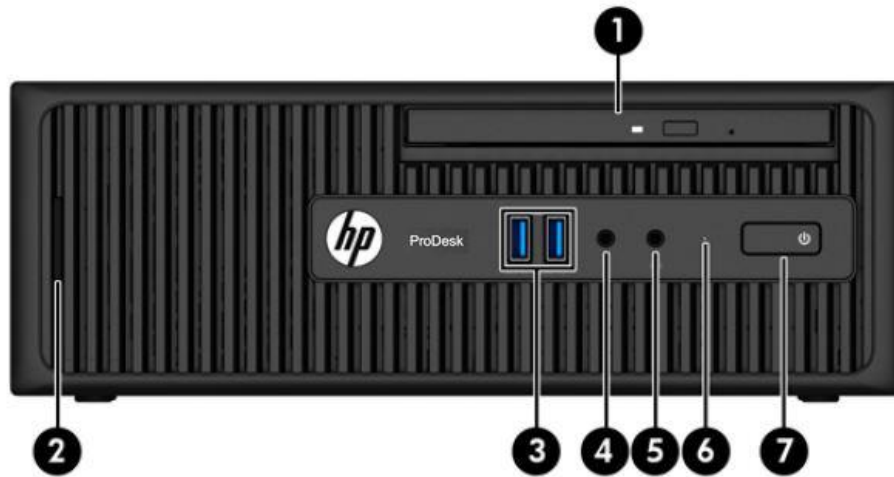


Overview

Chassis HP ProDesk 400 G2.5 Small Form Factor Business PC



Drive configuration may vary by model. Some models have a bezel blank covering the optical drive bay.

1. Slim Optical Drive (optional)
2. SD Card Reader (optional)
3. (2) USB 3.0 Ports (blue)
4. 3.5mm Microphone Jack
5. 3.5mm Headphone Output
6. Hard Drive Activity Light
7. Dual-State Power Button

NOTE: The Power On Light is normally white when the power is on. If it is flashing red, there is a problem with the computer and it is displaying a diagnostic code. Refer to the Maintenance and Service Guide to interpret the code

Not Shown (internal)

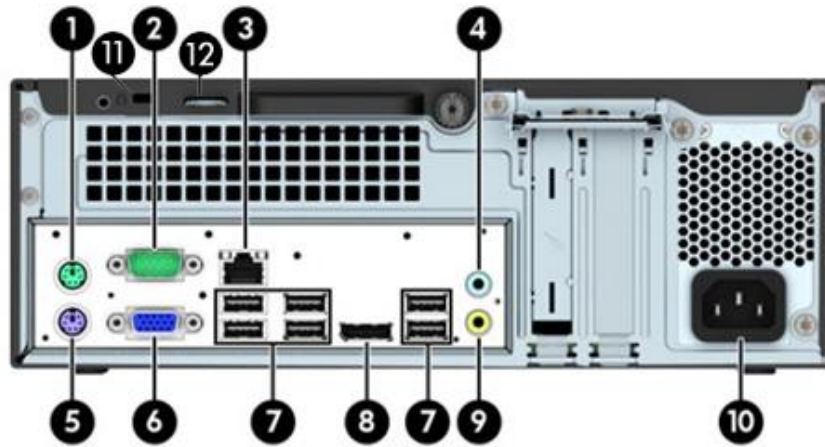
Slots

- (1) PCI 3.0 Express x16 Graphics Connector
- (1) PCI Express 2.0 x1 Accessory Connector

Bays

- (1) 9.5mm slimline ODD bay
- (1) Media Card Reader Bay (SD)
- (1) 3.5" internal bay supports both 3.5" HD/SSD or 2.5 HD/SSD (does not support a 2nd HDD).

Overview



- | | | | |
|----|----------------------------------|-----|--|
| 1. | PS/2 Mouse Connector (green) | 7. | (6) USB 2.0 Ports (black) |
| 2. | RS-232 Serial Connector | 8. | DisplayPort Monitor Connector |
| 3. | RJ-45 Network Connector | 9. | Line-Out Audio Connector for powered devices (green) |
| 4. | Line-In Audio Connector (blue) | 10. | Power Cord Connector |
| 5. | PS/2 Keyboard Connector (purple) | 11. | Lock Slot |
| 6. | VGA Monitor Connector | 12. | Loop Link Opening |

Overview

AT A GLANCE

- Expandable, upgradable chassis and system board
- Intel® H81 Express chipset supporting Intel 4th generation Core processors, featuring integrated Intel HD Graphics
- Processor support up to 65W
- HP developed and engineered UEFI BIOS supporting security, manageability and software image stability
- Realtek RTL8111HSH-CG GbE integrated network connection
- Up to 16GB DDR3 Synchronous Dynamic Random Access Memory (SDRAM)
- Multi-independent monitor support
- Discrete graphics option available
- Standard and high efficiency energy saving power supply options
- ENERGY STAR® certified models certified EPEAT® Gold

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

Standard Features and Configurable Components

OPERATING SYSTEMS

Preinstalled (Windows)

Windows 10 Pro 64*

Windows 10 Home 64*

Windows 8.1 Pro 64*

Windows 8.1 64*

Windows 7 Professional 64 (available through downgrade rights from Windows 10 Pro)**

Windows 7 Professional 32 (available through downgrade rights from Windows 10 Pro)**

Windows 7 Professional 64 (available through downgrade rights from Windows 8.1 Pro)***

Windows 7 Professional 32 (available through downgrade rights from Windows 8.1 Pro)***

Windows 7 Professional 64*

Windows 7 Professional 32*

Pre-installed (Other)

FreeDOS 2.0

Novell SUSE Linux Enterprise Desktop 11

WebSupport Only

Windows 10 Pro 64

Windows 10 Home 64

Windows 8.1 Pro 64

Windows 8.1 64

Windows 7 Professional 64 (available through downgrade rights from Windows 10 Pro)

Windows 7 Professional 32 (available through downgrade rights from Windows 10 Pro)

Windows 7 Professional 64 (available through downgrade rights from Windows 8.1 Pro)

Windows 7 Professional 32 (available through downgrade rights from Windows 8.1 Pro)

Windows 7 Professional 64

Windows 7 Professional 32

Windows 10 Enterprise 64

Windows 8.1 Enterprise 64

Windows 7 Enterprise 64

Windows 7 Enterprise 32

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

**This system is preinstalled with Windows 7 Pro software and also comes with a license and media for Windows 10 Pro software. You may only use one version of the Windows software at a time. Switching between versions will require you to uninstall one version and install the other version. You must back up all data (files, photos, etc.) before uninstalling and installing operating systems to avoid loss of your data.

***This system is preinstalled with Windows 7 Pro software and also comes with a license and media for Windows 8.1 Pro software. You may only use one version of the Windows software at a time. Switching between versions will require you to uninstall one version and install the other version. You must back up all data (files, photos, etc.) before uninstalling and installing operating systems to avoid loss of your data.

PROCESSORS*

Intel® 4th Generation Core™ i7 Processors

Intel® Core™ i7-4790S Processor

Up to 4.0 GHz Max. Turbo Frequency (3.2 GHz base frequency)

8 MB cache, 4 cores, 8 threads

Intel HD Graphics 4600

Supports DDR3 memory up to 1600 MT/s data rate

Standard Features and Configurable Components

Intel® 4th Generation Core™ i5 Processors

Intel® Core™ i5-4690S Processor

Up to 3.9 GHz Max. Turbo Frequency (3.2 GHz base frequency)
6 MB cache, 4 cores, 4 threads
Intel HD Graphics 4600
Supports DDR3 memory up to 1600 MT/s data rate

Intel® Core™ i5-4590S Processor

Up to 3.7 GHz Max. Turbo Frequency (3.0 GHz base frequency)
6 MB cache, 4 cores, 4 threads
Intel HD Graphics 4600
Supports DDR3 memory up to 1600 MT/s data rate

Intel® 4th Generation Core™ i3 Processors

Intel® Core™ i3-4370 Processor

Up to 3.8 GHz Base Frequency
4 MB cache, 2 cores, 4 threads
Intel HD Graphics 4600
Supports DDR3 memory up to 1600 MT/s data rate

Intel® Core™ i3-4170 Processor

Up to 3.7 GHz Base Frequency
3 MB cache, 2 cores, 4 threads
Intel HD Graphics 4400
Supports DDR3 memory up to 1600 MT/s data rate

Intel® Pentium® Processors

Intel® Pentium® G3260 Processor

Up to 3.3 GHz Base Frequency
3 MB cache, 2 cores, 2 threads
Intel HD Graphics
Supports DDR3 memory up to 1333 MT/s data rate

Intel® Celeron™ Processors

Intel® Celeron™ G1850 Processor

2.9 GHz base frequency
2 MB cache, 2 cores, 2 threads
Intel HD Graphics
Supports DDR3 memory up to 1333 MT/s data rate

*Multi-Core is designed to improve performance of certain software products. Not all customers or software applications will necessarily benefit from use of this technology. 64-bit computing on Intel® architecture requires a computer system with a processor, chipset, BIOS, operating system, device drivers, and applications enabled for Intel® 64 architecture. Processors will not operate (including 32-bit operation) without an Intel® 64 architecture-enabled BIOS. Performance will vary depending on your hardware and software configurations. Intel's numbering is not a measurement of higher performance.

Standard Features and Configurable Components

CHIPSET

Intel® 8 Series (H81 Express) Chipset

GRAPHICS

Integrated

Intel HD Graphics on all models (integrated on processor)*

Discrete (optional)

NVIDIA® NV5™ 310 512MB x16

*HD content required to view HD images.

ADAPTERS AND CABLES

HP DisplayPort to DisplayPort Cable

HP DisplayPort to DVI-D Adapter

HP DisplayPort To HDMI 1.4 Adapter

HP DisplayPort to VGA Adapter

HP Serial Port Adapter

HP DisplayPort Cable

STORAGE*

SATA Hard Disk Drives

1 TB, 7200 RPM, SATA 6.0 Gb/s, SMART IV, 3.5"

500 GB, 7200 RPM, SATA 6.0 Gb/s, SMART IV, 3.5"

Hybrid Drives

1 TB SATA 6G 2.5" (8 GB cache) SSHD Drive

500 GB SATA 6G 2.5" (8GB cache) SSHD Drive

Solid State Drives

120 GB SATA 2.5 Non-SED SSD

128 GB SATA 2.5 3D Non-SED SSD

256 GB SATA 2.5 3D Non-SED SSD

Self-encrypting Drives

500 GB 2.5" FIPS 140-2 Self-Encrypting (SED)

Self-encrypting Solid State Drive

256 GB SATA 2.5" Opal2 Self-Encrypting (SED) Solid State Drive SSD

180 GB SATA 2.5" Opal2 Self-Encrypting (SED) Solid State Drive (Pro 2500)

128 GB SATA 2.5" Opal2 Self-Encrypting (SED) Solid State Drive

120 GB SATA 2.5" Opal2 Self-Encrypting (SED) Solid State Drive (Pro 2500)

*For hard drives and solid state drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 16 GB (for Windows 7) and 36 GB (for Windows 8.1) of system disk is reserved for the system recovery software.

Standard Features and Configurable Components

***NOTE:** For hard drives and solid state drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 16 GB (for Windows 7) and 36 GB (for Windows 8.1/10) of system disk is reserved for the system recovery software

Optical Disc Drive

HP 9.5mm Desktop G2 Slim DVD-ROM Drive

HP 9.5mm Desktop G2 Slim SATA BDXL Blu-Ray Writer

HP 9.5mm Desktop G2 Slim SuperMulti DVD Writer Drive

Media Card Reader (optional)*

SD Media Card Reader (Supports Secure Digital (SD, SDXC, SDHC, UHS-I))

*Card sold separately

MEMORY

Form Factor	Type	Maximum	# of Slots
Small Form Factor	DDR3L-1600 (Transfer rates up to 1600 MT/s)	16 GB	2 UDIMM

Both slots are customer accessible / upgradeable.

- 2,048 MB (2048 MB x 1)
- 4,096 MB (4096 MB x 1)
- 8,192 MB (4096 MB x 2)
- 8,192 MB (8192 MB x 1)
- 16,384 MB (8192 MB x 2)

NOTE: For systems configured with more than 3 GB of memory and a 32-bit operating system, all memory may not be available due to system resource requirements. Addressing memory above 4 GB requires a 64-bit operating system. Memory modules support data transfer rates up to 1600 MT/s; actual data rate is determined by the system's configured processor. See processor specifications for supported memory data rate.

NETWORKING/COMMUNICATIONS

Ethernet (RJ-45)

Realtek RTL8111HSH-CG GbE Ethernet Controller (standard)

Intel Ethernet I210-T1 PCIe x1 Gb Network Interface Card (optional)

Wireless*

Intel® N 7265 802.11ac PCIe Bluetooth™ (optional)

Intel® N 7265 802.11ac PCIe No Bluetooth™ (optional)

Broadcom 802.11n PCIe Bluetooth™ NIC (optional)

Broadcom 802.11n PCIe No Bluetooth™ NIC (optional)

* Wireless access point and Internet service required and not included. Availability of public wireless access points limited.

AUDIO/MULTIMEDIA

HD audio with Realtek ALC221VB

Microphone and headphone front ports (3.5mm)

Line-out and Line-In rear Ports (3.5mm)

Internal mono speaker (standard)

Standard Features and Configurable Components

KEYBOARDS AND POINTING DEVICES

Keyboards

HP USB PS/2 Washable Keyboard

HP USB Smart Card (CCID) Keyboard

HP USB Keyboard

Mice

HP PS/2 Mouse

HP USB 1000dpi Laser Mouse

HP USB Mouse

Combo

HP Wireless Keyboard and Mouse

HP BIOSphere

Key features of the HP BIOS include:

- Deployment and manageability - HP BIOS provides several technologies that help integrate the HP ProDesk 400 G2.5 SFF Business PC into the enterprise, such as PXE, and F10 Setup support for 12 languages.
- Support UEFI specification 2.3.1
- Thermal and power management - The HP BIOS provides and enables thermal and power management technologies so component temperatures are managed for high reliability and to assist in operating the HP Business Desktop computer in any enterprise environment.
- Thermal Controlled Fans – Automatic or manual controlled fan speeds for cooling and acoustic performance
- Serviceability - HP BIOS provides diagnostic and detailed service information.
- Upgrades and recovery - HP BIOS provides numerous ways to upgrade HP Business Desktop computers, including BIOS updates from within DOS (DOSFlash), BIOS updates from within Windows (HPQFlash), HP Client Manager, and fail-safe recovery (Emergency Boot Block Recovery). In addition, the HP Business Desktop BIOS Utilities tool enables replicated BIOS setup throughout the Enterprise; it is available from within the BIOS F10 setup and from the support website.
- HP BIOS uses PKI signing of the BIOS for trusted BIOS upgrades and recovery.
- Serviceability - HP BIOS provides diagnostic and detailed service information.

Additional HP BIOS Features:

- Power-On password - Helps prevent an unauthorized user from powering on the system.
- Administrator password - Also known as the setup password, this helps prevent unauthorized changes to the system configuration. If the administrator password is not known, the BIOS version cannot be changed and changes cannot be made to BIOS settings using F10 setup or under the OS.
- Advanced Configuration and Power Interface (ACPI) - Represents a significant innovation in power and configuration management, allowing operating systems and applications to manage power based on activity and usage. HP Pro models use ACPI to provide power conservation features.
- S5 Max Power Savings setting supports EU Lot6 requirement and allows the computer to power down below 1W in S5 (when turned off). When S5 Max Power Savings feature is enabled power to slots is turned off along with WOL functionality.

Standard Features and Configurable Components

- Master Boot Record Security - Helps to prevent changes and/or infections to the Master Boot Record caused by viruses or malicious code.
- HP BIOS Protection – prevents unauthorized updates or changes to the BIOS due to malware, viruses, or malicious BIOS updates. Based on NIST SP800-147 policy guidelines.

*BIOS Absolute Persistence module is shipped turned off, and will be activated when customers purchase and activate a subscription. Service may be limited. Check with Absolute for availability outside the U.S. The optional subscription service of Absolute Recovery Guarantee is a limited warranty. Certain conditions apply. For full details visit: <http://www.absolute.com/company/legal/agreements/computrace-agreement>. If Data Delete is utilized, the Recovery Guarantee payment is null and void. In order to use the Data Delete service, customers must first sign a Pre-Authorization Agreement and either create a PIN or purchase one or more RSA SecurID tokens from Absolute Software.

SECURITY

SFF

Trusted Platform Module, SLB9660TT1.2FW4.40 (TPM) 1.2 (Common Criteria EAL4+ certified)	X
SATA port disablement (via BIOS)	X
DriveLock	N/A
RAID configurations	N/A
Intel® Identify Protection Technology (IPT)*	N/A
Serial, parallel, USB enable/disable (via BIOS)	X
Optional USB Port Disable at factory (user configurable via BIOS)	X
Removable media write/boot control	X
Power-On password (via BIOS)	X
Administrator password (via BIOS)	X
HP Chassis (1 bay) Security Kit	N/A
Solenoid Hood Lock / Sensor	N/A
Support for chassis padlocks and cable lock devices	X

*Models configured with Intel Core processors have the ability to utilize advanced security protection for online transactions. IPT, used in conjunction with participating web sites, provides double identity authentication by adding a hardware component in addition to the usual user name and password. IPT is initialized through an HP Client Security module.

ENVIRONMENTAL & REGULATORY

ENERGY STAR® certified models available

EPEAT® registered where applicable/supported. EPEAT registration varies by country. See www.epeat.net for registration status by country.

TAA compliant models available

For accessibility information on HP products, please visit: <http://www.hp.com/accessibility>.

PORTS

I/O Ports – Standard

USB 2.0	6 (rear)
USB 3.0	2 (front)
Serial (RS-232)	1
PS/2	1 keyboard (purple)

Standard Features and Configurable Components

Video	1 mouse (green) 1 VGA 1-DisplayPort 1.2
-------	---

NOTE: When configured with an Intel Celeron, Pentium® or 4th generation Intel Core i3 CPU only two of the available video output ports are active

Audio	Front: 1 headphone; 1 mic Rear: 1 line in; 1 line out 3.5mm diameter
-------	--

RJ-45 Network Interface	1
-------------------------	---

I/O Ports – Optional

Parallel Port via PCIe Card (see I/O options below)

BAYS

(3 total – 2 external, 1 internal)

External, SD reader	1
External, Slimline ODD	1
3.5" internal bay that supports 2.5" device w/o bracket	1

SERVICE AND SUPPORT

On-site Warranty ¹: One-year (1-1-1) or three-years (3-3-3) limited warranty (depending on country) delivers on-site, next business day ² service for parts and labor and includes free telephone support ³ 24 x 7. One-year and three-year onsite and labor are not available in all countries. Service offers terms up to 5 years by choosing a Care Pack. To choose the right level of service for your HP product, visit HP Care Pack Central: www.hp.com/go/cpc

NOTE 1: Terms and conditions may vary by country. Certain restrictions and exclusions apply. Other warranty variations may be offered in your region.

NOTE 2: On-site service may be provided pursuant to a service contract between HP and an authorized HP third-party provider, and is not available in certain countries. Global service response times are based on commercially reasonable best effort and may vary by country.

NOTE 3: Technical telephone support applies only to HP-configured and third-party HP qualified hardware and software. Toll-free calling and 24 x 7 support may not be available in some countries.

Technical Specifications – Operating Systems and Software

SOFTWARE COMPONENTS AND APPLICATIONS WITH WINDOWS

BIOS

Preboot Authentication
HP DriveLock
Secure Erase
Hybrid Boot (Windows 8.1 & higher)
Measured Boot (Windows 8.1 & higher)
Secure Boot (Windows 8.1 & higher)
Absolute Persistence Module¹

Multimedia

Cyberlink Power DVD, BD
Cyberlink Power2Go (Secure Burn)
Cyberlink YouCam BE (Windows 7 only)

Communication

Intel® Wireless Display (WiDi) Software for Windows²
Native Miracast Support³

HP Value Add Software

HP ePrint Driver⁴
HP Recovery Disc Creator (Windows 7 only)
HP Recovery Manager
HP Support Assistant

3rd Party

Foxit PhantomPDF Express for HP (available in US only – optional)

Microsoft Products

Buy Office
Bing Search
Skype

Manageability

HP Driver Packs⁵
HP SoftPaq Download Manager (SDM)
HP System Software Manager (SSM)⁵
HP BIOS Config Utility (BCU)⁵
HP Client Catalog⁵
HP CIK for Microsoft SCCM⁵
LANDESK Management⁶

For more information on HP Client Management Solutions refer to: <http://www.hp.com/go/clientmanagement>.

Technical Specifications – Operating Systems and Software

Client Security Software

HP Drive Encryption ⁷
HP Client Security Manager

Standard

TPM 1.2
Security lock slot

NOTE: The Absolute Persistence agent is shipped turned off, and must be activated by customers when they purchase a subscription. Subscriptions can be purchased for terms ranging multiple years. Service is limited, check with Absolute for availability outside the U.S.

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

Footnotes:

¹Computrace agent is shipped turned off, and must be activated by customers when they purchase a subscription. Subscriptions can be purchased for terms ranging from one to five years. Service is limited, check with Absolute for availability outside the U.S.

²Integrated Intel® Wi-Di Display is available on select configurations only and requires a separate projector, TV or monitor with an integrated or external Wi-Di receiver. For more information on Intel® Wi-Di Display visit www.intel.com/go/wirelessdisplay

³Miracast 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>

⁴Requires an Internet connection to HP web-enabled printer and HP ePrint account registration (for a list of eligible printers, supported documents and image types and other HP ePrint details, see www.hp.com/go/businessmobileprinting).

⁵ Not preinstalled, however available on manageability website.

⁶ Subscription required.

⁷ Data is protected prior to Drive Encryption login. Turning the PC off or into hibernate logs out of Drive Encryption and prevents data access.

Technical Specifications - Graphics

Intel HD Graphics		
VGA Controller	Integrated	
DisplayPort	Multimode capable; supports HDCP, Display Port Audio (2 streams), HBR2 link rates and Multi-Stream Technology for a maximum of 2 displays (including VGA or wireless displays controlled by the integrated graphics)	
Bus Type	N/A	
RAMDAC	N/A	
Memory	Intel graphics do not have dedicated memory but utilizes some of the computer's system memory. The amount of memory used for graphics depends on the amount of system memory installed, BIOS settings, operating system, and system load.	
Maximum Graphics Memory	Microsoft Windows 7	Windows 8.1
	Up to 1.7GB	Up to 1.8GB
	Note: the actual amount of maximum graphics memory can be less than the amounts listed above depending upon your computer's configuration.	
Maximum Color Depth	32 bits/pixel	
Graphics/Video API Support	<p>4th Generation Core processors:</p> <ul style="list-style-type: none"> • The Processor Graphics contains a refresh of the seventh generation graphics core enabling substantial gains in performance and lower power consumption. Up to 16 EU support. • Next Generation Intel Clear Video Technology HD Support is a collection of video playback and enhancement features that improve the end user's viewing experience <ul style="list-style-type: none"> ○ Encode/transcode HD content ○ Playback of high definition content including Blu-ray Disc ○ Superior image quality with sharper, more colorful images • DirectX Video Acceleration (DXVA) support for accelerating video processing <ul style="list-style-type: none"> ○ Full AVC/VC1/MPEG2 HW Decode • DirectX 11.2 • OpenGL 4.3 • Open CL 1.2 	

Supported Display Resolutions and Refresh Rates

Note: other resolutions may be available but are not recommended as they may not have been tested and qualified by HP

Resolution	Refresh Rates
800x600	60 Hz
1024x768	60 Hz
1152x864	60 Hz
1280x600	60 Hz
1280x720	60 Hz
1280x800	60 Hz
1280x960	60 Hz
1280x1024	60 Hz
1360x768	60 Hz
1366x768	60 Hz
1400x1050	60 Hz
1440x900	60 Hz

Technical Specifications - Graphics

1600x900	60 Hz
1600x1200	60 Hz
1680x1050	60 Hz
1920x1080	60 Hz
1920x1200	60 Hz
1920x1440*	60 Hz
2560x1440*	60 Hz
2560x1600*	60 Hz
3840x2160*	60Hz

* Only supported on displays connected to the external DisplayPort connector.

NVIDIA® NVS™ 310 Graphics Card

Introduction	<p>The NVIDIA® NVS™ 310 Graphics Card is a PCI Express low profile form factor graphics add-in card targeted as an active low cost graphics solution for the corporate business and enterprise markets.</p> <p>The NVIDIA® NVS™ 310 graphics card is an ideal solution for customers requiring a small form factor graphics add-in card for either standard or small form factor PC designs.</p>		
Performance and Features	<p>The NVIDIA® NVS™ 310 Graphics Card offers 512 MB of ultrafast DDR3 memory and is capable of supporting up to 2 displays.</p> <p>DisplayPort connector supports multimode technology to support connection to DVI-D, VGA and HDMI monitors with optional adapters in kits NR078AA, FH973AT, BP937AA, AS615AA.</p> <p>For a DisplayPort to DisplayPort connections use the optional DisplayPort Cable Kit VN567AA.</p>		
Form Factor	Low Profile: 2.713 × 6.15 in		
Graphics Controller	NVIDIA® NVS™ 310		
Memory Clock	875MHz		
Memory Size	512 MB DDR3		
Memory Bandwidth	14 GB/s		
Max. Power	19.5W		
Display Max. Resolution	Up to 2560 x 1600 (digital display) per display		
Display Output	Up to 2 displays in the following configurations		
	<table border="0"> <tr> <td data-bbox="483 1682 754 1965">DisplayPort output:</td> <td data-bbox="770 1682 1509 1965"> <ul style="list-style-type: none"> • Drives two DisplayPort enabled digital display at resolutions up to 2560 × 1600 at 60 Hz with reduced blanking, when connected natively using the 2 DisplayPort connectors on the NVS 310 graphics card • Supports 2 monitors up to resolution of 1920 × 1200 at 60 Hz with reduced blanking using DisplayPort Multi-Stream topology technology. </td> </tr> </table>	DisplayPort output:	<ul style="list-style-type: none"> • Drives two DisplayPort enabled digital display at resolutions up to 2560 × 1600 at 60 Hz with reduced blanking, when connected natively using the 2 DisplayPort connectors on the NVS 310 graphics card • Supports 2 monitors up to resolution of 1920 × 1200 at 60 Hz with reduced blanking using DisplayPort Multi-Stream topology technology.
DisplayPort output:	<ul style="list-style-type: none"> • Drives two DisplayPort enabled digital display at resolutions up to 2560 × 1600 at 60 Hz with reduced blanking, when connected natively using the 2 DisplayPort connectors on the NVS 310 graphics card • Supports 2 monitors up to resolution of 1920 × 1200 at 60 Hz with reduced blanking using DisplayPort Multi-Stream topology technology. 		

Technical Specifications - Graphics

	DVI-D output:	<ul style="list-style-type: none"> • Drives two digital display at resolutions up to 1920 × 1200 at 60 Hz with reduced blanking using DisplayPort to DVI-D single-link cable adaptors • Drives two digital display at resolutions up to 2560× 1600 at 60 Hz with reduced blanking using DisplayPort to DVI-D dual-link cable adaptors
	HDMI output:	<ul style="list-style-type: none"> • NVS 310 is capable of driving two high definition (HD) panels up to resolutions of 1920 × 1080P at 60 Hz using DisplayPort to HDMI cable adaptors
	VGA display output:	<ul style="list-style-type: none"> • Drives two analog display at resolutions up to 1920 × 1200 at 60 Hz using DisplayPort to VGA cable adaptors

Supported Display Resolutions and Refresh Rates

Note: other resolutions may be available but are not recommended as they may not have been tested and qualified by HP

Resolution	Maximum Refresh Rates (Hz) by Connection			
	DisplayPort to VGA	DisplayPort to DVI-D	DisplayPort to HDMI	DisplayPort
640 x 480	85	60	60	60
800 x 600	85	60	60	60
1024 x 768	85	60	60	60
1280 x 720	85	60	60	60
1280 x 1024	85	60	60	60
1440 x 900	75	60	60	60
1600 x 1200	60	60	60	60
1680 x 1050	60	60	60	60
1920 x 1080	60-R	60-R	60	60
1920 x 1200	60-R	60-R		60
1920 x 1440				60
2048 x 1536				60
2560 x 1600				60

Technical Specifications – Hard Disk and Solid State Storage

HARD DISK AND SOLID STATE STORAGE

Introduction

HP Serial Advanced Technology Attachment (SATA) Hard Drives maximize the performance of HP Business PCs by providing the technologies to meet your increasing storage demands with high-capacity drives offering superior reliability and performance.

SATA provides faster data transfer speeds, better system cooling airflow, more bandwidth, more headroom for speed increases in future generations and better data integrity. A next-generation technology, the SATA interface connects hard drives to the PC platform enabling easy aggregation of multiple hard drives into a single PC. This offers you the additional benefits of dedicated bandwidth, the ability to more easily identify device failures and scalability. The HP ProDesk 400 G2.5 Series Business PC supports the latest SATA 6.0Gb/s specification.

SMART IV Technology

Self Monitoring Analysis and Reporting Technology (SMART) hard drive technology allows hard drives to monitor their own health and to raise flags if imminent failures are predicted. If the drive determines that a failure is imminent, the SMART hard drive technology enables the intelligent manageability or management software to generate a fault alert. While the current versions of SMART hard drives do a good job monitoring the data on the hard drive media, the ever increasing emphasis on reliability and quality has promoted HP to implement SMART IV technology which constantly checks that the data flow from host interface to media and media to host interface is not compromised. This is accomplished by inserting a 2 byte parity code into every 512 byte block in the data path of the hard drive's Cache RAM. This unique parity checking performed by HP's SMART IV technology hard drives, allows for more complete error detection coverage encompassing the entire data path between the host and the hard drive.

Smart IV is also known as IOEDC: I/O Error Detection Code.

Native Command Queuing

NCQ or Native Command Queuing is a SATA protocol extension that allows the hard drive to have several write or read commands outstanding at the same time. In contrast, normal non-queued operation requires each command to be completed before the next command is issued by the host system. Queuing allows the drive to complete the commands in the order that allows for best overall throughput. It also involves an advanced method of transferring data to or from the host, called First Party Direct Memory Access (FPDMA), which allows the hard drive and the host controller to manage the data transfers for multiple outstanding commands, without involving the host processor. NCQ can contribute to better performance but the results are dependent on many factors, including the access patterns of the various applications and operating system functions that are initiating drive accesses. Enabling NCQ features in the hard drive requires AHCI support from the host system BIOS, controller, and driver. AHCI support is typically implemented in RAID configurations.

Note: GB = 1 billion bytes. Actual available capacity is less.

1TB 7.2K rpm SATA 6.0Gb/s 3.5" Hard Disk Drive	
Capacity	1,000,204,886,016 bytes
Rotational Speed	7,200 rpm
Interface	Serial ATA 3.0 (6.0 Gb/s)
Buffer Size	32 MB
Logical Blocks	1,953,525,168

Technical Specifications – Hard Disk and Solid State Storage

Seek Time (typical reads, includes controller overhead, including settling)	Single Track:	2.0 ms
	Average:	11 ms
	Full-Stroke:	21 ms
Height (nominal)	1 in/2.54 cm	
Width (nominal)	Media diameter: 3.5 in/8.89 cm	
	Physical size: 4 in/10.2 cm	
Operating Temperature	41° to 131° F (5° to 55° C)	

500GB 7.2K rpm SATA 6.0Gb/s 3.5” Hard Disk Drive

Capacity	500,107,862,016 bytes	
Rotational Speed	7,200 rpm	
Interface	Serial ATA 3.0 (6.0 Gb/s)	
Buffer Size	16 MB	
Logical Blocks	976,773,168	
Seek Time (typical reads, includes controller overhead, including settling)	Single Track:	2.0 ms
	Average:	11 ms
	Full-Stroke:	21 ms
Height (nominal)	1 in/2.54 cm	
Width (nominal)	Media diameter: 3.5 in/8.89 cm	
	Physical size: 4 in/10.2 cm	
Operating Temperature	41° to 131° F (5° to 55° C)	

1TB SATA 6G 2.5” 8GB Solid State Hybrid Drive (SSHD)

Formatted Capacity	1 TB
Spindle Speed	5,400 rpm +/- 0.2%
Drive Type	Solid State Hybrid Drive (SSHD) technology with NAND Flash
Interface	Serial ATA (SATA)

Technical Specifications – Hard Disk and Solid State Storage

Cache Buffer	64 MB	
NAND Flash Commercial Multilevel Cell (cMLC)	8 GB	
Number of Sectors	976,773,168	
Seek Time (typical reads)	Single Track:	2.0 ms
	Average:	12 ms
Height	0.374 +/- .008 in (9.5 +/- 0.2 mm)	
Width	2.750 +/- 0.010 in (69.85 +/- 0.25 mm)	
Length	3.951 +0.008 / -0.010 in (100.35 +0.20 / -0.25 mm)	
Weight	0.254 lb/115 g (max)	
Operating Temperature	41° to 131° F (5° to 55° C)	

500 GB SATA 6G 2.5" 8GB Solid State Hybrid Drive (SSHD)		
Formatted Capacity	500 GB	
Spindle Speed	5,400 rpm +/- 0.2%	
Drive Type	Solid State Hybrid Drive (SSHD) technology with NAND Flash	
Interface	Serial ATA (SATA)	
Cache Buffer	64 MB	
NAND Flash Commercial Multilevel Cell (cMLC)	8 GB	
Number of Sectors	976,773,168	
Seek Time (typical reads)	Single Track:	2.0 ms
	Average:	12 ms
Height	0.268 +/- .008 in (6.8 +/- 0.2 mm)	
Width	2.750 +/- 0.010 in (69.85 +/- 0.25 mm)	
Length	3.951 +0.008 / -0.010 in (100.35 +0.20 / -0.25 mm)	

Technical Specifications – Hard Disk and Solid State Storage

Weight	0.209 lb/95 g (max)
Operating Temperature	41° to 131° F (5° to 55° C)

256GB SATA 2.5” 3D Non-SED Solid State Drive

Unformatted Capacity	256 GB 500,118,192 (User Addressable Sectors)	
Architecture	Self-Encrypting (SED) Solid State Drive with NAND Flash and SATA interface. Fully complies with ATA/ATAPI-7 Standard (Partially Complies with ATA/ATAPI-8) Power Saving Modes: DIPM (Partial / Slumber mode) Support NCQ : Up to 32 depth Synchronous Signal Recovery	
Interface	Serial ATA (6.0 Gb/s)	
Form Factor	2.5 inch	
Height	6.80 mm ± 0.20	
Width	69.85 mm ± 0.25	
Length	100.20 mm ± 0.25	
Weight	Up to 54 g	
Bandwidth Performance	Sustained Sequential Read:	Up to 540 MB/s
	Sustained Sequential Write:	Up to 280 MB/s
Power	Power consumption:	Active: Typical 250mW; Idle: Typical 50mW
Mean Time Between Failure (MTBF)	1,500,000 hours	
Environmental (all conditions, non-condensing)	Operating Temperature:	32° to 158° F (0° to 70° C)
	Relative Humidity:	5% to 95%
	Shock:	1,500 G/0.5 ms

Technical Specifications – Hard Disk and Solid State Storage

128GB SATA 2.5” 3D Non-SED Solid State Drive		
Unformatted Capacity	128 GB 250,069,680 (User Addressable Sectors)	
Architecture	Self-Encrypting (SED) Solid State Drive with NAND Flash and SATA interface. Fully complies with ATA/ATAPI-7 Standard (Partially Complies with ATA/ATAPI-8) Power Saving Modes: DIPM (Partial / Slumber mode) Support NCQ : Up to 32 depth Synchronous Signal Recovery	
Interface	Serial ATA (6.0 Gb/s)	
Form Factor	2.5 inch	
Height	6.80 mm ± 0.20	
Width	69.85 mm ± 0.25	
Length	100.20 mm ± 0.25	
Weight	Up to 54 g	
Bandwidth Performance	Sustained Sequential Read:	Up to 530 MB/s
	Sustained Sequential Write:	Up to 140 MB/s
Power	Power consumption:	Active: Typical 250mW; Idle: Typical 50mW
Mean Time Between Failure (MTBF)	1,500,000 hours	
Environmental (all conditions, non-condensing)	Operating Temperature:	32° to 158° F (0° to 70° C)
	Relative Humidity:	5% to 95%
	Shock:	1,500 G/0.5 ms

256GB SATA 2.5” 3D Non-SED Solid State Drive

Technical Specifications – Hard Disk and Solid State Storage

Unformatted Capacity	256 GB 500,118,192 (User Addressable Sectors)	
Architecture	Self-Encrypting (SED) Solid State Drive with NAND Flash and SATA interface. Fully complies with ATA/ATAPI-7 Standard (Partially Complies with ATA/ATAPI-8) Power Saving Modes: DIPM (Partial / Slumber mode) Support NCQ : Up to 32 depth Synchronous Signal Recovery	
Interface	Serial ATA (6.0 Gb/s)	
Form Factor	2.5 inch	
Height	6.80 mm ± 0.20	
Width	69.85 mm ± 0.25	
Length	100.20 mm ± 0.25	
Weight	Up to 54 g	
Bandwidth Performance	Sustained Sequential Read:	Up to 540 MB/s
	Sustained Sequential Write:	Up to 280 MB/s
Power	Power consumption:	Active: Typical 250mW; Idle: Typical 50mW
Mean Time Between Failure (MTBF)	1,500,000 hours	
Environmental (all conditions, non-condensing)	Operating Temperature:	32° to 158° F (0° to 70° C)
	Relative Humidity:	5% to 95%
	Shock:	1,500 G/0.5 ms

120 GB SATA 2.5 Non-SED SSD

Unformatted Capacity	120 GB
Architecture	Multi-Level Cell (MLC) NAND
Interface	Serial ATA 3.0 (6.0 Gb/s)

Technical Specifications – Hard Disk and Solid State Storage

Form Factor	2.5 inch	
Height	Low profile, 7mm height	
Width	69.85 mm ± 0.25	
Length	100.45 mm max	
Weight	Up to 78 g	
Bandwidth Performance	Sustained Sequential Read:	Up to 540 MB/s
	Sustained Sequential Write:	Up to 480 MB/s
Power	Power consumption:	Average: Read <3.7W; Write 3.7W; Standby <55mW
Environmental (all conditions, non-condensing)	Operating Temperature:	32° to 158° F (0° to 70° C)
	Relative Humidity:	5% to 95%
	Shock:	1,500 G/0.5 ms

500GB 2.5" FIPS 140-2 SED Solid State Drive

Formatted Capacity	500 GB	
Architecture	Self-Encrypting (SED) Solid State Drive with SATA interface.	
Interface	Serial ATA (6.0 Gb/s)	
Form Factor	2.5 inch	
Height	6.80 mm ± 0.20	
Width	69.85 mm ± 0.25	
Length	100.35 mm ± 0.25/0.20	
Weight (typical)	<95 g (0.209 lb)	
Bandwidth Performance	Sustained data transfer rate OD	100 MB/s max

Technical Specifications – Hard Disk and Solid State Storage

	I/O data-transfer rate	600 MB/s max
Power	Power consumption:	Spinup (max): 1.00A Idle, active: 0.70W Sleep 0.18W
Environmental (all conditions, non-condensing)	Operating Temperature:	41° to 131° F (5° to 55° C)
	Relative Humidity:	5% to 95%
	Shock:	Maximum 400 G/2 ms

256GB SATA 2.5” Opal2 SED Solid State Drive

Unformatted Capacity	256 GB 500,118,192 (User Addressable Sectors)	
Architecture	Self-Encrypting (SED) Solid State Drive with NAND Flash and SATA interface. Trusted Computing Group(TCG) OPAL compliant encrypted solid state drive	
Interface	Serial ATA (6.0 Gb/s)	
Form Factor	2.5 inch	
Height	6.80 mm ± 0.20	
Width	69.85 mm ± 0.25	
Length	100.20 mm ± 0.25	
Weight	Up to 73 g	
Bandwidth Performance	Sustained Sequential Read:	Up to 520 MB/s
	Sustained Sequential Write:	Up to 460 MB/s
Power	Power consumption:	Active: 3.891W; Idle: 0.085W
Mean Time Between Failure (MTBF)	1,500,000 hours	
	Operating Temperature:	32° to 158° F (0° to 70° C)

Technical Specifications – Hard Disk and Solid State Storage

Environmental (all conditions, non-condensing)	Relative Humidity:	5% to 95%
	Shock:	1,500 G/0.5 ms

180GB SATA 2.5” Opal2 SED Solid State Drive (Pro 2500)

Formatted Capacity	180 GB 351,651,888 (Total Logical Sectors)	
Architecture	ATA 8 Compliant and SATA 3.0 compliant Supports Mode 2 Multiword DMA Supports Drive Failure Prediction Supports SMART Offline Read Scan Supports Mode 4 PIO Supports Mode 5 UDMA Supports HP Drive Protection System ATA 8 ACS-2 Data / TRIM Support Support DEVSLP feature Supports TRIM Command per ATA8 / ACS 2 Supports FIPS-197 features Support TCG Storage Architecture Core Specification 2.0	
Interface	Serial ATA 3.0 (6.0 Gb/s)	
Form Factor	2.5 inch	
Height	Low profile, 7mm height	
Width	69.85 mm ± 0.25	
Length	100.45 mm max	
Weight	Up to 78 g	
Bandwidth Performance	Sustained Sequential Read:	Up to 540 MB/s
	Sustained Sequential Write:	Up to 490 MB/s
Power	Power consumption:	Average: Read <3.7W; Write 3.7W; Standby <55mW
Environmental (all conditions, non-condensing)	Operating Temperature:	32° to 158° F (0° to 70° C)
	Relative Humidity:	5% to 95%
	Shock:	1,500 G/0.5 ms

Technical Specifications – Hard Disk and Solid State Storage

128GB SATA 2.5” Opal2 SED Solid State Drive		
Unformatted Capacity	128 GB 250,069,680 (User Addressable Sectors)	
Architecture	Self-Encrypting (SED) Solid State Drive with NAND Flash and SATA interface. Trusted Computing Group(TCG) OPAL compliant encrypted solid state drive	
Interface	Serial ATA (6.0 Gb/s)	
Form Factor	2.5 inch	
Height	6.80 mm ± 0.20	
Width	69.85 mm ± 0.25	
Length	100.20 mm ± 0.25	
Weight	Up to 73 g	
Bandwidth Performance	Sustained Sequential Read:	Up to 520 MB/s
	Sustained Sequential Write:	Up to 340 MB/s
Power	Power consumption:	Active: 0.78A / 3.891W; Idle: 0.005A / 0.026W
Mean Time Between Failure (MTBF)	1,500,000 hours	
Environmental (all conditions, non-condensing)	Operating Temperature:	32° to 158° F (0° to 70° C)
	Relative Humidity:	5% to 95%
	Shock:	1,500 G/0.5 ms

120GB SATA 2.5” Opal2 SED Solid State Drive (Pro 2500)		
Unformatted Capacity	120 GB 234,441,648 (Total Logical Sectors)	

Technical Specifications – Hard Disk and Solid State Storage

Architecture	ATA 8 Compliant and SATA 3.0 compliant Supports Mode 2 Multiword DMA Supports Drive Failure Prediction Supports SMART Offline Read Scan Supports Mode 4 PIO Supports Mode 5 UDMA Supports HP Drive Protection System ATA 8 ACS-2 Data / TRIM Support Support DEVSLP feature Supports TRIM Command per ATA8 / ACS 2 Supports FIPS-197 features Support TCG Storage Architecture Core Specification 2.0	
Interface	Serial ATA 3.0 (6.0 Gb/s)	
Form Factor	2.5 inch	
Height	Low profile, 7mm height	
Width	69.85 mm ± 0.25	
Length	100.45 mm max	
Weight	Up to 78 g	
Bandwidth Performance	Sustained Sequential Read:	Up to 540 MB/s
	Sustained Sequential Write:	Up to 480 MB/s
Power	Power consumption:	Average: Read <3.7W; Write 3.7W; Standby <55mW
Environmental (all conditions, non-condensing)	Operating Temperature:	32° to 158° F (0° to 70° C)
	Relative Humidity:	5% to 95%
	Shock:	1,500 G/0.5 ms

Technical Specifications - Removable Storage

HP 9.5mm Desktop G2 Slim SuperMulti DVD Writer Drive		
Height	9.5 mm height	
Orientation	Either horizontal or vertical	
Interface type	SATA/ATAPI	
Disc recording capacity	Up to 8.5 GB DL or 4.7 GB standard	
Dimensions (W x H x D)	5.04 x 0.37 x 5.0 in (128 x 9.5 x 127 mm) without bezel	
Weight (max)	0.31 lb (140 g)	
Write speeds	DVD-RAM	Up to 5X
	DVD-R DL	Up to 6X
	DVD+R	Up to 8X
	DVD+RW	Up to 8X
	DVD+R DL	Up to 6X
	DVD-R	Up to 8X
	DVD-RW	Up to 6X
	CD-R	Up to 24X
Read speeds	CD-RW	Up to 10X
	DVD-RAM	Up to 5X
	DVD-RW, DVD+RW	Up to 8X
	DVD-R DL, DVD+R DL	Up to 8X
	DVD+R, DVD-R	Up to 8X
	DVD-ROM DL, DVD-ROM	Up to 8X
	CD-ROM, CD-R	Up to 24X
Access time (typical reads, including settling)	CD-RW	Up to 24X
	Random	DVD-ROM: 170 ms (typical), CD-ROM: 170 ms (typical)
	Full Stroke	DVD-ROM: 320 ms (typical), CD-ROM: 320 ms (typical)
Power	Stop Time	6 seconds (typical)
	Source	Slimline SATA DC power receptacle
	DC Power Requirement	5 VDC ± 5%-100 mV ripple p-p
Environmental conditions (operating - non-condensing)	DC Current	5 VDC (< 1000 mA typical, 1600 mA maximum)
	Temperature	41° to 122° F (5° to 50° C)
	Relative Humidity	10% to 80%

Technical Specifications - Removable Storage

	Maximum Wet Bulb Temperature	84° F (29° C)
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HP 9.5mm Desktop G2 Slim SATA BDXL Blu-Ray Writer			
Height	9.5mm height		
Orientation	Either horizontal or vertical		
Interface type	SATA/ATAPI		
Disc recording capacity	Up to 128 GB QL, 100 GB TL, 50 GB DL or 25 GB standard SL		
Dimensions (W x H x D)	5.04 x 0.37 x 5.0 in (128 x 9.5 x 127 mm) without bezel		
Weight (max)	Up to 0.29 lb (132g) without bezel		
		Triple-layer	Quadruple-layer
Write speeds	BD-R	Up to 4X	Up to 4X
	BD-RE	Up to 2X	Not supported
		Single-layer	Double-layer
	BD-R	Up to 6X	Up to 6X
	BD-RE	Up to 2X	Up to 2X
	DVD-R	Up to 8X	Up to 6X
	DVD-RW	Up to 6X	Not supported
	DVD+R	Up to 8X	Up to 6X
	DVD+RW	Up to 8X	Not supported
	DVD-RAM	Up to 5X	
	CD-R	Up to 24X	
	CD-RW	Up to 10X	
	(This should be for read speeds)	Triple-layer	Quadruple-layer
	BD-R	Up to 6X	Up to 6X
	BD-RE	Up to 4X	Not supported
		Single-layer	Double-layer
BD-ROM	Up to 6X	Up to 6X	
BD-R	Up to 6X	Up to 6X	
Read speeds	BD-RE	Up to 6X	Up to 6X
	DVD-ROM	Up to 8X	Up to 8X
	DVD-R	Up to 8X	Up to 8X
	DVD-RW	Up to 8X	

Technical Specifications - Removable Storage

	DVD+R	Up to 8X	Up to 8X
	DVD+RW	Up to 8X	
	BDMV (AACIS Compliant Disc)	Up to 6X/2X (Read/Play)	
	DVD-RAM	Up to 5X	
	DVD-Video (CSS Compliant Disc)	Up to 8X/4X (Read/Play)	
	CD-R/RW/ROM	Up to 24X	
	CD-DA(DAE)	Up to 24X/10X (Read/Play)	
Access time (typical reads, including settling)	Random	BD-ROM: 205 ms (typical), DVD-ROM: 185 ms (typical), CD-ROM: 165 ms (typical)	
	Full Stroke	BD-ROM: 350 ms (typical), DVD-ROM: 345 ms (typical), CD-ROM: 340 ms (typical)	
Power	Source	Slimline SATA DC power receptacle	
	DC Power Requirement	5 VDC \pm 5%-100 mV ripple p-p	
	DC Current	5 VDC -1200 mA typical, 2000 mA maximum	
Environmental conditions (operating - non-condensing)	Temperature	41° to 122° F (5° to 50° C)	
	Relative Humidity	10% to 80%	
	Maximum Wet Bulb Temperature	84° F (29° C)	

HP 9.5mm Desktop G2 Slim DVD-ROM Drive		
Height	9.5mm	
Orientation	Either horizontal or vertical	
Interface type	SATA/ATAPI	
Dimensions (W x H x D)	5.04 x 0.37 x 5.0 in (128 x 9.5 x 127 mm) without bezel	
Weight (max)	Up to 0.31 lb (140g) without bezel	
Read speeds	DVD+R/-R/+RW/-RW/+R DL /-R DL	Up to 8X
	DVD-ROM	Up to 8X
	CD-ROM, CD-R	Up to 24X
	CD-RW	Up to 24X
Access time (typical reads, including settling)	Random	DVD-ROM: 170 ms (typical), CD-ROM: 170 ms (typical)
	Full Stroke	DVD-ROM: 320 ms (typical), CD-ROM: 320 ms (typical)
Power	Source	Slimline SATA DC power receptacle
	DC Power Requirement	5 VDC \pm 5%-100 mV ripple p-p

Technical Specifications - Removable Storage

	DC Current	5 VDC - <1000 mA typical, < 1600 mA maximum
Environmental (all conditions non-condensing)	Temperature	41° to 122° F (5° to 50° C)
	Relative Humidity	10% to 80%
	Maximum Wet Bulb Temperature (operating)	84° F (29° C)

Technical Specifications – Memory

SYSTEM MEMORY SUPPORT

The HP ProDesk 400 G2.5 Business PC supports the 4th generation Intel® Core™ processor family. Based on a new PC micro-architecture, the processor is designed for a two-chip platform consisting of a processor and Platform Controller Hub (PCH). Unlike previous generations, the 4th generation Intel® Core™ processor includes an Integrated Memory Controller (IMC). The IMC supports DDR3/DDR3L protocols with two independent, 64-bit wide channels each accessing one or two DIMMs.

- Two channels of non-ECC DDR3/DDR3L unbuffered dual in-line memory modules (UDIMM) or DDR3/DDR3L unbuffered small outline dual in-line memory modules (SO-DIMM) with a maximum of two DIMMs per channel
- Single-channel and dual-channel memory organization modes
- Data burst length of eight for all memory organization modes
- Memory data transfer rates of up to 1600 MT/s; actual supported data transfer rate determined by the configured processor.
- 64-bit wide channels
- DDR3/DDR3L system memory I/O voltage of 1.5V
- Theoretical maximum memory bandwidth of:
 - 21.3 GB/s in dual-channel mode assuming 1333 MT/s
 - 25.6 GB/s in dual-channel mode assuming 1600 MT/s

PLATFORM MEMORY SUPPORT

- The Small Form Factor (SFF) platform supports up to two (2) industry-standard DDR3-SDRAM DIMMs.

CAUTION: You must shut down the computer and disconnect the power cord before adding or removing memory modules. Regardless of the power-on state, voltage is always supplied to the memory modules as long as the computer is plugged in to an active AC outlet. Adding or removing memory modules while voltage is present may cause irreparable damage to the memory modules or system board.

NOTE: For systems configured with more than 3 GB of memory and a 32-bit operating system, all memory may not be available due to system resource requirements. Addressing memory above 4 GB requires a 64-bit operating system.

Technical Specifications – Networking/Communication

Realtek RTL8111HSH-CG GbE		
10/100/1000 NIC	Ethernet Features	10 Mbit/s operation (10BASE-T; IEEE 802.3i; IEEE 802.3 clauses 13-14) 100 Mbit/s operation (100BASE-TX; IEEE 802.3u; IEEE 802.3 clauses 21-30) 1000 Mbit/s operation (1000BASE-T; IEEE 802.3ab; IEEE 8023 clauses 40) Auto-Negotiation (Automatic Speed Selection) Full Duplex Operation at all Speeds, Half Duplex operation at 10 and 100 Mbit/s IEEE 802.1p QoS (Quality of Service) Support IEEE 802.1q VLAN support IEEE 802.3x Flow Control (IEEE 802.3 clauses 31-32; configurable) IEEE 802.3az EEE (Energy Efficient Ethernet) Jumbo Frame 9K Auto MDI/MDIX Crossover cable detection
	Power Management	ACPI compliant – multiple power modes Situation-sensitive features reduce power consumption Advanced link down power saving for reducing link down power consumption
	Performance Features	TCP/IP/UDP Checksum Offload (configurable) Protocol Offload (ARP & NS) Large send offload and Giant send offload Receiving Side Scaling
	Manageability	Wake-on-LAN from standby and hibernation (Magic Packet and Microsoft Wake-Up Frame); Wake-on-LAN from off (Magic Packet only) PXE 2.1 Remote Boot Statistics Gathering (SNMP MIB II, Ethernet-like MIB, Ethernet MIB (802.3x, clause 30)) Comprehensive diagnostic and configuration software suite Virtual Cable Doctor for Ethernet cable status
	Interface	PCI Express 1.1 x1 to fully support ASPM L0s/L1 and CLKREQ
	NIC Device Driver Name	PCIe GbE Ethernet Family Controller

Broadcom BCM943228Z 802.11n 2x2 DualBand Combo PCIe x1 Card

	Wireless LAN Standards	IEEE 802.11a IEEE 802.11b IEEE 802.11g IEEE 802.11n
	Interoperability	Wi-Fi certified
	Frequency Band	802.11b/g/n <ul style="list-style-type: none"> • 2.402 – 2.482 GHz 802.11a/n <ul style="list-style-type: none"> • 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

Technical Specifications – Networking/Communication

		NOTE: The FCC has declared as of January 1, 2015 products that utilize passive scanning on channel 12/13 and are capable of transmitting must fully comply with requirements of 15.247 or otherwise disable those channels.
	Antenna Structure	2 transmit; 2 receive (2x2)
	Data Rates	802.11a: 6, 9, 12, 18, 24, 36, 48, 54 Mbps 802.11b: 1, 2, 5.5, 11 Mbps 802.11g: 6, 9, 12, 18, 24, 36, 48, 54 Mbps 802.11n: MCS 0 ~ MCS 15, (20MHz, and 40MHz)
	Modulation	Direct Sequence Spread Spectrum CCK, BPSK, QPSK, 16-QAM, 64-QAM
	Security¹	<ul style="list-style-type: none"> • 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 • Cisco Certified Extensions, all versions through CCX4 and CCX Lite • WAPI
	Sub-channels	Multinational support with frequency bands and channels compliant to local regulations.
	Network Architecture Models	Ad-hoc (Peer to Peer) Infrastructure (Access Point Required)
	Roaming	IEEE 802.11 compliant roaming between band Access Points
	Output Power²	<ul style="list-style-type: none"> • 802.11b : +16dBm minimum • 802.11g : +14dBm minimum • 802.11a : +14dBm minimum • 802.11n HT20(2.4GHz) : +13dBm minimum • 802.11n HT40(2.4GHz) : +13dBm minimum • 802.11n HT20(5GHz) : +12dBm minimum • 802.11n HT40(5GHz) : +12dBm minimum
	Power Consumption	Transmit: 2.0 W (max) Receive: 1.6 W (max) Idle mode (PSP): 180 mW (WLAN Associated) Idle mode: 60 mW (WLAN unassociated) Radio disabled: 30 mW
	Power Management	ACPI and PCI Express compliant power management 802.11 compliant power saving mode
	Receiver Sensitivity⁴	802.11b, 1Mbps : -94dBm maximum 802.11b, 11Mbps : -86dBm maximum 802.11g, 6Mbps : -88dBm maximum 802.11g, 54Mbps : -74dBm maximum 802.11a, 6Mbps : -86dBm maximum 802.11a, 54Mbps : -72dBm maximum 802.11n, MCS07 : -69dBm maximum 802.11n, MCS15 : -66dBm maximum
	Antenna type	High efficiency antenna with spatial diversity, mounted in the display enclosure

Technical Specifications – Networking/Communication

	Two embedded dual band 2.4/5 GHz antennas are provided to the card to support WLAN MIMO and Bluetooth communications		
Form Factor	PCI-Express M.2 MiniCard		
Dimensions	Type 2230 : 2.3 x 22.0 x 30.0 mm Or Type 1630 : 2.3 x 16.0 x 30.0 mm		
Weight	Type 2230 : 2.8g Or Type 1630 : 2g		
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		
<ol style="list-style-type: none"> 1. Check latest software/driver release for updates on supported security features. 2. Maximum output power may vary by country according to local regulations. 3. In Power Save Polling mode and on battery power. 4. Receiver sensitivity is measured at a packet error rate of 8% for 802.11b (CCK modulation) and a packet error rate of 10% for 802.11a/g (OFDM modulation). 5. WLAN supplier's client utility is required for Cisco Compatible Extensions support with Microsoft Windows XP. WLAN may also be compatible with certain third-party software supplicants. WLAN supplier IHV extensions required for Cisco Compatible Extensions support for Microsoft Windows Vista. 			
HP Integrated Module with Bluetooth 4.0+EDR Wireless Technology			
Bluetooth Specification	4.0+EDR Compliant		
Frequency Band	2402 to 2480 MHz		
Number of Available Channels	79 (1 MHz) available channels		
Data Rates and Throughput	3 Mbps data rate; throughput up to 2.17 Mbps		
	Synchronous Connection Oriented links up to 3, 64 kbps, voice channels		
	Asynchronous Connection Less links 2178.1 kbps/177.1 kbps asymmetric or 1306.9 kbps symmetric		
Transmit Power	The Bluetooth component shall operate as a Class II Bluetooth device with a maximum transmit power of +4 dBm for BR and EDR.		
Receiver Sensitivity	Modulation	0.01% BER	0.001% BER
	GFSK	-80 dBm	-70 dBm
	$\pi/4$ -DQPSK	-80 dBm	-70 dBm
	8DPSK	-80 dBm	-70 dBm
Power Consumption	Peak (Tx) 330 mW Peak (Rx) 230 mW Selective Suspend 17 mW		
Range	Up to 33 ft (10 m)		
Electrical Interface	USB 2.0 compliant		
Bluetooth Software Supported Link Topology	Microsoft Windows Bluetooth Software		
Electrical Interface Bluetooth Software Supported Security	Point to Point, Multipoint Pico Nets up to 7 slaves		
	Full support of Bluetooth Security Provisions		

Technical Specifications – Networking/Communication

	Power Management	Microsoft Windows ACPI, and USB Bus Support
	Power Management Certifications	Self-configurable to optimize power conservation in all operating modes, including Standby, Hold, Park, and Sniff
	Security	All necessary regulatory approvals for supported countries, including:
	Certifications	FCC (47 CFR) Part 15C, Section 15.247 & 15.249
	Bluetooth Profiles Supported	
	Power Management Certifications	ETS 300 328, ETS 300 826
		Low Voltage Directive IEC950
		UL, CSA, and CE Mark
	Certifications	Serial Port Profile (SPP) ¹
	Bluetooth Profiles Supported	Service Discovery Application Profile (SDAP)
		Dial-Up Networking (DUN) ^{1,2}
		Generic Object Exchange Profile (GOEP) ^{1,2}
		Object Push Profile (OPP) ^{1,2}
		File Transfer Profile (FTP)
		Synchronization Profile (SYNC)
		Hard Copy Cable Replacement (HCRP) ^{1,2}
		Personal Area Networking Profile (PAN) ^{1,2}
		Human Interface Device Profile (HID) ^{1,2}
		FAX Profile (FAX)
		Basic Imaging Profile (BIP) ²
		Headset Profile (HSP)
		Hands Free Profile (HFP)
		Advanced Audio Distribution Profile (A2DP)

Intel 7265 802.11ac 2x2 DualBand Combo PCIe x1 Card

	Wireless LAN Standards	IEEE 802.11a IEEE 802.11b IEEE 802.11g IEEE 802.11n IEEE 802.11ac
	Interoperability	Wi-Fi certified
	Frequency Band	802.11b/g/n <ul style="list-style-type: none"> 2.402 – 2.482 GHz <p>Note: The FCC has declared as of January 1, 2015 products that utilize passive scanning on channel 12/13 and are capable of transmitting must fully comply with requirements of 15.247 or otherwise disable those channels.</p> 802.11a/n <ul style="list-style-type: none"> 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 <p>Note: Indonesia no support this band)</p>
	Data Rates	<ul style="list-style-type: none"> 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, and 80MHz)

Technical Specifications – Networking/Communication

Modulation	Direct Sequence Spread Spectrum BPSK, QPSK, CCK, 16-QAM, 64-QAM, 256-QAM
Security¹	<ul style="list-style-type: none"> • 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 • Cisco Certified Extensions, all versions through CCX4 and CCX Lite • WAPI
Network Architecture Models	Ad-hoc (Peer to Peer) Infrastructure (Access Point Required)
Roaming	IEEE 802.11 compliant roaming between access points
Output Power²	<ul style="list-style-type: none"> • 802.11b : +16dBm minimum • 802.11g : +14dBm minimum • 802.11a : +14dBm minimum • 802.11n HT20(2.4GHz) : +13dBm minimum • 802.11n HT40(2.4GHz) : +13dBm minimum • 802.11n HT20(5GHz) : +12dBm minimum • 802.11n HT40(5GHz) : +12dBm minimum • 802.11ac 80MHz(5GHz) : +11dBm minimum
Power Consumption	Transmit: 2.0 W (max) Receive: 1.6 W (max) Idle mode (PSP): 180 mW (WLAN Associated) Idle mode: 60 mW (WLAN unassociated) Radio disabled: 30 mW
Power Management	ACPI and PCI Express compliant power management 802.11 compliant power saving mode
Receiver Sensitivity³	802.11b, 1Mbps : -94dBm maximum 802.11b, 11Mbps : -86dBm maximum 802.11g, 6Mbps : -88dBm maximum 802.11g, 54Mbps : -74dBm maximum 802.11a, 6Mbps : -86dBm maximum 802.11a, 54Mbps : -72dBm maximum 802.11n, MCS07 : -69dBm maximum 802.11n, MCS15 : -66dBm maximum 802.11ac, 1SS, MCS-0 : -86dBm maximum 802.11ac, 1SS, MCS-9 : -61dBm maximum 802.11ac, 2SS, MCS-0 : -83dBm maximum 802.11ac, 2SS, MCS-9 : -58dBm maximum
Antenna type	High efficiency antenna with spatial diversity, mounted in the display enclosure Two embedded dual band 2.4/5 GHz antennas are provided to the card to support WLAN MIMO communications and Bluetooth communications
Form Factor	PCI-Express M.2 MiniCard
Dimensions	Type 2230 : 2.3 x 22.0 x 30.0 mm Or Type 1630 : 2.3 x 16.0 x 30.0 mm
Weight	Type 2230 : 2.8g Or Type 1630 : 2g

Technical Specifications – Networking/Communication

	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		
	<ol style="list-style-type: none"> 1. Check latest software/driver release for updates on supported security features. 2. Maximum output power may vary by country according to local regulations. 3. Receiver sensitivity is measured at a packet error rate of 8% for 802.11b (CKK modulation) and a packet error rate of 10% for 802.11a/g (OFDM modulation). 			
	HP Integrated Module with Bluetooth 4.0+EDR Wireless Technology			
	Bluetooth Specification	4.0+EDR Compliant		
	Frequency Band	2402 to 2480 MHz		
	Number of Available Channels	79 (1 MHz) available channels		
	Data Rates and Throughput	3 Mbps data rate; throughput up to 2.17 Mbps		
		Synchronous Connection Oriented links up to 3, 64 kbps, voice channels		
		Asynchronous Connection Less links 2178.1 kbps/177.1 kbps asymmetric or 1306.9 kbps symmetric		
	Transmit Power	The Bluetooth component shall operate as a Class II Bluetooth device with a maximum transmit power of +4 dBm for BR and EDR.		
	Receiver Sensitivity	Modulation	0.01% BER	0.001% BER
		GFSK	-80 dBm	-70 dBm
		π/4-DQPSK	-80 dBm	-70 dBm
		8DPSK	-80 dBm	-70 dBm
	Power Consumption	Peak (Tx) 330 mW Peak (Rx) 230 mW Selective Suspend 17 mW		
	Range	Up to 33 ft (10 m)		
	Electrical Interface	USB 2.0 compliant		
	Bluetooth Software Supported Link Topology	Microsoft Windows Bluetooth Software		
	Electrical Interface Bluetooth Software Supported Security	Point to Point, Multipoint Pico Nets up to 7 slaves Full support of Bluetooth Security Provisions		
	Power Management Power Management Certifications	Microsoft Windows ACPI, and USB Bus Support Self-configurable to optimize power conservation in all operating modes, including Standby, Hold, Park, and Sniff		
	Security	All necessary regulatory approvals for supported countries, including:		
	Certifications Bluetooth Profiles Supported	FCC (47 CFR) Part 15C, Section 15.247 & 15.249		
	Power Management Certifications	ETS 300 328, ETS 300 826 Low Voltage Directive IEC950		
	Certifications Bluetooth Profiles Supported	UL, CSA, and CE Mark Serial Port Profile (SPP) ¹ Service Discovery Application Profile (SDAP) Dial-Up Networking (DUN) ^{1,2} Generic Object Exchange Profile (GOEP) ^{1,2} Object Push Profile (OPP) ^{1,2} File Transfer Profile (FTP)		

Technical Specifications – Networking/Communication

		Synchronization Profile (SYNC) Hard Copy Cable Replacement (HCRP) ^{1,2} Personal Area Networking Profile (PAN) ^{1,2} Human Interface Device Profile (HID) ^{1,2} FAX Profile (FAX) Basic Imaging Profile (BIP) ² Headset Profile (HSP) Hands Free Profile (HFP) Advanced Audio Distribution Profile (A2DP)
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High Definition Audio

Type	Integrated
HD Stereo Codec	Realtek 2-channel ALC221 codec
Audio I/O Ports	Front microphone-In
	Rear Line-In
	Rear Line-Out
	Front Headphone-Out Front Microphone
	All ports are 3.5mm
Internal Speaker Amplifier	1.5W amplifier for the internal speaker only. External speakers must be powered externally.
Multi-streaming Capable	Playback multi-streaming can be enabled in the Realtek control panel to allow independent audio streams to be sent to/from the front and rear jacks.
Sampling	8 kHz - 192 kHz
Wavetable Syntheses	Yes – Uses OS soft wavetable
Analog Audio	Yes
# of Channels on Line-Out	Stereo (Left & Right channels)
Internal Mono Speaker	Yes
External Speaker Jack	Yes

Technical Specifications – Input/Output Devices

HP USB PS/2 Washable Keyboard

Physical Characteristics	Keys	104 (US) Layout, 105 (EU) layout – depending upon country
	Dimensions (L x W x H)	17.67x 6.62 x 1.38 in (449 x 168 x 35 mm)
	Weight	1.7 lb (0.77 kg) minimum
Electrical	Operating voltage	+ 5VDC ±5%
	Power consumption	50-mA maximum (with three LEDs ON)
	System interface	USB Type A plug connector
	ESD	CE level 4, 15-kV air discharge
	EMI - RFI	Conforms to FCC rules for a Class B computing device
	Microsoft PC 99 - 2001	Functionally compliant
Mechanical	Keycaps	Stepped -profile design
	Switch actuation	55-g nominal peak force with tactile feedback
	Switch life	20 million keystrokes
	Switch type	Contamination-resistant switch membrane
	Key-leveling mechanisms	For all double-wide and greater-length keys
	Cable length	7 ft (2.2 m)
	Microsoft PC 99 - 2001	Mechanically compliant
	Acoustics	43-dBA maximum sound pressure level
Environmental	Operating temperature	50° to 122° F (10° to 50° C)
	Non-operating temperature	4° to 149° F (-20° to 65° C)
	Operating humidity	10% to 95% (non-condensing at ambient)
	Non-operating humidity	0% to 95% (non-condensing at ambient)
	Operating shock	40 g, six surfaces
	Non-operating shock	80 g, six surfaces
	Operating vibration	2-g peak acceleration
	Non-operating vibration	4-g peak acceleration
	Drop (out of box)	26 in (66 cm) on carpet, six-drop sequence
Drop (in box)	42 in (107 cm) on concrete, 16-drop sequence	
Operating system support	Windows® 7, Windows Vista, Windows XP Professional	
Approvals	UL, cUL, FCC, CE, TUV GS, VCCI, BSMI, C-Tick, KCC, USB-IF, WHQL, EN/IEC 60601-1, IP66/NEMA4X	
Ergonomic compliance	ANSI HFS 100, ISO 9241-4, and TUVGS	

HP PS/2 Mouse

Dimensions (H x L x W)	1.54 x 2.43 x 4.60 in (3.70 x 6.18 x 11.68 cm)	
Weight	3.24 oz (92g; +10g/- 5 g)	
Environmental	Operating temperature	-32° to 104°F (0° to 40° C)

Technical Specifications – Input/Output Devices

	Non-operating temperature	-40° to 149°F (-40° to 65° C)
	Operating humidity	90% (non condensing at ambient)
	Non-operating humidity	60% (non condensing at ambient)
	Operating shock	N/A
	Non-operating shock	65 inch 2.9 ms, six surface; 30g 266 inch/second; 50g 266 inch/second six surface
	Operating vibration	2 g peak acceleration
	Non-operating vibration	Starting at 10 Hz, vary the frequency of vibration from 10 to 500 Hz and back to 10 Hz at a Logarithmic sweep rate of 0.5 octave per minute.
	Drop (out of box)	80 cm height onto asphalt tile over concrete or equivalent, 5-drop in 5 direction except the cable face
Electrical	Operating voltage	5 VDC ± 10%
	Power consumption	50mA
	System consumption	PS/2 mini-din connector
	ESD	CE level 4, 15 kV air discharge
	EMI-RFI	Conforms to FCC rules for a Class B computing device
	Microsoft PC99 - 2001	Functionally compliant
Mechanical	Resolution	500 DPI
	Tracking speed	28 in/s (71.12 cm/s) maximum
	Acceleration	±15%
	Switch actuation	60±20 gf
	Switch life	3,000,000 operations (using Hasco modified tester)
	Switch type	Low force micro-switches
	Tracking mechanism life	250 km

Technical Specifications – Input/Output Devices

	Cable length	6 ft (1.8 m)
	Microsoft PC99 - 2001	Mechanically compliant
Scroll wheel	Width	6 mm
	Diameter	22.5 ± 0.2 mm
	Maximum rotation force	14-30 gf-cm
	Switch type	Light force micro-switch
	Switch life	1 million operations
	Mechanical life	Minimum 200,000 revolutions
Regulatory Approvals	UL/cUL, FCC, CE Mark, TUV/GS, VCCI, KCC, BSMI, C-Tick	

HP USB Mouse

Dimensions (H x L x W)	1.54 x 4.6 x 2.43 in (4.05 x 11.68 x 6.18 cm)
Weight	3.24 oz (92g; +10g/- 5 g)
Cable length	70.9 in (180 cm)
System requirements	Available USB port

HP USB 1000dpi Laser Mouse

Dimensions (H x L x W)	2.43 x 1.59 x 4.6 in (61.8 x 40.48 x 116.8 mm)	
Weight	3.24 oz (92g)	
Cable length	70.9 in (180 cm)	
System requirements	Available USB port	
Environmental	Operating Temperature	32° to 104° F (0° to 40° C)
	Non-operating Temperature	-40° to 149° F (-40° to 65° C)

Technical Specifications – Input/Output Devices

	Operating Humidity	90% (non-condensing at ambient)
Mechanical	Resolution	800dpi
	Tracking Speed	71 cm/sec
	Cable Length	70.9 in (180 cm)

HP USB PS/2 Washable Mouse

Dimensions (H x L x W)	1.56 x 2.44 x 4.61 in (3.95 x 6.21 x 11.7 cm)	
Weight	4.44 oz (126 g)	
Environmental	Operating temperature	-32° to 104°F (0° to 40° C)
	Non-operating temperature	-4° to 140°F (-20° to 60° C)
	Operating humidity	10% to 90% (non-condensing at ambient)
	Non-operating humidity	10% to 90% non-condensing
	Operating shock	40 g, 6 surfaces
	Non-operating shock	80 g, 6 surfaces
	Operating vibration	2 g peak acceleration
	Non-operating vibration	4 g peak acceleration
	Drop (out of box)	80 cm height onto asphalt tile over concrete or equivalent, 5-drop in 5 direction except the cable face
Electrical	Operating voltage	5 VDC ± 10%
	Power consumption	100mA
	System consumption	PS/2 mini-din connector or USB
	ESD	CE level 2 8 kV air discharge
	EMI-RFI	Conforms to FCC rules for a Class B computing device
	Microsoft PC99 - 2001	Functionally compliant

Technical Specifications – Input/Output Devices

Mechanical	Resolution	1000 ± 20% DPI
	Tracking speed	14 in/s (35.56 cm/s) maximum
	Acceleration	2 g
	Switch actuation	70 g nominal peak force
	Switch life	3,000,000 operations (using Hasco modified tester)
	Switch type	Low force micro-switches
	Tracking mechanism life	8.8 ft total 70 cm+ 2m extension
	Cable length	Mechanically compliant
	Microsoft PC99 - 2001	1000 ± 20% DPI
Scroll wheel	Width	6 mm
	Diameter	1 in (25.4 mm)
	Maximum rotation force	48 rats/sec
	Switch type	Light force micro-switch
	Switch life	3 million operations
	Mechanical life	Minimum 200,000 revolutions
Regulatory Approvals	FCC, CE Mark, ICES-003-B, IP66/NEMA4X	

HP Wireless Keyboard and Mouse

Keyboard	Dimensions (H x L x W)	1.09 x 18.1 x 6.47 in (27.87 x 460.3 x 164.3 mm)
	Weight – Without Two AA Alkaline Batteries	1.94 lb (880 g)
Mouse	Dimensions (H x L x W)	1.46 x 4.53 x 2.47 in (37 x 115 x 62.9 mm)
	Weight – Without Two AA Alkaline Batteries	0.15 lb (67 g)
Receiver	Dimensions (H x L x W)	0.33x 1.79 x 0.72 in (8.4 x 45.5 x 18.4 mm)
	Weight	0.21 oz (5.9 g)

Technical Specifications – Input/Output Devices

	Range	32.8 ft (10 m)
System Requirements	Windows 10, Windows 8, Windows 7 Professional Edition 32*, Windows 7 Professional Edition 64*, Windows Vista or Windows XP Available USB port for the receiver CD-ROM Drive * Not all features are available in all editions or versions of Windows. Systems may require upgraded and/or separately purchased hardware, drivers and/or software to take full advantage of Windows functionality. See http://www.microsoft.com .	
Approvals	Product Safety	UL; CSA /TUV (Europe only); CE Mark; CB Report
	Ergonomics	ANSI; ISO (Europe only); GS Mark (Germany only)
	EMC	FCC; CE; ACA (-tick); BSMI; KC ; VCCI
	CE Mark	EN 55022:2010; EN 55024; EN 301489-1; EN 61000
	Design Guidelines for PCs	PC 99 – connector overmold colors; PC 2001 – full functionality
	Telecom	All local telecom requirements and approvals for intended markets
	USA	FCC Title 47 CFR, Par 15, Subpart C; other local requirements
	Country Support	US, Belgium, Switzerland, Spain, Denmark, Netherlands, France, Germany, Italy, Portugal, Sweden, Norway, Finland, UK, Poland, Czech Republic, Turkey, Greece, Austria, Bulgaria, Cyprus, Estonia, Hungary, Ireland, Latvia, Lithuania, Luxemburg, Malta, Romania, Slovakia, Slovenia, Vietnam, HK, Australia, NZ, Malaysia, Singapore, Indonesia, Philippines, Thailand, Canada, China, Japan, Korea, Taiwan, India, Venezuela, Ecuador, Russia, Ukraine, Israel, Croatia, United Arab Emirates, Peru, Brazil, Chile, Argentina, Mexico, South Africa, and up to 193 countries worldwide.
Environmental	Keyboard contains 25% post-consumer recycled plastic material	
Encryption	128bit AES Encryption	

HP Parallel Port PCIe x1 Card

Technical Specifications – Input/Output Devices

Dimensions (H x L x W)	0.22 x 4.76 x 3.11 in (18 x 121 x 79 mm) with bracket	
Bus	PCI Express Spec. 2.0, Single-Lane (x1)	
IRQ & IO	Assigned by system	
Parallel Communication	Interface	IEEE 1284
	Number of ports	1 port
	FIFO	16 byte hardware
	Mode	SPP/ECP/EPP/BPP
	Speed	Maximum 1.8 MBps
	PCB connector	DB25 Female
Driver Support	Microsoft client	XP/ Vista/ 7 / 8 (x86/x64)
	Microsoft server	2000/2003/2008/2008R2 (x86/x64)
	Microsoft embedded	XP Embedded/POS Ready 2009/Embedded System 2009
	Linux	Linux 2.4x/2.6x/3,x
	DOS	DOS
Regulatory Approvals	Hardware	CE EN55022 Class B, EN55024, EN61000-3-2, EN61000-3-3, VCCI Class B, FCC Part 15 Class B, BSMI: CNS13438, C-Tick; CISPR22 AS/NZS, RoHS
	Software	Microsoft WHQL Windows Microsoft Client: XP/Vista/7/8 (x86/x64) Microsoft Server™ 2000/20003/2008 (x86/x64)
Environmental	Operating Temperature	32° to 140° F (0° to 60° C)
	Operating Humidity	5% to 95% RH
	Storage Temperature	-4° to 185° F (-20° to 85° C)

Technical Specifications – Power

UNIT ENVIRONMENT AND OPERATING CONDITIONS

General Unit Operating Guidelines

- Keep the computer away from excessive moisture, direct moisture and the extremes of heat and cold, to ensure that unit is operated within the specified operating range.
- Leave a 10.2 cm (4 in) clearance on all vented sides of the computer to permit the required airflow.
- Never restrict airflow into the computer by blocking any vents or air intakes.
- Do not stack computers on top of each other or place computers so near each other that they are subject to each other's re-circulated or preheated air.
- Occasionally clean the air vents on the front, back, and any other vented side of the computer. Lint, dust and other foreign matter can block the vents and limit the airflow.
- If the computer is to be operated within a separate enclosure, intake and exhaust ventilation must be provided on the enclosure, and the same operating guidelines listed above will still apply.

Temperature Range	Operating: 50° to 95° F (10° to 35° C)* Non-operating: -22° to 140° F(-30° to 60° C)
Relative Humidity	Operating: 10% to 90% (non-condensing at ambient) Non-operating: 5% to 95% (non-condensing at ambient)
Maximum Altitude (unpressurized)	Operating: 10,000 ft (3048 m) Non-operating: 30,000 ft (9144 m)

*Operating temperature is de-rated 1.0 deg C per 300 m (1000 ft) to 3000 m (10,000 ft) above sea level, no direct sustained sunlight. Maximum rate of change is 10 deg C/Hr. The upper limit may be limited by the type and number of options installed.

POWER SUPPLY

High Efficiency* 80 PLUS Bronze	180W active PFC 82/85/82% efficient at 20/50/100% load (115V) 82/85/82% efficient at 20/50/100% load (230V)
Operating Voltage Range	90 - 264 VAC
Rated Voltage Range	100 - 240 VAC
Rated Line Frequency	50/60 Hz
Operating Line Frequency	47 – 63 Hz
Rated Input Current	3.6A
Current Leakage without Ground (NFPA 99)	< 300 µA @ 120V
Current Leakage with Ground (NFPA 99)	< 100 µA @ 120V
Power Supply Fan	50mm Fan
Power cord length	6.0 ft. (1.83 m)
External Power Adapter	
Dimensions	N/A
Total Cord Length	N/A

*High efficiency power supply is a requirement for ENERGY STAR® certification in conjunction with a select range of processors and modules

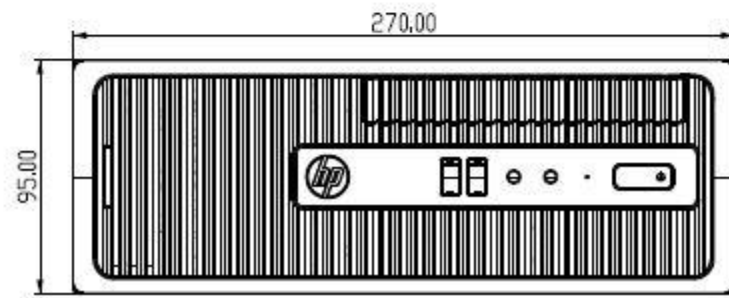
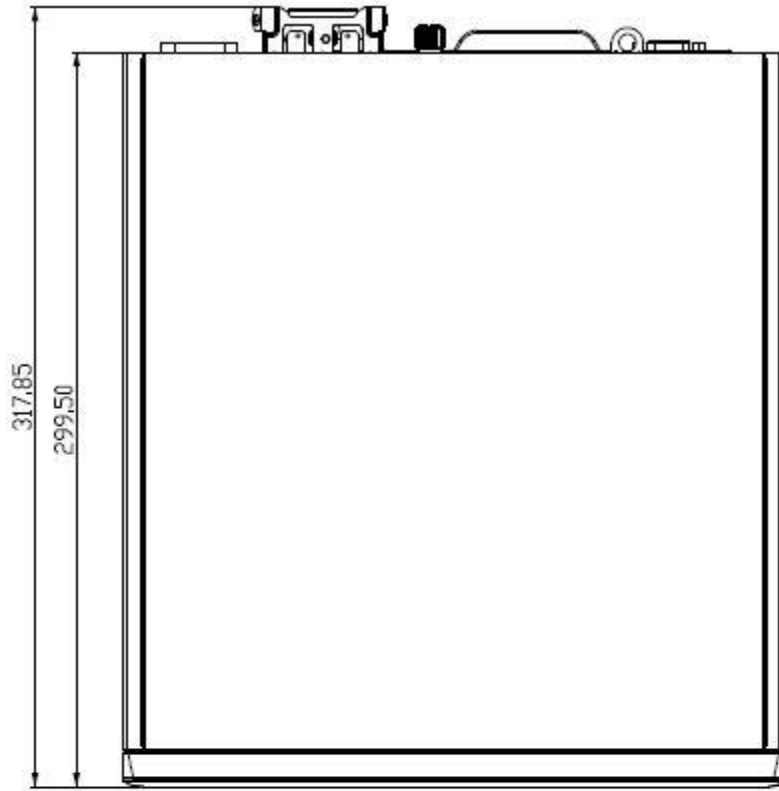
Technical Specifications – Weights & Dimensions

WEIGHTS & DIMENSIONS

(configured with 2TB HDD, Wi-Fi card, graphics card)

Chassis (W x H x D)	10.6x11.8x3.7 in 95x270x299.5mm
System Volume	7.7 L 7.31 L (not including bezel)
System Weight*	4.5 kg 9.92 lb
Max Supported Weight (desktop orientation)	4.4 kg
Tower Stand (H x W x D)	27.29 x 151.75 x 190 mm 1.15x 5.97 x 7.48 in
Packaged (H x W x D)	440 x 210 x 520 mm 17.32 x 8.27 x 20.47 in
Shipping Weight	7.07 kg (15.58lb) SEA 10-units per layer 4-layer max. 40-units per pallet
Palletization Profile	AIR 10-units per layer 2-layer max. 20-units per pallet

Technical Specifications – Weights & Dimensions



Technical Specifications – Miscellaneous Features

MANAGEMENT FEATURES

- Advanced Configuration and Power Management Interface (ACPI). Allows the system to wake from a low power mode. Controls system power consumption, making it possible to place individual cards and peripherals in a low-power or powered-off state without affecting other elements of the system.
- Intel Wired for Management support; industry wide initiative to make Intel architecture based PCs, servers and mobile computers more inherently manageable out-of-the-box and over the network
- Dual State Power Button; acts as both an on/off button and a suspend-to-sleep button

SERVICEABILITY FEATURES

- Dual colored power LED on front of computer to indicate either normal or fault condition
- Diagnostic LED Explanation Table:
 - Number of 1-second red LED blinks followed by a 2-second pause, then repeats:
 - 2 - processor thermal protection activated
 - 3 - processor not installed
 - 4 - power supply failure
 - 5 -- memory error
 - 6 - video error
 - 7 - PCA failure (ROM detected failure prior to video)
 - 8 - invalid ROM, boot block recovery mode
 - 9 - system not fetching code
 - 10 - system hang while loading an option ROM
- HP PC Hardware Diagnostics UEFI:
 - This utility enables hardware level testing outside the operating system on many components. The diagnostics can be invoked by pressing F2 at POST, and is available as a download from <http://hp.com/go/techcenter/pcdiags>
- System/Emergency ROM
- Flash ROM
- CMOS Battery Holder for easy replacement
- Flash Recovery with Video Configuration Record Software
- 5 Aux Power LED on System PCA
- Processor ZIF Socket for easy Upgrade
- Over-Temp Warning on Screen (Requires IM Agents)
- Clear Password Jumper
- DIMM Connectors for easy Upgrade
- Clear CMOS Button
- NIC LEDs (integrated) (Green & Amber)
- Dual Color Power and HD LED - To Indicate Normal Operations and Fault Conditions
- Color coordinated cables and connectors
- Front power switch
- System memory can be upgraded without removing the system board or any internal components
- CD & Diskette Removal
- Tool icon for easy Identification

ADDITIONAL FEATURES

Description

Drive Lock	Implementation of the industry standard ATA Security feature set. When enabled, it prevents software access to user data on the drive until one or two user-defined passwords are provided.
Drive Protection System	DPS Access through F10 Setup during Boot

Technical Specifications – Miscellaneous Features

A diagnostic hard drive self test. It scans critical physical components and every sector of the hard drive for physical faults and then reports any faults to the user

Running independently of the operating system, it can be accessed through a Windows-based diagnostics utility or through the computer's setup procedure. It produces an evaluation on whether the hard drive is the source of the problem and needs to be replaced

The system expands on the Self-Monitoring, Analysis, and Reporting Technology (SMART), a continuously running systems diagnostic that alerts the user to certain types of failures

SMART Technology (Self-Monitoring, Analysis and Reporting Technology)

Allows hard drives to monitor their own health and to raise flags if imminent failures were predicted

SMART I - Drive Failure Prediction

Predicts failures before they occur. Tracks fault prediction and failure indication parameters such as re-allocated sector count, spin retry count, calibration retry count

SMART II - Off-Line Data Collection

By avoiding actual hard drive failures, SMART hard drives act as "insurance" against unplanned user downtime and potential data loss from hard drive failure

SMART III - Off-Line Read Scanning with Defect Reallocation

IOEDC: I/O Error Detection Circuitry

Detects errors in Read/Write buffers on HDD cache RAM

SMART IV - End-to-End CRC for hard drives

Interface in F10 setup provides confirmation of SMART IV support.

Change Log

Business Monitors

	Part Number
HP ProDisplay P202	K7X27AA
HP ProDisplay P202m	K7X28AA
HP ProDisplay P222va	K7X30AA
HP ProDisplay P232	K7X31AA
HP ProDisplay P242va	K7X32AA
HP EliteDisplay E201	C9V73AA
HP EliteDisplay E221	C9V76AA
HP EliteDisplay E231	C9V75AA
HP EliteDisplay E190i	E4U30AA
HP EliteDisplay E241i	FOW81AA
HP EliteDisplay E271i	D7Z72AA
HP EliteDisplay E221c	D9E49AA
HP EliteDisplay S230tm	E4S03AA
HP L2206tm	B0L55AA

Communication Devices

	Part Number
Intel Ethernet I210 – T1 Gbe NIC	E0X95AA
Intel 7260 802.11 a/b/g/n PCIe x1 WLAN Card	F2P07AA
Broadcom BCM943228Z 802.11n 2x2 DualBand PCIe x1 Card	TBD

Graphics Solutions

	Part Number
NVIDIA® NVS™ 310 Graphics (PCIe x16)	A7U59AA

Graphics Cables

	Part Number
HP DisplayPort To DVI-D Adapter	FH973AA
HP DisplayPort to VGA Adapter	AS615AA
HP DisplayPort Cable Kit	VN567AA
HP DisplayPort To HDMI 1.4 Adapter	K2K92AA
HP DisplayPort To Dual Link DVI-D Adapter	NR078AA
HP USB Graphics Adapter	NL571AA
Dual Output USB Graphics Adapter	C5U89AA

Data Storage Drives and Accessories

	Part Number
HP 500GB SATA 6.0Gb/s Hard Drive	QK554AA
HP 1TB 7200rpm SATA 6.0Gb/s Hard Drive	QK555AA
HP 128 GB SATA 3.0Gb/s Solid State Drive	QV063AA
HP 128 GB SED Opal 2 Solid State Drive Desktop	G1K24AA
HP 256 GB SATA 3D Non-SED Solid State Drive Desktop	TBD

Input Devices

	Part Number
HP USB Mouse	QY777AA

Change Log

HP USB 1000dpi Laser Mouse	QY778AA
HP PS/2 Mouse	QY775AA
HP Conferencing Keyboard	K8P74AA
HP Wireless Keyboard and Mouse	QY449AA
HP USB Keyboard	QY776AA
HP PS/2 Standard Keyboard	DT527AA
HP USB Smart Card (CCID) Keyboard	BV813AA
HP USB and PS/2 Washable Keyboard and Mouse Kit	BU207AA

I/O Cards and Adapters

	Part Number
HP PCIe x1 Parallel Port Card	N1M40AA
HP Serial Port Adapter	PA716A

System Memory

	Part Number
HP 2GB DDR3L-1600 DIMM	N1M45AA
HP 4GB DDR3L-1600 DIMM	N1M46AA
HP 8GB DDR3L-1600 DIMM	N1M47AA

Multimedia Devices

	Part Number
HP Desktop G2 9.5mm Slim DVD-ROM Drive	N1M41AA
HP Desktop G2 9.5mm Slim SuperMulti DVD Writer Drive	N1M42AA
HP Desktop G2 9.5mm Slim BDXL Blu-Ray Writer Drive	N1M43AA
HP USB Business Speakers	D9J19AA
HP Business Headset	QK550AA

Security Devices

	Part Number
HP Business PC Security Lock Kit	PV606AA
HP UltraSlim Cable Lock	H4D73AA

Stands and Accessories

	Part Number
HP EliteDesk/ProDesk G2 (10 kit) Bezel Support Kit	N1M44AA
HP 2x2 SFF Stand	N3R84AV

LANDesk Software (E-Delivery)

Contact your HP representative for available options.

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