardants in plastics
- Cadmium
- Chlorinated Hydrocarbons
- Chlorinated Paraffins
- 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)

### Technical Specifications – Environmental

- Polybrominated Biphenyl Oxides (PBBOs)
- Polychlorinated Biphenyl (PCB)
- Polychlorinated Terphenyls (PCT)
- Polyvinyl Chloride (PVC) – except for wires and cables, 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 HP web site at: <http://www.hp.com/go/recyclers>. These instructions may be used by recyclers and other WEEE treatment facilities as well as HP OEM customers who integrate and re-sell HP equipment.

#### HP Inc. Corporate Environmental Information

For more information about HP's commitment to the environment:

Global Citizenship Report

<http://www.hp.com/hpinfo/globalcitizenship/gcreport/index.html>

Eco-label certifications

<http://www8.hp.com/us/en/hp-information/environment/ecolabels.html>

ISO 14001 certificates:

<http://h20195.www2.hp.com/V2/GetDocument.aspx?docname=c04755842>

and

<http://www.hp.com/hpinfo/globalcitizenship/environment/pdf/cert.pdf>

#### Footnotes

<sup>1</sup>External power supplies, WWAN modules, power cords, cables and peripherals excluded. Service parts obtained after purchase may not be Low Halogen.

<sup>2</sup>Percentage of ocean-bound plastic contained in each component varies by product

<sup>3</sup>100% outer box packaging and corrugated cushions made from sustainably sourced certified and recycled fibers.

<sup>4</sup>Recycled plastic content percentage is based on the definition set in the IEEE 1680.1-2018 standard.

<sup>5</sup>Molded pulp cushions are made from 100% recycled wood fiber and organic materials.

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<b>Date of change:</b>	<b>Version History:</b>		<b>Description of change:</b>
December 11, 2020	From v1 to v2	Changed	Format
March 2, 2021	From v2 to v3	Changed	ENVIRONMENTAL DATA section
April 21, 2021	From v3 to v4	Changed	GRAPHICS section
May 3, 2021	From v4 to v5	Changed	POWER section
		Removed	Adobe from ISV certified
May 11, 2021	From v5 to v6	Changed	PROCESSOR section
May 31, 2021	From v6 to v7	Added	HP Smart Support and footnote
June 1, 2021	From v7 to v8	Changed	Image page 1
June 9, 2021	From v8 to v9	Changed	Display section
June 10, 2021	From v9 to v10	Removed	Workwell from Software section
June 16, 2021	From v10 to v11	Changed	SYSTEM UNIT Temperature section
July 1, 2021	From v11 to v12	Changed	PROCESSOR section