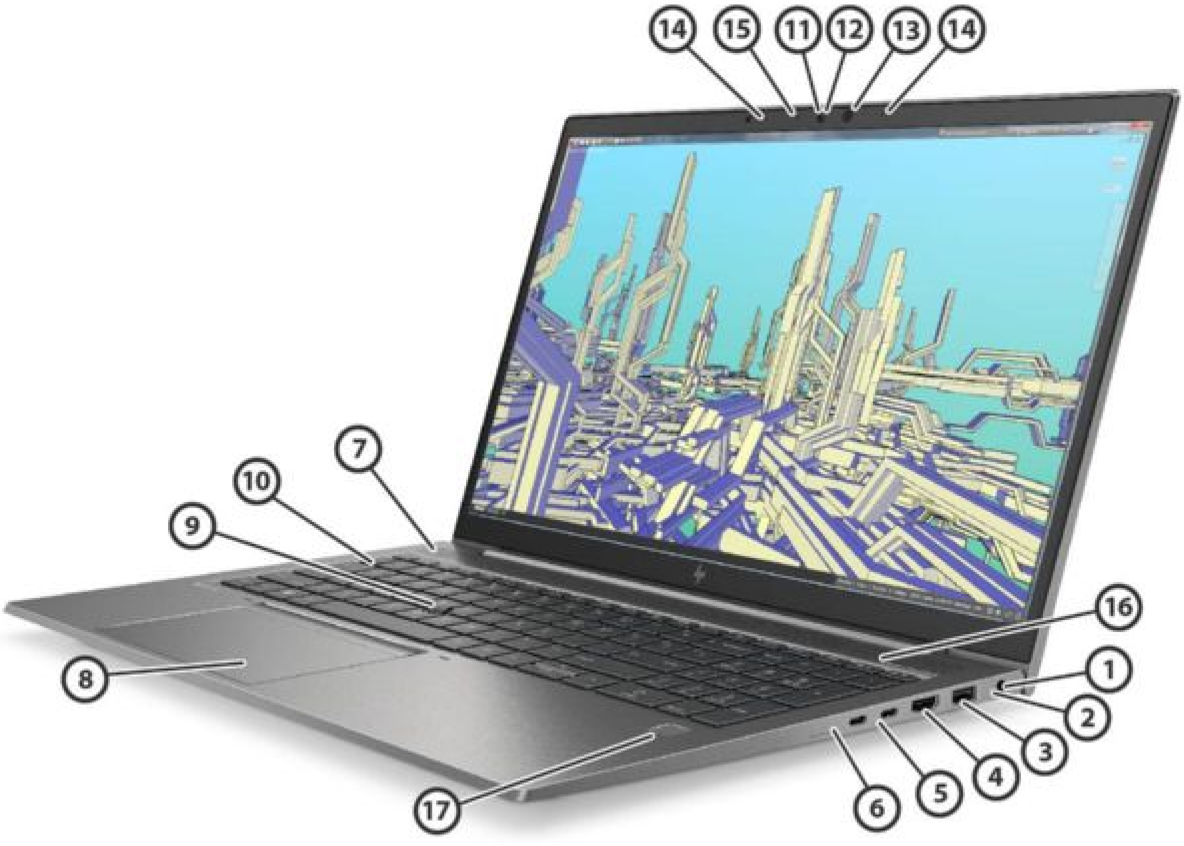
HP ZBook Firefly 15 G7 Mobile Workstation



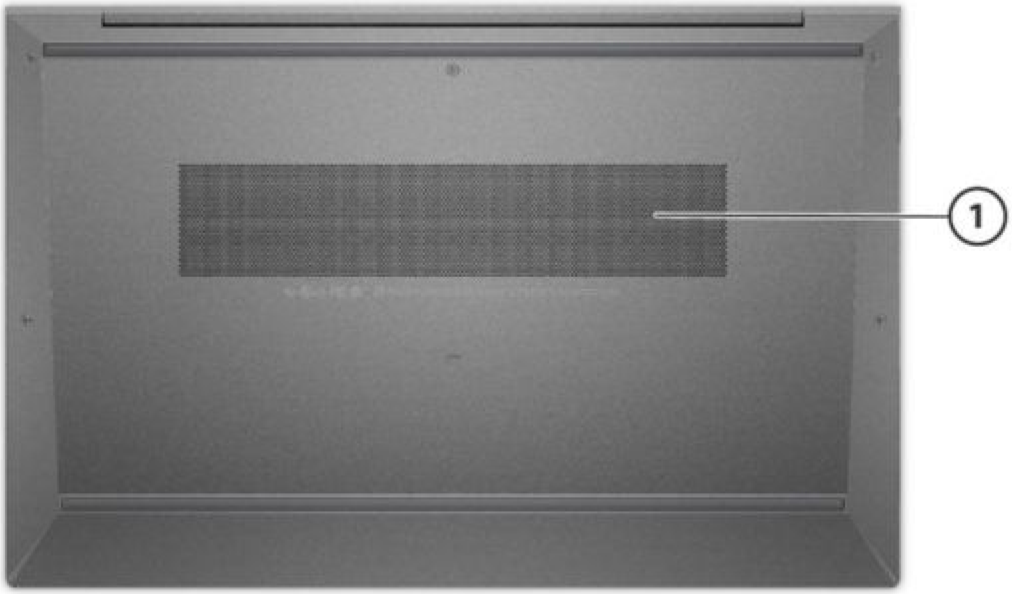
Right

1. Power connector
2. Battery Charging LED
3. USB 3.1 Gen 1
4. HDMI 2.0 (HDMI cable not included)
5. 2 USB Type-C® with Thunderbolt™
6. Nano SIM card slot (optional)[1]
7 Speakers
8. Clickpad
9. Dual point stick with buttons
10. HP Premium Keyboard
11. HD Camera (select models only)
12. IR Camera (select models only)
13. HP Privacy Camera Shutter
14. Multi-array microphone
15. Webcam LED
16. Power button (on keyboard)
17. fingerprint sensor (optional)

[1] 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

Left

1.	Nano security lock slot (cable lock sold separately)	3.	Audio combo jack
2.	USB 3.1 Gen 1	4.	HP Smart Card Reader



Bottom

1. Fan Venting

At A Glance

- Work anywhere without compromising on performance or security with Windows 10 Pro[1], 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® Quadro® graphics with 4GB of video memory.
- Bring your ideas to life quickly and effectively with the latest 10th gen quad core Intel® Core™ processors[2] with up to 4.9 GHz of acceleration when you need it most.[3]
- Strenuously tested to meet ISV certification and deliver superb performance and support with leading software providers, including Autodesk and Adobe®.[4]
- Have confidence with the world's most secure mobile workstations.[5] Instantly protect against visual hacking with HP Sure View Reflect[6] and defend against firmware and malware attacks with HP Sure Start Gen5[7], HP Sure Sense[8] and HP Sure Platform[9], new tamper detection switch.
- Built with the environment in mind, this ZBook includes recycled ocean-bound plastics[10], plastic-free packaging, a reduction in hazardous material and ultra-efficient power consumpion.
- The keyboard has been re-imagined with rubber domes, power button, and a quiet clickpad for a more comfortable, intuitive, and quiet experience. Easily input numbers with a dedicate number pad.
- Choice of modern viewing experiences:
  - 39.6 cm (15.6") diagonal 4K UHD IPS eDP + PSR anti-glare, 100% sRGB, 400 nits with ambient light sensor (3840 x 2160)
  - 39.6 cm (15.6") diagonal FHD IPS eDP + PSR anti-glare, 100% sRGB at 400 nits with ambient light sensor (1920 x 1080)
  - 39.6 cm (15.6") diagonal FHD IPS eDP anti-glare on-cell touch screen, 45% NTSC at 250 nits (1920 x 1080)
  - 39.6 cm (15.6") diagonal FHD IPS eDP anti-glare, 45% NTSC at 250 nits (1920 x 1080)
- Designed for ultimate durability, this ZBook undergoes brutal MIL-STD 810H [11] 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[12] transfers and the flexibility to run up to two external 4K displays.[13,14]
- Work without limits in any location with up to 2TB[15] 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[16] 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.[17]

[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 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.

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

[3] Intel® Turbo Boost 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 for more information.

[4] Adobe and Autodesk software sold separately.

[5] Based on HP's unique and comprehensive security capabilities at no additional cost among desktop workstation vendors as of Sept. 2017 on HP Mobile Workstations with 7th Gen and higher Intel® Processors.

[6] HP Sure View Reflect integrated privacy screen is an optional feature that must be configured at purchase.

[7] HP Sure Start Gen5 is available on select HP PCs with Intel processors. See product specifications for availability.

[8] HP Sure Sense requires Windows 10. See product specifications for availability.

[9] HP Sure Platform is only available on configurations with discrete graphics

[10] Speaker enclosure component made with 5% ocean bound plastic as of 2/3/2020.

[11] Testing is not intended to demonstrate fitness of U.S. Department of Defense (DoD) 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.

[12] HP Thunderbolt Dock with Thunderbolt™ 3 sold separately.

[13] External displays sold separately.

[14] Optional hybrid graphics is required to run up to two external 4K displays.

[15] 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.

[16] 4G LTE is an optional feature, 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.

[17] Based on internal testing vs. previous generation product with 802.11ac wireless LAN module.

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

OPERATING SYSTEM

Preinstalled OS	Windows 10 Pro 64 - HP recommends Windows 10 Pro for business.[1] Windows 10 Home 64[1] Windows 10 Home Single Language 64[1] Windows 10 Pro 64 [1] Windows 10 China Government Editions [1] FreeDOS 3.0
Web support OS	Windows 10 Enterprise 64[1] Red Hat® Enterprise Linux® 7 Workstation

[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 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.

[2] Tested and documented only.

PROCESSOR

10th Generation Intel® Core™ i7-10810U vPro™ with Intel® UHD Graphics (1.1 GHz base frequency, up to 4.9 GHz with Intel® Turbo Boost Technology, 12 MB L3 cache, 6 cores)[1,2,3,4]

10th Generation Intel® Core™ i7-10710U with Intel® UHD Graphics (1.1 GHz base frequency, up to 4.9 GHz with Intel® Turbo Boost Technology, 12 MB L3 cache, 6 cores) [1,2,3,4]

10th Generation Intel® Core™ i7-10510U with Intel® UHD Graphics (1.8 GHz base frequency, up to 4.9 GHz with Intel® Turbo Boost Technology, 8 MB L3 cache, 4 cores) [1,2,3,4]

10th Generation Intel® Core™ i7-10610U vPro™ with Intel® UHD Graphics (1.8 GHz base frequency, up to 4.9 GHz with Intel® Turbo Boost Technology, 8 MB L3 cache, 4 cores)[1,2,3,4]

10th Generation Intel® Core™ i5-10310U vPro™ with Intel® UHD Graphics (1.7 GHz base frequency, up to 4.4 GHz with Intel® Turbo Boost Technology, 6 MB L3 cache, 4 cores)[1,2,3,4]

10th Generation Intel® Core™ i5-10210U vPro™ with Intel® UHD Graphics (1.6 GHz base frequency, up to 4.2 GHz with Intel® Turbo Boost Technology, 6 MB L3 cache, 4 cores) [1,2,3,4]

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

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

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

[4] In accordance with Microsoft's support policy, HP does not support the Windows 8 or Windows 7 operating system on products configured with Intel and AMD 7th generation and forward processors or provide any Windows 8 or Windows 7 drivers on http://www.support.hp.com.

CHIPSET

Chipset is integrated with processor

INTEL® CORE^{TM} I5 WITH VPRO/CORE I7 WITH VPRO TECHNOLOGY CAPABLE

Intel® Core^{TM} i5 with vPro^{TM}, Core^{TM} i7 with vPro^{TM} technology is a selectable feature that is available on units configured with select processors, a qualified Intel® WLAN module and a preinstalled Windows® operating system. It provides advances in remote manageability, security, energy efficient performance, and wireless connectivity. Intel® Active Management Technology (iAMT) offers built-in manageability and proactive security for networked mobile workstations, even when they are powered off* or when the operating system is inoperable. It can help identify threats before they reach the network, isolate infected systems, and update regardless of their power state.

[1] Requires a Windows operating system, network hardware and software, connection with a power source, and a direct (non-VPN) corporate network connection which is either cable or wireless LAN.
[2] Some functionality of Intel® Core^{TM} i5 with vPro^{TM}/Core^{TM} i7 with vPro^{TM} technology, such as Intel® Active Management technology and Intel® Virtualization technology, requires additional third- party software in order to run. Availability of future "virtual appliances" applications for Intel® Core^{TM} i5 with vPro^{TM}/Core i7 with vPro^{TM} technology is dependent on third- party software providers. Compatibility with future "virtual appliances" is yet to be determined.

GRAPHICS

Integrated

Intel® UHD Graphics [1, 3, 5, 6]

Discrete

NVIDIA Quadro P520 (4 GB GDDR5 dedicated)[2, 4]

[1] UHD content required to view UHD images.

[2] Both UMA & Discrete configurations support 3 independent displays when on the HP UltraSlim Dock (sold separately) - Max. resolution = 2.5K @60Hz (DP1) & 2.5K @60Hz (DP2) & FHD (VGA), and support 3 independent displays when on the HP Thunderbolt Dock G2 (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).

[3] Support HD decode, DX12, HDMI 1.4, HDCP 2.3 via DP up to 4K @ 60Hz and via HDMI up to 4K @ 30Hz

[4] HDMI cable Sold Separately

[5] 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.

Features

DISPLAY

Non-touch

- 15.6" diagonal FHD IPS eDP + PSR anti-glare, 100% sRGB at 400 nits with ambient light sensor (1920 x 1080) [1,2,3,4,5]
- 15.6" diagonal FHD IPS eDP anti-glare, 45% NTSC at 250 nits (1920 x 1080) [1,2,3,4,5]
- 15.6" diagonal 4K UHD IPS eDP + PSR anti-glare, 100% sRGB, 400 nits with ambient light sensor (3840 x 2160) [1,2,3,4,5]

Touch

- 15.6" diagonal FHD IPS eDP anti-glare touch screen, 45% NTSC at 250 nits (1920 x 1080) [1,2,3,4,5]

[1] HP Sure View Reflect is optional and must be configured at purchase.
[2] UHD content required to view UHD images.
[3] Sold separately or as an optional feature.
[4] Resolutions are dependent upon monitor capability, and resolution and color depth settings.
[5] Actual brightness will be lower with HP Sure View or touch screen.

STORAGE AND DRIVES*

M.2 Storage (NVMe™ PCIe SSD)
256 GB PCIe (NVMe™) TLC Self Encrypting (SED) Solid State Drive
512 GB PCIe (NVMe™) TLC Self Encrypting (SED) Solid State Drive
256 GB PCIe (NVMe™) TLC Solid State Drive
512 GB PCIe (NVMe™) TLC Solid State Drive
1 TB PCIe (NVMe™) TLC Solid State Drive
2 TB PCIe (NVMe™) TLC Solid State Drive
256 GB PCIe® NVMe™ M.2 Value SSD

Cache Memory

256 GB PCIe® NVMe™ M.2 QLC SSD + 16 GB Intel® Optane™ Memory[1,2]
512 GB PCIe® NVMe™ M.2 QLC SSD + 32 GB Intel® Optane™ Memory[1,2]

[1] Intel® Optane™ memory is sold separately. Intel® Optane™ memory system acceleration does not replace or increase the DRAM in your system. Available for HP commercial desktops and notebooks and for select HP workstations (HP Z240 Tower/SFF, Z2 Mini, ZBook Studio, 15 and 17 G5) and requires a SATA HDD, 7th Gen or higher Intel® Core™ processor or Intel ® Xeon® processor E3-120 V6 product family or higher, BIOS version with Intel® Optane™ supported, Windows 10 version 1703 or higher, M.2 type 2280-S1- M connector on a PCH Remapped PCIe Controller and Lanes in a x2 or x4 configuration with B-M keys that meet NVMe™ Spec 1.1, and an Intel® Rapid Storage Technology (Intel® RST) 15.5 driver.
[2] 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.

DRIVE CONTROLLERS

M.2 Storage Bay (PCIe NVMe)	PCIe Gen 3 x 4 lanes NVMe Solid State Drive
RAID:	Not supported

MEMORY

Maximum Memory
64 GB DDR4-2666 non-ECC SDRAM[1]
2 DDR4 SODIMMS
Supports Dual Channel Memory[2]
Slots are customer accessible / upgradeable

[1] 64GB memory configurations is only available on configurations without discrete graphics.
[2] 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® Wi-Fi 6 AX201 (2x2) and Bluetooth® 5 combo, vPro™ [1]
Intel® Wi-Fi 6 AX201 (2x2) and Bluetooth® 5 combo, non-vPro™ [1]

[1] 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[1,2]

Intel® XMM™ 7360 LTE Advanced CAT 9
Intel® XMM™ 7560 LTE-Advanced Pro Cat 16

[1] WWAN is an optional feature and requires factory configuration 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.

[2] Gigabit class Category 16 4G LTE module is optional and must be configured at the factory. Module designed for up to 1 Gbps download speeds as carriers deploy 5 carrier aggregation and 100Mhz channel bandwidth, requires activation and separately purchased service contract. Backwards compatible to HSPA 3G technologies. 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. 4G LTE not available on all products, in all regions.

Optional Near Field Communication (NFC) module

AUDIO/MULTIMEDIA

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

Camera[1, 2]

720p HD webcam with IR

720p HD webcam

[1] HD content required to view HD images.

[2] 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.

KEYBOARDS/POINTING DEVICES/BUTTONS & FUNCTION KEYS

Keyboard
HP Premium Keyboard, full-size, spill-resistant, backlit, 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
CyberLink Power Media Player
HP Hotkey Support
HP Noise Cancellation Software
HP Performance Advisor[8]
HP Recovery Manager
HP Z Central Remote Boost Software[2]
HP Support Assistant [1]
HP JumpStart
HP Mobile Connect Pro [3]
Native Miracast support [4]
HP Connection Optimizer[9]

Security Management
Absolute persistence module [6]
HP Device Access Manager
HP FingerPrint Sensor
HP Manageability Integration Kit[11]
HP Power On Authentication
HP Support Assistant[7]
Security lock slot[12]
Trusted Platform Module TPM 2.0 Embedded Security Chip
Master Boot Record security

Features

Pre-boot authentication
Microsoft Defender[10]
HP Client Security Manager Gen5[7, 17]
HP BIOSphere Gen5 [5]
HP Sure Recover Gen2[13]
HP Sure Recover with Embedded Reimaging Gen2[14]
HP Sure Start Gen5 [5, 15]
HP Secure Erase [16]
HP Sure Sense[18]
HP Sure Platform[19]

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

[1] HP Support Assistant - Requires Windows and Internet Access.

[2] HP Z Central Remote Boost Software - The remote desktop solution for serious workstation users and their most demanding applications. Download at: http://www.hp.com/go/RGS.

[3] HP Mobile Connect Pro is only available on preconfigured devices with WWAN. For geographic availability refer to http://www.hp.com/go/mobileconnect.

[4] 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.

[5] HP BIOSphere Gen5 is available on select HP Pro, Elite and ZBook PCs. See product specifications for details. Features may vary depending on the platform and configurations. HP Sure Start Gen5 - Available on HP Elite and HP Z Workstation products equipped with Intel® 8th generation processors.

[6] 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.

[7] Requires Windows and Intel® 8th generation processors.

[8] 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

[9] HP Connection Optimizer requires Windows 10.

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

[11] HP Manageability Integration Kit can be downloaded from http://www.hp.com/go/clientmanagement.

[12] Security lock slot is Lock sold separately.

[13] HP Sure Recover Gen2: See product specifications for availability. Requires an open, wired network connection. Not available on platforms with multiple internal storage drives. You must back up important files, data, photos, videos, etc. before using HP Sure Recover to avoid loss of data. HP Sure Recover (Gen1) does not support platforms with Intel® Optane™.

[14] HP Sure Recover with Embedded Reimaging Gen2 is an optional feature which must be configured at purchase. See product specifications for availability. Not available on platforms with multiple internal storage drives. 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™.

[15] HP Sure Start Gen5 is available on select HP PCs with Intel processors. See product specifications for availability.

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

[17] HP Client Security Manager Gen5 requires Windows and is available on select HP Pro, Elite and ZBook PCs. See product specifications for details.

[18] HP Sure Sense requires Windows 10. See product specifications for availability.

[19] Wireless access point and Internet service required and sold separately. Availability of public wireless access points limited.

Features

POWER

Power Supply

Up to 23 hours[1]

HP Long Life 3-cell, 56 Wh Li-ion polymer[2]

HP Smart 65 W External AC Power Adapter[3]
HP Smart 45 W External AC Power Adapter

Supports battery fast charge: approximately 50% in 30 minutes (defined under system hibernation and off mode)

[1] 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 MobileMark14 battery benchmark https://bapco.com/products/mobilemark-2014/ for additional details.

[2] Supports HP Fast Charge Technology

[3] 45W Power Adapter is not available with Discrete Graphics Configurations.

ENVIRONMENTAL

Targeting ENERGY STAR® certified and EPEAT® GOLD registered configurations available [1]

Low halogen[2]

[1] Based on US EPEAT® registration according to IEEE 1680.1-2018 EPEAT®. Status varies by country. Visit www.epeat.net for more information.

[2] External power supplies, power cords, cables and peripherals are not low halogen. Service parts obtained after purchase may not be low halogen.

WEIGHTS & DIMENSIONS

Dimensions (w x d x h)
35.95 x 23.36 x 1.92 cm
14.15 x 9.19 x 0.76 in

Weights
Starting at 1.75kg (3.87 lb)
Weight varies by configuration and components.

PORTS/SLOTS

1 smart card reader

Left side
1 USB 3.1 Gen 1 (charging)
1 USB 3.1 Gen 1
1 headphone/microphone combo

Right side
1 power connector
2 USB Type-C® (Thunderbolt™ 3)
1 HDMI 1.4b

1 Nano SIM slot (optional)

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.Optional1 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.

[1] 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.

SYSTEM UNIT

Stand-Alone Power Requirements (AC Power)	**Nominal Operating Voltage**	19.5V		
	Average Operating Power(idle)	**WIN10**	System in idle mode + max panel brightness 250nit, 400nits, 550nits	Adapter Safety test condition
	Integrated graphics	6.78W		
	Discrete Graphics	15.3W		
	Max Operating Power	Discrete < 65W UMA < 45W		
Temperature	**Operating**	32° to 95° F (0° to 35° C) (not writing optical)		
	Non-operating	41° to 95° F (5° to 35° C) (writing optical)		
Relative Humidity	**Operating**	10% to 90%, non-condensing		
	Non-operating	5% to 95%, 101.6° F (38.7° C) maximum wet bulb temperature		
Shock	**Operating**	40 G, 2 ms, half-sine		
	Non-operating	200 G, 2 ms, half-sine		
Random Vibration	**Operating**	0.75 grms		
	Non-operating	1.50 grms		
Maximum Altitude (unpressurized)	**Operating**	-50 to 10,000 ft. (-15.24 to 3,048 m)		
	Non-operating	-50 to 15,000 ft. (-15.24 to 12,192 m)		
Planned Industry Standard Certifications	**UL**	Yes		
	CSA	Yes		
	FCC Compliance	Yes		
	ENERGY STAR®	Select models[1]		
	EPEAT®	Registered Gold in United States		
	ICES	Yes		
	Australia / NZ A-Tick Compliance	Yes		
	CCC	Yes		
	Japan VCCI Compliance	Yes		
	KCC	Yes		
	BSMI	Yes		
	CE Marking Compliance	Yes		
	MIL STD 810H	Yes		
	BNCI or BELUS	Yes		
	CIT	Yes		
	GOST	Yes		
	Saudi Arabian Compliance (ICCP)	Yes		
	SABS	Yes		

[1] Configurations of the HP ZBook Firefly 15 G7 that are ENERGY STAR® qualified are identified as HP ZBook Firefly 15 G7 ENERGY STAR on HP websites and on http://www.energystar.gov.

Technical Specifications – System Unit

DISPLAYS

15.6" diagonal FHD IPS eDP anti-glare, 45% NTSC at 250 nits (1920 x 1080)	**Outline Dimensions** (W x H)	350.96 x 205.54 mm (max)	
	Active Area	344.16 x 193.59 mm (typ.)	
	Weight	370 g (max)	
	Diagonal Size	15.6 inch	
	Thickness	3.0 mm/ 5.0 mm (w/PCB) (max)	
	Interface	eDP 1.2 (2 lane)	
	Surface Treatment	Anti-Glare	
	Touch enabled	No	
	Contrast Ratio	600:1 (typ.)	
	Refresh Rate	60 Hz	
	Brightness	250 nits	
	Pixel Resolution	**Pitch**	1920 x 1080 (FHD)
		Format	RGB Stripe
	Backlight	LED	
	Color Gamut Coverage	NTSC 45%	
	Color Depth	6 bits (Hi FRC supportive w/ condition to enable)	
	Viewing Angle	UWVA 85/85/85/85	

15.6" diagonal FHD IPS eDP anti-glare touch screen, 45% NTSC at 250 nits (1920 x 1080)	**Outline Dimensions** (W x H)	350.96 x 205.74 mm (max)	
	Active Area	344.16 x 193.59 mm (typ.)	
	Weight	380 g (max)	
	Diagonal Size	15.6 inch	
	Thickness	3.2mm/ 5.2mm (PCB) (max)	
	Interface	eDP 1.2	
	Surface Treatment	Anti-Glare On-cell	
	Touch enabled	YES	
	Contrast Ratio	600:1 (typ.)	
	Refresh Rate	60 Hz	
	Brightness	250 nits	
	Pixel Resolution	**Pitch**	1920 x 1080 (FHD)
		Format	RGB Stripe
	Backlight	LED	
	Color Gamut Coverage	NTSC 45%	
	Color Depth	6 bits	
	Viewing Angle	UWVA 85/85/85/85	

Technical Specifications – Displays

15.6" diagonal FHD IPS eDP + PSR anti-glare, 100% sRGB at 400 nits with ambient light sensor (1920 x 1080)	**Outline Dimensions** (W x H)	349.46 x 204.79 mm (max)	
	Active Area	344.16 x 193.59 mm (typ.)	
	Weight	325 g (max)	
	Diagonal Size	15.6 inch	
	Thickness	2.6mm / 4.6mm (PCB) (max)	
	Interface	eDP 1.4	
	Surface Treatment	Anti-Glare	
	Touch enabled	No	
	Contrast Ratio	1200:1 (typ.)	
	Refresh Rate	60 Hz	
	Brightness	400 nits	
	Pixel Resolution	**Pitch**	1920 x 1080 (FHD)
		Format	RGB Stripe
	Backlight	LED	
	Color Gamut Coverage	sRGB 100% (NTSC 72%)	
	Color Depth	8 bit	
	Viewing Angle	UWVA 85/85/85/85	

15.6" diagonal 4K UHD IPS eDP + PSR anti-glare, 100% sRGB, 400 nits with ambient light sensor (3840 x 2160)	**Outline Dimensions (W x H)**	349.52 x 205.42 mm (max)	
	Active Area	344.22 x 193.62 mm (typ.)	
	Weight	320 g (max)	
	Diagonal Size	15.6 inch	
	Thickness	2.6mm / 4.6mm (PCB) (max)	
	Interface	eDP 1.4	
	Surface Treatment	Anti-Glare	
	Touch Enabled	No	
	Contrast Ratio	1200:1 (typ.)	
	Refresh Rate	60 Hz	
	Brightness	400 nits	
	Pixel Resolution	**Pitch**	3840 x 2160 (UHD)
		Format	RGB Stripe
	Backlight	LED	
	Color Gamut Coverage	sRGB 100% only for UHD LP	
	Color Depth	8 bit	
	Viewing Angle	UWVA 85/85/85/85	

STORAGE AND DRIVES

256GB M.2 2280 NVMe PCIe-3x4 TLC SSD	**Form Factor**	M.2 2280	
	Drive Weight	0.02 lb (10 g)	
	Capacity	256 GB	
	NAND Type	TLC	
	Height	0.09 in (2.3 mm)	
	Width	0.87 in (22 mm)	
	Interface	PCIe NVMe Gen3X4	
	Performance	**Maximum Sequential Read**	**Maximum Sequential Write**
		2800 ~ 3500 MB/s	1400 ~ 2200 MB/s
	Logical Blocks	500,118,192	
	Operating Temperature	32° to 158°F (0° to 70°C) [ambient temp]	
	Features	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.	

256GB M.2 2280 NVMe PCIe Gen 3 Value SSD	**Form Factor**	M.2 2280	
	Drive Weight	0.02 lb (10 g)	
	Capacity	256 GB	
	NAND Type	Value	
	Height	0.09 in (2.3 mm)	
	Width	0.87 in (22 mm)	
	Interface	PCIe NVMe Gen3	
	Performance	**Maximum Sequential Read**	**Maximum Sequential Write**
		2100 ~ 2200 MB/s	900 ~ 1400 MB/s
	Logical Blocks	500,118,192	
	Operating Temperature	32° to 158°F (0° to 70°C) [ambient temp]	
	Features	ATA Security (optional); 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.	

Technical Specifications – Storage

256GB M.2 2280 NVMe PCIe-3x2x2 SSD + 16GB Intel Optane SSD	**Form Factor**	M.2 2280	
	Drive Weight	0.02 lb (10 g)	
	Capacity	256 GB + 16 GB	
	Generation	H10	
	NAND Type	QLC + 3D XPoint	
	Height	0.09 in (2.3 mm)	
	Width	0.87 in (22 mm)	
	Interface	PCIe NVMe Gen3X2X2	
	Performance	**Maximum Sequential Read**	**Maximum Sequential Write**
		Up to 1450 MB/s	Up to 500 MB/s
	Logical Blocks	500,118,192	
	Operating Temperature	32° to 158°F (0° to 70°C) [ambient temp]	
	Features	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.	

256GB M.2 2280 NVMe PCIe-3x4 Self Encrypted TLC SSD	**Form Factor**	M.2 2280	
	Drive Weight	0.02 lb (10 g)	
	Capacity	256 GB	
	NAND Type	TLC	
	Height	0.09 in (2.3 mm)	
	Width	0.87 in (22 mm)	
	Interface	PCIe NVMe Gen3X4	
	Performance	**Maximum Sequential Read**	**Maximum Sequential Write**
		2800 ~ 3500 MB/s	1663 ~ 2200 MB/s
	Logical Blocks	500,118,192	
	Operating Temperature	32° to 158°F (0° to 70°C) [ambient temp]	
	Features	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.	

Technical Specifications – Storage

512GB M.2 2280 NVMe PCIe-3x4 TLC SSD	**Form Factor**	M.2 2280	
	Drive Weight	0.02 lb (10 g)	
	Capacity	512 GB	
	NAND Type	TLC	
	Height	0.09 in (2.3 mm)	
	Width	0.87 in (22 mm)	
	Interface	PCIe NVMe Gen3X4	
	Performance	**Maximum Sequential Read**	**Maximum Sequential Write**
		3100 ~ 3500 MB/s	2400 ~ 2956 MB/s
	Logical Blocks	1,000,215,215	
	Operating Temperature	32° to 158°F (0° to 70°C) [ambient temp]	
	Features	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.	

512GB M.2 2280 NVMe PCIe-3x2x2 SSD + 32GB Intel Optane SSD	**Form Factor**	M.2 2280	
	Drive Weight	0.02 lb (10 g)	
	Capacity	512 GB + 32 GB	
	Generation	H10	
	NAND Type	QLC + 3D XPoint	
	Height	0.09 in (2.3 mm)	
	Width	0.87 in (22 mm)	
	Interface	PCIe NVMe Gen3X2X2	
	Performance	**Maximum Sequential Read**	**Maximum Sequential Write**
		Up to 2400 MB/s	Up to 1300 MB/s
	Logical Blocks	1,000,215,215	
	Operating Temperature	32° to 158°F (0° to 70°C) [ambient temp]	
	Features	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.	

Technical Specifications – Storage

512GB M.2 2280 NVMe PCIe-3x4 Self Encrypted TLC SSD	**Form Factor**	M.2 2280	
	Drive Weight	0.02 lb (10 g)	
	Capacity	512 GB	
	NAND Type	TLC	
	Height	0.09 in (2.3 mm)	
	Width	0.87 in (22 mm)	
	Interface	PCIe NVMe Gen3X4	
	Performance	**Maximum Sequential Read**	**Maximum Sequential Write**
		3100 ~ 3500 MB/s	2400 ~ 2956 MB/s
	Logical Blocks	1,000,215,215	
	Operating Temperature	32° to 158°F (0° to 70°C) [ambient temp]	
	Features	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.	

1TB M.2 2280 NVMe PCIe-3x4 TLC SSD	**Form Factor**	M.2 2280	
	Drive Weight	0.02 lb (10 g)	
	Capacity	1 TB	
	NAND Type	TLC	
	Height	0.09 in (2.3 mm)	
	Width	0.87 in (22 mm)	
	Interface	PCIe NVMe Gen3X4	
	Performance	**Maximum Sequential Read**	**Maximum Sequential Write**
		3100 ~ 3500 MB/s	2770 ~ 3037 MB/s
	Logical Blocks	2,000,409,264	
	Operating Temperature	32° to 158°F (0° to 70°C) [ambient temp]	
	Features	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.	

Technical Specifications – Storage

2TB M.2 2280 NVMe PCIe-3x4 TLC SSD	**Form Factor**	M.2 2280	
	Drive Weight	0.02 lb (10 g)	
	Capacity	2TB	
	NAND Type	TLC	
	Height	0.09 in (2.3 mm)	
	Width	0.87 in (22 mm)	
	Interface	PCIe NVMe Gen3X2	
	Performance	**Maximum Sequential Read**	**Maximum Sequential Write**
		3180 ~ 3500 MB/s	2920 ~ 3000 MB/s
	Logical Blocks	3,907,029,168	
	Operating Temperature	32° to 158°F (0° to 70°C) [ambient temp]	
	Features	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.

NETWORKING/COMMUNICATION

Intel Wi-Fi 6 AX201 + BT5 (802.11ax 2x2, non-vPro, supporting gigabit file transfer speeds) non-vPro	**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
	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: 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)
	Modulation	Direct Sequence Spread Spectrum OFDM, BPSK, QPSK, CCK, 16-QAM, 64-QAM, 256-QAM, 1024QAM
	Security[1]	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 IEEE 802.11i WAPI
	Network Architecture Models	Ad-hoc (Peer to Peer) 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 802.11n HT40(5GHz) : +14.5dBm minimum 802.11ac VHT80(5GHz) : +11.5dBm minimum 802.11ac VHT160(5GHz) : +11.5dBm minimum

Technical Specifications – Networking

	802.11ax HT40(2.4GHz) : +10dBm minimum 802.11ax VHT160(5GHz) : +10dBm minimum	
Power Consumption	Transmit mode 2.0 W Receive mode 1.6 W Idle mode (PSP) 180 mW (WLAN Associated) Idle mode 50 mW (WLAN unassociated) Connected Standby 10mW Radio disabled 8 mW	
Power Management	ACPI and PCI Express compliant power management 802.11 compliant power saving mode	
Receiver Sensitivity[3]	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(HT40): -59dBm maximum 802.11ax, MCS11(VHT160): -58.5dBm 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 with CNVi Interface	
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 Non-operating	14° to 158° F (-10° to 70° C) -40° to 176° F (-40° to 80° C)
Humidity	Operating Non-operating	10% to 90% (non-condensing) 5% to 95% (non-condensing)
Altitude	Operating Non-operating	0 to 10,000 ft (3,048 m) 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 Wireless Technology

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.
Power Consumption	Peak (Tx): 330 mW Peak (Rx): 230 mW Selective Suspend: 17 mW

Bluetooth Software Supported Link Topology	Microsoft Windows Bluetooth Software
Power Management	Microsoft Windows ACPI, and USB Bus Support
Certifications	FCC (47 CFR) Part 15C, Section 15.247 & 15.249
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)

Intel Wi-Fi 6 AX201 + BT5 (802.11ax 2x2, vPro, supporting gigabit file transfer speeds) vPro	**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
	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: 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)

Technical Specifications – Networking

Modulation	Direct Sequence Spread Spectrum OFDM, BPSK, QPSK, CCK, 16-QAM, 64-QAM, 256-QAM , 1024QAM
Security[1]	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 IEEE 802.11i WAPI
Network Architecture Models	Ad-hoc (Peer to Peer) 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 802.11n HT40(5GHz) : +14.5dBm minimum 802.11ac VHT80(5GHz) : +11.5dBm minimum 802.11ac VHT160(5GHz) : +11.5dBm minimum 802.11ax HT40(2.4GHz) : +10dBm minimum 802.11ax VHT160(5GHz) : +10dBm minimum
Power Consumption	Transmit mode :2.0 W Receive mode :1.6 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[3]	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(HT40): -59dBm maximum 802.11ax, MCS11(VHT160): -58.5dBm 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 with CNVi Interface
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 White - Radio ON	

HP Integrated Module with Bluetooth 4.0/4.1/4.2/5.0/5.1 Wireless Technology

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.
Power Consumption	Peak (Tx): 330 mW Peak (Rx): 230 mW Selective Suspend: 17 mW
Bluetooth Software Supported Link Topology	Microsoft Windows Bluetooth Software
Power Management	Microsoft Windows ACPI, and USB Bus Support
Certifications	FCC (47 CFR) Part 15C, Section 15.247 & 15.249
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^{TM} support with appropriate Intel® chipset components

Technical Specifications – Networking

Intel® XMM™ 7360 LTE-Advanced CAT9 (Pandora)*

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
Weight	5.8 g
Dimensions (Length x Width x Thickness)	42 x 30 x 2.3 mm

* Mobile Broadband is an optional feature and requires configuration at purchase. 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.

Intel® XMM™ 7560 LTE-Advanced Pro DL CAT16 (Phuket)*

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). TDD LTE: 2600 (Band 38), 1900 (Band 39), 2400 (Band 40), 2500 (Band 41), 3500 (Band 42), 5200 (Band 46 RX only) 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.7 20MHz throughput up to 75Mbps 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: 978 Mbps (Download), 75 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
Dimensions (Length x Width x Thickness)	42 x 30 x 2.3 mm

* Mobile Broadband is an optional feature and requires configuration at purchase. 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.

Near Field Communications Controller (optional)

Dimensions (L x W x H)	Module 25 mm by 10 mm by 2.0 mm		
Chipset	NPC100		
System interface	I2C		
NFC RF standards	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		
NFC Forum Support	Tag Type 1, Type 2, Type3 and Type 4, NFCIP-1 and NFCIP-2		
Reader (PCD-VCD) Mode(1)	ISO/IEC 14443 A ISO/IEC 14443 B ISO/IEC 15693 MIFARE 1K MIFARE 4K MIFARE DESFire FeliCa Jewel and Topaz cards		
Card Emulation (PICC-VICC) Mode(1)	ISO/IEC 14443 A ISO/IEC 14443 B and B' MIFARE FeliCa		
Frequency	13.56 MHz		
NFC Modes Supported	Reader/Writer, Peer-to-Peer		
Raw RF Data Rates	106, 212, 424, 848 kbps		
Operating temperature	0°C to 70°C		
Storage temperature	-20°C to 125°C		
Humidity	10-90% operating 5-95% non-operating		
Supply Operating voltage	4.35 to 5.25 Volts		
I/O Voltage	1.8V or 3.3V		
Power Consumption	**Booster enable,**	VBAT= 3.3V,	
	VCC_BOOST = 5V)	**Polling**	7.3 mA

	Mode Power Consumption, Typical	**Detected Test Tag Type 1**	Total 283.8 mA Net Module 236.8 mA
		Detected Test Tag Type 2	Total 288.8 mA Net Module 241.8 mA
		Detected Test Tag Type 3	Total 287.7 mA Net Module 240.7 mA
		Detected Test Tag Type 4	Total 282.3 mA Net Module 235.3 mA
Antenna	Antenna connector, 0.5mm pitch, 7 connector FPC. Antenna matching is external to module.		

POWER

HP 45W Smart AC Adapter (nPFC Standard Barrel 4.5mm Right Angle 1.8m	**Dimensions**	95x45x26.8mm	
	Weight	unit: 200g +/- 10g	
	Input	**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
		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 5,000 m)
		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.	

HP 45W Smart AC Adapter (nPFC Standard Barrel 4.5mm Right Angle 1.8m 2prong)	**Dimensions**	95x45x26.8mm	
	Weight	unit: 200g +/- 10g	
	Input	**Input Efficiency**	87.74 % at 115 Vac and 88.4 % at 230Vac
		Input frequency range	47 to 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
		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, 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.	

HP 65W Smart AC Adapter (nPFC Slim USB-C® Straight 1.8m)	**Dimensions**	88x53.5x21mm	
	Weight	unit: 220g +/- 10g	
	Input	**Input Efficiency**	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
		Input frequency range	47 ~ 63 Hz
		Input AC current	1.6 A at 90 VAC and maximum load
	Output	**Output power**	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	5% to 95%
		Storage Humidity	5% 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 100,000 hours at 25°C ambient condition.	

Technical Specifications – Power

HP 65W Smart AC Adapter (nPFC Standard USB-C® Straight 1.8m)	**Dimensions**	90.0x51x28.5mm	
	Weight	unit: 250g +/- 10g	
	Input	**Input Efficiency**	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
		Input frequency range	47 ~ 63 Hz
		Input AC current	1.6 A at 90 VAC and maximum load
	Output	**Output power**	65W
		DC output	5V/9V/12V/15V/20V
		Hold-up time	5ms at 115 Vac input
		Output current limit	8.0A Max.
	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, 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.	

HP 65W Smart AC Adapter (nPFC Standard Barrel 4.5mm for Emerging Markets)	**Dimensions**	102x55x30mm	
	Weight	unit: 250g +/- 10g	
	Input	**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 5,000 m)
		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.	
HP 65W Smart AC Adapter (nPFC Standard Barrel 4.5mm Right Angle 1.8m)	**Dimensions**	90x51x28.5mm	
	Weight	unit: 230g +/- 10g	
	Input	**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**	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 5,000 m)
		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.	

HP 3-cell Long Life Li-Ion (56 WHr) supporting HP Fast Charge	**Dimensions (H x W x L)**	7.0 x 66.5 x 276.3 mm (0.275 x 2.618 x 10.877 inch)	
	Weight	0.215kg (0.45 lb)	
	Cells/Type	3cell Lithium-Ion Polymer cell / 615383	
	Energy	Voltage	11.55V
		Amp-hour capacity	4.59Ah
		Watt-hour capacity	56Wh
	Temperature	Operating (Charging)	32° to 122° F (0° to 50° C)
		Operating (Discharging)	14° to 140° F (-10° to 60° C)
	Fuel Gauge LED	NA	
	Warranty	Depends on system offering	
	Optional Travel Battery Available	No	

ENVIRONMENTAL DATA

Eco-Label Certifications & declarations

This product has received or is in the process of being certified to the following approvals and may b 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 your country.

System Configuration

The configuration used for the Energy Consumption and Declared Noise Emissions data for the Notel 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 fa HP computers marked with the ENERGY STAR® Logo are compliant with the applicable U.S. Environm Protection Agency (EPA) ENERGY STAR® specifications for computers. If a model family does not offe ENERGY STAR® compliant configurations, then energy efficiency data listed is for a typically configur featuring a hard disk drive, a high efficiency power supply, and a Microsoft Windows® operating syst

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 att 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	TBD	TBD
Fixed Disk - Random writes	TBD	TBD

Longevity and Upgrading

"This product can be upgraded, possibly extending its useful life by several years. Upgradeable featu and/or components contained in the product may include:

- 3 USB ports
- 1 PC card slot (type I/II)
- 1 ExpressCard/54 slot
- 1 IEEE 1394 Port
- 2 SODIMM memory slots
- Optional expansion base docking station
- 1 multi-bay II storage port
- Interchangeable HDD

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 the1ppm 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 Equipme (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 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 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 o 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, has been voluntarily removed from mo 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 packagin 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 recycl 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 f 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 instruct may be used by recyclers and other WEEE treatment facilities as well as HP OEM customers 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

title

Date of change:	**Version History:**		**Description of change:**
	From v1 to v2		