

Overview

HP Z230 Tower Workstation

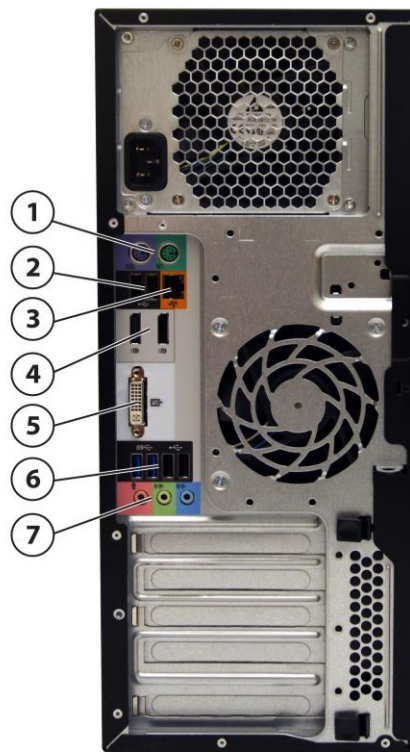


1. Optional Handle* in Top 5.25" Bay
2. Optional 14-in-1 Media Card Reader
3. Optional External Slim Optical Drive Bay
4. Power Button
5. Front I/O (in top to bottom order): 1 USB 2.0 Battery Charging Port, 1 USB 2.0 port, 2 USB 3.0 (blue) ports, Headphone, Microphone



View our **Z230**
inventory here

Overview



1. PS/2 ports (keyboard, mouse)
2. 2 USB 2.0
3. RJ-45 to integrated GBE
4. 2 DisplayPort (DP 1.2) output from Intel HD graphics (available on selected processors only)
5. DVI-I single link
6. 2 USB 3.0, 2 USB 2.0
7. 1 Audio Line In, 1 Audio Line Out, 1 Microphone

Overview

Form Factor	Minitower
Operating Systems	Preinstalled: - Windows 7 Professional 32/64 - Windows 7 Professional 64-bit (National Academic) - Windows 8.1 Pro 64-bit - Windows 8.1 Standard 64-bit - Windows 8.1 Single Language (EM) - Windows 8.1 Simplified Chinese Edition 64-bit - Windows 8.1 Pro Downgrade to Windows 7 Professional 32/64 - Windows 8.1 Pro Downgrade to Windows 7 Professional 32/64 (National Academic) - HP Installer Kit for Linux (includes drivers for 64-bit OS versions of REL 6.6 and REL 7, SUSE Linux Enterprise Desktop (SLED) 11, Ubuntu 14.04) - Ubuntu 14.04 - SUSE Linux Enterprise Desktop 11 64-bit (90 day license) - Red Hat Enterprise Linux Workstation (1 year paper license available; Preinstall not available) Supported: - Windows 10 64-bit - Windows 8/8.1 Enterprise 64-bit - Windows 7 Enterprise 32/64 - Red Hat Enterprise Linux Desktop/Workstation 6, 7 NOTES: For detailed OS/hardware support information for Linux, see: http://www.hp.com/support/linux_hardware_matrix

Name	Cores	Clock Speed (GHz)	Intel® Turbo Boost Technology ¹	Cache (MB)	Memory Speed (MT/s)	Hyper-Threading	Integrated Graphics	Featuring Intel® vPro™ Technology	TDP (W)
Intel® Xeon® processor E3-1281v3	4	3.7	4.1	8	1600	Y	N/A	Y	80W
Intel® Xeon® processor E3-1280v3	4	3.6	4.0	8	1600	Y	N/A	Y	80W
Intel® Xeon® processor E3-1271v3	4	3.6	4.0	8	1600	Y	N/A	Y	80W
Intel® Xeon® processor E3-1246v3	4	3.5	3.9	8	1600	Y	Intel HD Graphics P4600	Y	84W
Intel® Xeon® processor E3-1245v3	4	3.4	3.8	8	1600	Y	Intel HD Graphics P4600	Y	84W
Intel® Xeon® processor E3-1241v3	4	3.5	3.9	8	1600	Y	N/A	Y	80W
Intel® Xeon® processor E3-1240v3	4	3.4	3.8	8	1600	Y	N/A	Y	80W
Intel® Xeon® processor E3-1231v3	4	3.4	3.8	8	1600	Y	N/A	Y	80W
Intel® Xeon® processor E3-1226v3	4	3.3	3.7	8	1600	N	Intel HD Graphics P4600	Y	84W
Intel® Xeon® processor E3-1225v3	4	3.2	3.6	8	1600	N	Intel HD Graphics P4600	Y	84W
Intel® Core™ i7-4790 processor	4	3.6	4.0	8	1600	Y	Intel HD Graphics 4600	Y	84W

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Intel® Core™ i5-4690 processor	4	3.5	3.9	6	1600	N	Intel HD Graphics 4600	Y	84W
Intel® Core™ i5-4590 processor	4	3.3	3.7	6	1600	N	Intel HD Graphics 4600	Y	84W
Intel® Core™ i3-4350 processor	2	3.6	NA	4	1600	Y	Intel HD Graphics 4600	N	54W
Intel® Core™ i3-4170 processor	2	3.7	NA	3	1600	Y	Intel HD Graphics 4400	N	54W
Intel® Core™ i3-4160 processor	2	3.6	NA	3	1600	Y	Intel HD Graphics 4400	N	54W
Intel® Core™ i3-4150 processor	2	3.5	NA	3	1600	Y	Intel HD Graphics 4400	N	54W
Intel® Pentium® G3240 processor	2	3.1	NA	3	1333	N	Intel HD Graphics	N	54W

¹The specifications shown in this column represent the maximum turbo frequency with one core active. Turbo boost stepping occurs in 100MHz increments. Processors that do not have turbo functionality are denoted as N/A.

Available Processor Disclaimers

Integrated Intel® HD graphics is not supported on the Intel Xeon processor E3-1230v3, E3-1240v3, E3-1270v3 or E3-1280v3.

Intel® Xeon E3, Intel Core i3 and Intel Pentium processors can support either ECC or non-ECC memory; Intel® Core i5/i7 processors only support non-ECC memory.

Intel's numbering is not a measurement of higher performance. Processor numbers differentiate features within each processor family, not across different processor families. See: http://www.intel.com/products/processor_number/ for details.

64-bit computing on Intel® 64 architecture requires a computer system with a processor, chipset, BIOS, operating system, device drivers and applications enabled for Intel 64 architecture. Processor will not operate (including 32-bit operation) without an Intel 64 architecture-enabled BIOS. Performance will vary depending on your hardware and software configurations. See: <http://www.intel.com/info/em64t> for more information.

Dual-Core and Quad-Core technologies are designed to improve performance of multithreaded software products and hardware-aware multitasking operating systems and may require appropriate operating system software for full benefits; check with software provider to determine suitability; Not all customers or software applications will necessarily benefit from use of these technologies.

Color

Jack Black

Expansion Slots (see system board section for more details)

1 PCIe Gen3 x16 slot
1 PCIe Gen2 x4 slot /x16 connector
1 PCIe Gen2 x1 slot/x4 connector
1 PCIe Gen2 x1 slot
1 PCI slot 32-bit

In the PCIe Gen3 x16 slot, if it is not being used for a graphics card, only cards certified as After Market Options for this platform are supported.

Expansion Bays (see storage section for more details)

- 2 external Half Height 5.25" Bays
- 1 external Slim Optical Drive Bay
- 2 internal 3.5" Drive Bays

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	• 1 internal 2.5" Drive Bay
Front I/O	2 USB 3.0, 1 USB 2.0, 1 USB 2.0 Charging Data Port, 1 Headphone, and 1 Microphone.
Internal I/O	1 USB 3.0 and 3 USB 2.0 ports available as 2 separate 2x10(3.0 x1, 2.0 x1) and 2x5(2.0 x2) header: supports one HP Internal USB 2.0 Port Kit and one USB 3.0 Media Card Reader.
Rear I/O	1 DVI-I Single Link and 2 DisplayPort (DP 1.2) outputs from Intel HD graphics (available on specific processors only); 2 USB 3.0 ports, 4 USB 2.0 ports, 1 serial port (optional), 1 parallel port (optional), 2 PS/2, RJ-45 (LoM), 1 Audio Line-in, and 1 Audio Line-out, Microphone; 2 IEEE 1394b ports (optional).
Interfaces Supported	14-in-1 Media Card Reader (optional)
Chassis Dimensions (H x W x D)	Standard minitower orientation: 399mm x 170mm x 442mm (15.7 x 6.7 x 17.4 in)
Weight	Exact weights depend upon configuration: Minimum: 8.8 kg (19.4 lb) Typical*: 9.5 kg (20.94 lb) Maximum: 11.8 kg (26.01 lb) Supported Weight (desktop orientation): 35 kg (77 lb) * Typical weight when configured with 2 3.5" hard drives, 1 optical drive, 2 DIMMs and 1 NVIDIA Quadro K600 graphics card
Temperature	Operating: 40° to 95°F (5° to 35°C) Non-operating: -40° to 140°F (-40° to 60°C) NOTES: Derate the maximum operating temperature by one degree C (1.8 degrees F) for every 305m (1,000 ft) altitude over 1,524m (5,000 ft).
Humidity	Operating: 8% to 85% Non-operating: 8% to 90%
Maximum Altitude (non-pressurized)	Operating: 3,000 m; 10,000 ft Non-operating: 9,100 m; 30,000 ft
Power Supply	400 watts wide-ranging, active Power Factor Correction, 92% Efficient 320W Standard Efficiency wide-ranging, active PFC Power Supply option available in some countries. The Power Supply Efficiency Report for the 400W 92% Efficiency Power Supply may be found at the following link: http://www.pluginloadsolutions.com/psu_reports/HEWLETT-PACKARD%20COMPANY_704427-001%20(DPS-400AB-19%20A)_400W_ECOS%203496_Report.pdf
Backup Devices	For a complete listing of compatible DAT tape drives, LTO tape drives and RDX Removable Disk Backup System offerings, please visit http://www.hp.com/go/connect
Chipset	Intel® C226 chipset
Memory	4 DIMM slots, supporting up to 32GB ECC/non-ECC, DDR3 1600 MT/s
Memory disclaimers	The CPUs determine the speed at which the memory is clocked. If a 1333 MT/s capable CPU is used in the system, the maximum speed the memory will run at is 1333 MT/s regardless of the specified speed of

Overview

	the memory.
Workstation ISV Certifications	See the latest list of certifications at http://www.hp.com/united-states/campaigns/workstations/partnerships.html

Supported Components

Processors

	Factory Configured	Option Kit	Support Notes
Intel® Xeon® processor E3-1200 v3 family (Z230)			
Intel® Xeon® processor E3-1281v3, Quad-Core, 8 MB cache, 3.7 GHz, up to 4.1 GHz with Intel Turbo Boost Technology	Y	N	See Note 2
Intel® Xeon® processor E3-1280v3, Quad-Core, 8 MB cache, 3.6 GHz, up to 4.0 GHz with Intel Turbo Boost Technology	Y	N	See Note 2
Intel® Xeon® processor E3-1271v3, Quad-Core, 8 MB cache, 3.6 GHz, up to 4.0GHz with Intel Turbo Boost Technology	Y	N	See Note 2
Intel® Xeon® processor E3-1246v3, Quad-Core, 8 MB cache, 3.5 GHz, up to 3.9 GHz with Intel Turbo Boost Technology	Y	N	See Note 2
Intel® Xeon® processor E3-1245v3, Quad-Core, 8 MB cache, 3.4 GHz, up to 3.8 GHz with Intel Turbo Boost Technology	Y	N	See Note 2
Intel® Xeon® processor E3-1241v3, Quad-Core, 8 MB cache, 3.5 GHz, up to 3.9 GHz with Intel Turbo Boost Technology	Y	N	See Note 2
Intel® Xeon® processor E3-1240v3, Quad-Core, 8 MB cache, 3.4 GHz, up to 3.8 GHz with Intel Turbo Boost Technology	Y	N	See Note 2
Intel® Xeon® processor E3-1231v3, Quad-Core, 8 MB cache, 3.4 GHz, up to 3.8 GHz with Intel Turbo Boost Technology	Y	N	See Note 2
Intel® Xeon® processor E3-1226v3, Quad-Core, 8 MB cache, 3.3 GHz, up to 3.7 GHz with Intel Turbo Boost Technology	Y	N	See Note 2
Intel® Xeon® processor E3-1225v3, Quad-Core, 8 MB cache, 3.2 GHz, up to 3.6 GHz with Intel Turbo Boost Technology	Y	N	See Note 2
4th generation Intel® Core™ processor family			
Intel® Core™ i7-4790 processor, Quad-Core, 8 MB cache, 3.6 GHz, up to 4.0 GHz with Intel Turbo Boost Technology	Y	N	See Note 3
Intel® Core™ i5-4690 processor, Quad-Core, 6 MB cache, 3.5 GHz, up to 3.9 GHz with Intel Turbo Boost Technology	Y	N	See Note 3
Intel® Core™ i5-4590 processor, Quad-Core, 6 MB cache, 3.3 GHz, up to 3.7 GHz with Intel Turbo Boost Technology	Y	N	See Note 3
Intel® Core™ i3-4350 processor, Dual-Core, 4 MB cache, 3.6 GHz	Y	N	See Note 2
Intel® Core™ i3-4170 processor, Dual-Core, 3 MB cache, 3.7 GHz			
Intel® Core™ i3-4160 processor, Dual-Core, 3 MB cache, 3.6 GHz	Y	Y	
Intel® Core™ i3-4150 processor, Dual-Core, 3 MB cache, 3.5 GHz	Y	N	See Note 2
Dual Core Intel® Pentium® Processors (Z230)			

Supported Components

Intel® Pentium® G3240 processor, Dual-Core, 3 MB cache, 3.1 GHz Y N See Note 2

NOTE 1: Intel HD Graphics P4600 supports workstation-specific graphics drivers for improved compatibility and performance on select professional applications, compared to Intel HD Graphics 4600.

NOTE 2: These processors support either ECC or non-ECC memory

NOTE 3: These processors support only non-ECC memory

Monitors / Displays

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP Z Display Z30i 30-inch IPS LED Backlit Monitor				
HP Z Display Z27i 27-inch IPS LED Backlit Monitor				
HP Z Display Z24i 24-inch IPS LED Backlit Monitor				
HP Z Display Z23i 23-inch IPS LED Backlit Monitor				
HP Z Display Z22i 21.5-inch IPS LED Backlit Monitor				
HP ZR2740w 27-inch LED Backlit IPS Monitor				
HP ZR2440w 24-inch LED Backlit IPS Monitor				
HP ZR2330w 23-inch IPS LED Backlit Monitor				
Supported by all Operating Systems available from HP				
Screen Size Diagonally Measured				

Hard Drives

SATA Hard Drives

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
SATA (Serial ATA) Hard Drives for HP Workstations				
500GB SATA 7200 rpm 6Gb/s 3.5" HDD	Y	Y	LQ036AA	
1TB SATA 7200 rpm 6Gb/s 3.5" HDD	Y	Y	LQ037AA	
2.0TB SATA 7200 rpm 6Gb/s 3.5" HDD	Y	Y	QB576AA	
3.0TB SATA 7200 rpm 6Gb/s 3.5" HDD	Y	Y	QF298AA	
4TB SATA 7200 rpm 6Gb/s 3.5" HDD	Y	Y	K4T76AA	
500GB SATA 7.2K SED SFF HDD	Y	N	(not available today as After Market Option)	
1TB SATA 7200 rpm 8GB 3.5" SSHD (hybrid)	Y	Y	M7S54AA	

SATA Solid State Drives HP Solid State Drives (SSDs) for Workstations

HP 128GB SATA 6Gb/s SSD	Y	Y	A3D25AA	
HP 256GB SATA 6Gb/s SSD	Y	Y	A3D26AA	
HP 512GB SATA 6Gb/s SSD	Y	Y	D8F30AA	
HP 1TB SATA 6Gb/s SSD	Y	Y	F3C96AA	
Intel Pro 1500 180GB SATA SSD	Y	Y	F5Z70AA	
Samsung Enterprise 240GB SATA SSD	Y	Y	F0W94AA	
Samsung Enterprise 480GB SATA SSD	Y	Y	F0W95AA	

Supported Components

Intelligent Disk Caching

64GB SSD Disk Cache Module

**Factory
Configured**

Y

**Option
Kit**

N

**Option
Kit Part
Number**

(not
available
today as
After
Market
Option)

**Support
Notes**

Not
supported
on Linux

NOTE: Intelligent Disk Caching SSD module uses Intel's Smart Response Technology. The SSD acts only as cache for the HDD and does not show up as a logical volume.

PCIe SSDs

PCIe SSDs for HP Workstations

HP Z Turbo Drive 512GB SSD*

Y

Y

G3G89AA

HP Z Turbo Drive 256GB SSD*

Y

Y

G3G88AA

Hard Drive Controllers

**Factory
Configured**

Option Kit

**Support
Notes**

Integrated SATA Controller (Z230)

Integrated SATA Controller, RAID 0,1 supported: 5x 6 Gb/s ports

Y

N

Factory integrated RAID on motherboard for SATA drives

RAID 0 Configuration – Striped Array

Y

N

RAID 1 Configuration – Mirrored Array

Y

N

SATA hardware RAID is not supported on Linux systems. The Linux kernel, with built-in software RAID, provides excellent functionality and performance. It is a good alternative to hardware-based RAID. All drives must be identical in type and capacity

Boot volume/RAID array must be less than 2 TB (for 32-bit Windows).

NOTE 1: Requires identical hard drives (speeds, capacity, interface).

Graphics

**Factory
Configure
d**

Option Kit

**Option Kit
Part
Number**

**Support
Notes**

**Supported
of
cards
Mixed?**

Integrated Intel HD Graphics Media Accelerators (Z230)

Intel HD Graphics P4600

Y

N

Available on
Intel® Xeon®
E3-12x5 v3
processors
only. See Note
1.

1

NO

Intel HD Graphics 4600

Y

N

Available on
Intel Core™
i7-4xxx/ Core
i5-4xxx/ Core
i3-4330
processors.
See Note 1.

1

NO

Intel HD Graphics 4400

Y

N

Available on

1

NO

Supported Components

Intel HD Graphics	Y	N		Intel Core i3-4130 processor. See Note 1. Available on Intel Pentium® 3220 processor. See Note 1	1	NO
Professional 2D						
NVIDIA NVS 310 512MB Graphics	Y	Y	A7U59AA	Can be mixed with one NVS 510	2	YES
NVIDIA NVS 315 1GB Graphics	Y	Y	E1U66AA		1	NO
NVIDIA NVS 510 2GB Graphics	Y	Y	C2J98AA	Can be mixed with one NVS 310	1	YES
Graphics Cable Adapters						
HP DisplayPort to Dual Link DVI Adapter	Y	Y	NR078AA		1	
HP DisplayPort To DVI-D Adapter (4-Pack)	Y	N			1	
HP DisplayPort To DVI-D Adapter (2-Pack)	Y	N			1	
HP DisplayPort To DVI-D Adapter	Y	Y	FH973AA		1	
HP DisplayPort To VGA Adapter	Y	Y	AS615AA		1	
Entry 3D						
AMD FirePro W2100 2GB Graphics	Y	Y	J3G91AA		2	
NVIDIA Quadro K420 1GB Graphics	Y	Y	J3G86AA		2	
NVIDIA Quadro K620 2GB Graphics	Y	Y	J3G87AA		1	
Mid-range 3D						
AMD FirePro W5100 4GB Graphics	N	Y	C2K00AA		1	
NVIDIA Quadro K2000 2GB Graphics	Y	Y	C2J93AA		1	
NVIDIA Quadro K2200 4GB Graphics	Y	Y	J3G88AA		1	
High End 3D						
AMD FirePro W7000 4GB Graphics	N	Y	C2K00AA	Requires 400W PSU. Not supported with 320W	1	NO

Supported Components

AMD FirePro W7100 8GB Graphics	N	Y	J3G93AA	PSU. Requires 400W PSU. Not supported with 320W PSU.	1
NVIDIA Quadro K4200 4GB Graphics	Y	Y	J3G89AA	Requires 400W PSU. Not supported with 320W PSU.	1

NOTE 1: Intermixing integrated Intel HD graphics and discrete graphics cards in order to drive more than three displays can be enabled using the Computer (F10) Setup Utility. However, HP recommends using only discrete graphics when four or more displays are required to be supported.

Memory

Sub-Section Description/Notes

Intel® Xeon E3, Intel Core i3 and Intel Pentium processors can support either ECC or non-ECC memory; Intel® Core i5/i7 processors only support non-ECC memory.

CTO

Support Notes

DDR3-1600 nECC Unbuffered DIMMs CTO

HP 32GB (4x8GB) DDR3-1600 nECC RAM
HP 16GB (2x8GB) DDR3-1600 nECC RAM
HP 16GB (4x4GB) DDR3-1600 nECC RAM
HP 8GB (2x4GB) DDR3-1600 nECC RAM
HP 4GB (1x4GB) DDR3-1600 nECC RAM

DDR3-1600 ECC Unbuffered DIMMs - CTO

HP 32GB (4x8GB) DDR3-1600 ECC RAM
HP 16GB (2x8GB) DDR3-1600 ECC RAM
HP 16GB (4x4GB) DDR3-1600 ECC RAM
HP 8GB (2x4GB) DDR3-1600 ECC RAM
HP 4GB (2x2GB) DDR3-1600 ECC RAM
HP 4GB (1x4GB) DDR3-1600 ECC RAM

Sub-Section Description/Notes

Two channels of DDR3 memory are supported. To realize full performance at least one DIMM must be inserted into each channel.

AMO

Option Kit Part Number

Support Notes

DDR3-1600 nECC Unbuffered DIMMs AMO

HP 8GB (1x8GB) DDR3-1600 non-ECC RAM
HP 4GB (1x4GB) DDR3-1600 nECC RAM

B1S54AA

B1S53AA

DDR3-1600 ECC Unbuffered DIMMs - AMO

HP 8GB (1x8GB) DDR3-1600 ECC RAM
HP 4GB (1x4GB) DDR3-1600 ECC RAM
HP 2GB (1x2GB) DDR3-1600 ECC RAM

A2Z50AA

A2Z48AA

A2Z47AA

NOTE: Only unbuffered DDR3 DIMMs are supported.

The CPUs determine the speed at which the memory is clocked. If a 1333 MHz capable CPU is used in the system, the maximum speed the memory will run at is 1333 MHz regardless of the specified speed of the

Supported Components

memory.

Multimedia and Audio Devices

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP Thin USB Powered Speakers, Low Halogen	N	Y	KK912AA	
Integrated Realtek HD ALC221 Audio	Y	N		

Optical and Removable Storage

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP Slim DVD-ROM Drive	Y	Y	E5Z82AA	For use as 1st Optical Drive
HP Slim SuperMulti DVDRW SATA Drive	Y	Y	E5Z80AA	For use as 1st Optical Drive
HP Slim Blu-ray Writer	Y	Y	E5Z81AA	For use as 1st Optical Drive
HP 16X DVD-ROM SATA Drive (non Lightscribe)	Y	Y	AR629AA	For use as 2nd Optical Drive
HP 16X DVD+/-RW SuperMulti SATA Drive	Y	Y	QS208AA	For use as 2nd Optical Drive
HP 15-in-1 Media Card Reader	Y	Y	F4N90AA	

Actual speeds may vary. Does not permit copying of commercially available DVD movies or other copyright protected materials. Intended for creation and storage of your original material and other lawful uses. Double Layer discs can store more data than single layer discs. However, double-layer discs burned with this drive may not be compatible with many existing single-layer DVD drives and players.

As Blu-ray is a new format containing new technologies, certain disc, digital connection, compatibility and/or performance issues may arise, and do not constitute defects in the product. Flawless playback on all systems is not guaranteed. In order for some Blu-ray titles to play, they may require a DVI or HDMI digital connection and your display may require HDCP support. HD-DVD movies cannot be played on this workstation.

Controller Cards

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP IEEE 1394b FireWire PCIe Card	Y	Y	NK653AA	See Note 1
HP Thunderbolt-2 PCIe 1-port I/O Card	Y	Y	F3F43AA	See Note 2

NOTE 1: For the HP Z230 CMT Workstation the 1394b card is only supported on Slots 3, 4, or 5

NOTE 2: Note 2: Four USB 3.0 ports are available integrated on the motherboard (2 front, 2 rear).

Supported Components

Integrated USB 3.0 ports are supported under Microsoft Windows 7 or Microsoft Windows 8 operating systems only.

Networking and Communications

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
Integrated Intel I217LM PCIe GbE Controller	Y	N		See Notes 1, 2, 3
Intel Ethernet I210-T1 PCIe NIC	Y	Y	E0X95AA	See Notes 3, 4
HP X520 10GbE Dual Port Adapter	Y	Y	C3N52AA	
HP 10GbE SFP+ SR Transceiver	Y	Y	C3N53AA	
Intel 6205 802.11 a/b/g/n PCIe x1 WLAN Card	N	Y	E0X93AA	

NOTE 1: The integrated network connection is required to support Intel vPro Technology.

NOTE 2: If AMT is enabled network teaming with the integrated LAN port is not possible.

NOTE 3: "Gigabit" Ethernet indicates compliance with IEEE standard 802.3ab for Gigabit Ethernet, and does not connote actual operating speed of 1 Gb/sec. For high speed transmission, connection to a Gigabit Ethernet server and network infrastructure is required.

NOTE 4: The Intel Ethernet I210-T1 PCIe NIC is supported on the following operating systems:

- Microsoft Windows 7 and Windows 8 32-bit and 64-bit versions
- Red Hat Enterprise Linux(RHEL)
- SLED 11.

Racking and Physical Security

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP xw4/Z2/Z4 Depth Adjustable Fixed Rail Rack Kit	N	Y	WH340AA	
HP Solenoid Lock and Hood (TWR) Sensor	Y	Y	E0X96AA	
HP Business PC Security Lock Kit	N	Y	PV606AA	
HP UltraSlim Cable Lock Kit	N	Y	H4D73AA	

Input Devices

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP SpacePilot Pro 3D USB Intelligent Controller	N	Y	WH343AA	
HP SpaceMouse Pro USB 3D Input Device	N	Y	B4A20AA	
HP USB 1000dpi Laser Mouse	Y	Y	QY778AA	
HP USB Optical 3-Button Mouse	Y	Y	DY651A	
HP USB Optical Mouse	Y	Y	QY777AA	
HP PS/2 Mouse	Y	Y	QY775AA	
HP 2.4GHz Wireless Keyboard & Mouse	N	Y	NB896AA	
HP USB CCID SmartCard Keyboard	Y	Y	BV813AA	
HP USB Keyboard	Y	Y	QY776AA	
HP PS/2 Keyboard	Y	Y	QY774AA	
3Dconnexion CADMouse	Y	Y	M5C35AA	

Supported Components

Other Hardware

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP Power Cord Kit	N	Y	DM293A	
HP Workstation Mouse Pad	Y	N		Japan only
HP Serial Port Adapter	Y	Y	PA716A	
HP ENERGY STAR Qualified Configuration	Y	N		
HP Parallel Port Adapter Kit	N	Y	KD061AA	
HP Internal USB Port Kit	N	Y	EM165AA	
HP eSATA PCI Cable Kit	Y	Y	FH966AA	

Software

	Factory Configured	Option Kit	Support Notes
HP Performance Advisor	Y	N	See Note 1
HP Remote Graphics Software (RGS) 6.0	Y	N	See Note 2
PDF Complete - Corporate Edition	Y	N	
MS Office Home & Business 2013	Y	N	
Cyberlink PowerDVD and Power2Go	Y	N	
HP PC Hardware Diagnostics UEFI	Y	N	Windows OS only
HP Client Security Software	Y	Y	

NOTE 1: Supports, and preinstalled with, Windows 7 and Windows 8 only. Also available as a free download from <http://www.hp.com/go/performanceadvisor>

NOTE 2: Supported Operating Systems:

- Windows 7 Professional
- Windows 8 Pro
- RHEL v5.2 - v6.3
- SLED 11 SP2

Operating Systems

Support Notes

Genuine Windows® 7 Professional 32-bit	See http://www.microsoft.com/windows/windows-7/ for support details.
Genuine Windows® 7 Professional 64-bit	See http://www.microsoft.com/windows/windows-7/ for support details.
Windows 8.1 Pro 64-bit	
Windows 8.1 Simplified Chinese Edition 64-bit	
Windows 8.1 Pro Downgrade to Windows 7 Professional 32-bit	
Windows 8.1 Pro Downgrade to Windows 7 Professional 64-bit	
Windows 8.1 Pro Downgrade to Windows 7 Professional 32-bit (National Academic)	
Windows 8.1 Pro Downgrade to Windows 7 Professional 64-bit (National Academic)	
Windows 8.1 Standard 64-bit	
HP Linux Installer Kit	See http://h20331.www2.hp.com/hpsub/cache/537200-

Supported Components

SUSE Linux Enterprise Desktop 11

Red Hat Enterprise Linux (RHEL) Workstation -
Paper License (1yr)

Ubuntu Linux 14.04

[0-0-225-121.html](#)

See <http://www.suse.com/products/desktop/>

See <http://www.redhat.com/rhel/desktop/>

System Technical Specifications

System Board		
System Board Form Factor	ATX 27.69 x 24.38 mm (10.9 x 9.6 inches)	
Processor Socket	Single LGA-1150	
CPU Bus Speed	DMI	
Chipset	Intel® PCH C226	
Memory Expansion Slots	4 DDR3 memory slots	
Memory Type Supported	DDR3, UDIMM (Unbuffered), ECC& non-ECC	
Memory Modes	Non-Interleaved for single channel. Interleaved when both channels are populated.	
Memory Speed Supported	1600MT/s DDR3	
Memory Protection	ECC available on data	
Maximum Memory	32GB	
Memory Configuration (Supported)	4GB and 8GB non-ECC/ 2GB, 4GB and 8GB ECC unbuffered DIMMs are supported. ECC and non-ECC memory DIMMs cannot be mixed on the same system. NOTE: Maximum memory capacities assume 64-bit operating systems, such as Genuine Windows® 7 Professional 64-Bit or Red Hat Linux 64-bit. 32-bit Windows Operating Systems support up to 4 GB.	
PCI Express Connectors	1 PCI Express Gen3 slot x16 mechanical/ x16 electrical (full height, full length) 1 PCI Express Gen2 slot x4 mechanical/ x1 electrical (full height) 1 PCI Express Gen2 slot x16 mechanical/ x4 electrical (full height, full length) 1 PCI Express Gen2 slot x1 mechanical/ x1 electrical (full height) In the PCIe Gen3 (x16 electrical/x16 mechanical) slot, if it is not being used for a graphics card, only cards certified as After Market Options for this platform are supported.	
PCI Connectors (5.0V)	1 PCI slot, full height, full length	
Supported Drive Interfaces	SATA	Integrated (5) Serial ATA interfaces (6Gb/s SATA). One port can optionally be used for eSATA. RAID 0 and 1 supported. Factory integrated RAID is Microsoft Windows only. RAID 5 is supported by Software XOR.
	Serial Attached SCSI	None
	Integrated RAID	NOTE: Requires identical hard drives (speeds, capacity, interface)
	Integrated Graphics	Intel HD Graphics 4600 (on Core i5/i7-4xxx processors); Intel HD Graphics P4600 (on Intel Xeon E3-12x5v3 processors). Based on Unified Memory Architecture (UMA)- a region of system memory is reserved and dedicated to the graphics display. Support for Microsoft DirectX 11, OpenGL 4.0 and OpenCL 1.2 on Intel HD Graphics P4600; 1 DVI-I and 2 DP 1.2 graphics ports integrated in motherboard; Supports up to three simultaneous displays across DP & DVI-I outputs. Max. resolution supported on DVI- I ports: 1920x1200 @60Hz Max. resolution supported on DP 1.2 ports: 3840x2160 @60Hz

System Technical Specifications

	Network Controller	Integrated Ethernet PHY Connection I217LM. Management capabilities: WOL, PXE 2.1 and AMT 9
	External SATA (eSATA)	1 port eSATA capable (SATA 5) with optional eSATA After-Market Option cable kit.
	IDE connector	No
	Floppy connector	No
	Serial	1 internal header (requires optional Serial Port Adapter Kit)
	2nd Serial	No
	Parallel	1 internal header (optional Parallel Port Adapter required)
	HD Integrated Audio	Yes
	CD-ROM input (Audio)	No
	AUX input (Audio)	No
IEEE 1394 Connector(s)	Rear	2 IEEE 1394b ports (requires optional PCIe 1394b card)
	Internal	No
USB Connector(s)	Front	2 USB 3.0, 1 USB 2.0, 1 USB 2.0 Charging Data Port.
	Rear	2 USB 3.0, 4 USB 2.0
	Internal	1 USB 3.0 and 3 USB 2.0 ports available as 2 separate 2x10(3.0 x1, 2.0 x1) and 2x5(2.0 x2) headers: supports 1 HP Internal USB Port Kits plus one USB 3.0 Media Card Reader.
HD Integrated Audio	Yes	
Flash ROM	Yes	
CPU Fan Header	Yes	
Chassis Fan Header	1 Rear System Chassis Fan Header, 1 Optional Front Chassis Fan Header	
Front Control Panel/Speaker Header	Yes	
CMOS Battery Holder - Lithium	Yes	
Integrated Trusted Platform Module	Integrated TPM 1.2. The TPM module disabled where restricted by law, i.e. Russia.	
Power Supply Headers	Yes	
Power Switch, Power LED & Hard Drive LED Header	Yes	
Clear Password Jumper	Yes	
Keyboard/Mouse	USB or PS/2	
	400W Wide Ranging, Active PFC, 92% Efficient; (Note: 320W Standard Efficiency wide-ranging, active PFC Power Supply option available in some countries). The Z230 Tower 400W PSU Efficiency Report can be found at this link: http://www.pluginloadsolutions.com/psu_reports/HEWLETT-PACKARD%20COMPANY_704427-001%20(DPS-400AB-19%20A)_400W_ECOS%203496_Report.pdf	
Operating Voltage Range	90-269 VAC	
Rated Voltage Range	100-240 VAC	
Rated Line Frequency	50-60 Hz	
Operating Line Frequency Range	47-66 Hz	
Rated Input Current	6A @ 100-240V	

System Technical Specifications

Heat Dissipation	Typical: 444 btu/hr (112 kcal/hr) Maximum: 1484 btu/hr (374 kcal/hr)
Power Supply Fan	92mm x 92mm x 25mm 4-wire PWM
ENERGY STAR® qualified (Config Dependent)	Yes
CECP Compliant @ 220V	Yes
FEMP Standby Power Compliant	Yes, with Wake-on-LAN disabled: <2W in S5- Power Off
Built-in Self Test (BIST) LED	Yes
Surge Tolerant Full Ranging Power Supply (withstands power surges up to 2000V)	Yes
Hood Lock Header	Yes
ErP Lot 6- Tier 1 Compliance @ 230V (<1W in S5- Power Off)	Yes
ErP Lot 6- Tier 2 Compliance @ 230V (<0.5W in S5- Power Off)	Yes
Declared Noise Emissions (Entry-level and High-end configurations)	

System Configurations

Example Configuration #1	TBD	
Example Configuration #2	Processor Info	1x Intel Xeon E3-1280v3 3.6 8MB 4C HT 84W GT0 CPU
	Memory Info	8GB (2x 4GB) 1600 MT/s DDR3 ECC
	Graphics Info	1x NVIDIA Quadro K620 2GB Graphics
	Disks/Optical/Floppy	2x SATA 2 TB 7.2k rpm/ 1xDVD-RW, 1x DVD-ROM
	PSU	400W 92%
	OS /BIOS	--

Energy Consumption (Watts)		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	35.4 W		37.4 W		35.8 W	
	Windows Busy Typ (S0)	128 W		129 W		130 W	
	Windows Busy Max (S0)	153 W		152 W		154 W	
	Sleep (S3)	1.67 W	1.58 W	1.86 W	1.77 W	1.65 W	1.57 W
	Off (S5)	0.92 W	0.85 W	1.11 W	1.03 W	0.91 W	0.83 W
	Zero Power Mode (EuP)	0.28 W		0.45 W		0.26 W	
Heat Dissipation (Btu/hr)		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	121 btu/hr		128 btu/hr		122 btu/hr	
	Windows Busy Typ (S0)	437 btu/hr		440 btu/hr		444 btu/hr	

System Technical Specifications

	Windows Busy Max (S0)	522 btu/hr		519 btu/hr		525 btu/hr	
	Sleep (S3)	5.70 btu/hr	5.39 btu/hr	6.35 btu/hr	6.04 btu/hr	5.63 btu/hr	5.36 btu/hr
	Off (S5)	3.14 btu/hr	2.90 btu/hr	3.79 btu/hr	3.51 btu/hr	3.11 btu/hr	2.83 btu/hr
	Zero Power Mode (EuP)	0.96 btu/hr		1.54 btu/hr		0.89 btu/hr	

Example Configuration #3	Processor Info	1x Intel Xeon E3-1280v3 3.6 8MB 4C HT 84W GTO CPU					
	Memory Info	32GB (4x 8GB) 1600 MT/s DDR3 ECC					
	Graphics Info	1x NVIDIA Quadro K2000 2GB Graphics					
	Disks/Optical/Floppy	3x SATA 2 TB 7.2k rpm/ 1xDVD-RW, 1x DVD-ROM					
	PSU	400W 92%					
	OS / BIOS	--					

Energy Consumption (Watts)		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	46.4 W		48.5 W		47.2 W	
	Windows Busy Typ (S0)	149 W		150 W		152 W	
	Windows Busy Max (S0)	181 W		180 W		183 W	
	Sleep (S3)	2.68 W	2.57 W	2.87 W	2.77 W	2.68 W	2.57 W
	Off (S5)	0.92 W	0.85 W	1.11 W	1.03 W	0.91 W	0.83 W
	Zero Power Mode (EuP)	0.28 W		0.45 W		0.26 W	
Heat Dissipation (Btu/hr)		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	158 btu/hr		165 btu/hr		161 btu/hr	
	Windows Busy Typ (S0)	508 btu/hr		512 btu/hr		519 btu/hr	
	Windows Busy Max (S0)	618 btu/hr		614 btu/hr		624 btu/hr	
	Sleep (S3)	9.14 btu/hr	8.77 btu/hr	9.79 btu/hr	9.45 btu/hr	9.14 btu/hr	8.77 btu/hr
	Off (S5)	3.14 btu/hr	2.90 btu/hr	3.79 btu/hr	3.51 btu/hr	3.11 btu/hr	2.83 btu/hr
	Zero Power Mode (EuP)	0.96 btu/hr		1.54 btu/hr		0.89 btu/hr	

Declared Noise Emissions (Entry-level and High-end configurations)		
System Configuration (Entry level)	Processor Info	Intel Core i3-4130
	Memory Info	4GB (2x2GB) 1600 MT/s
	Graphics Info	Integrated Intel HD Graphics 4400
	Disks/Optical	1x 500 GB 7200 RPM SATA HDD; DVD-RW SuperMulti ODD

Declared Noise Emissions (in accordance with ISO 7779 and ISO 9296)		Sound Power (LWAd, bels)	Deskside Sound Pressure (LpAm, decibels)
	Idle	3.3	
	Hard drive Operating (random reads)	3.3	
	DVD-ROM Operating (sequential reads)		

System Technical Specifications

System Configuration (High-end)	Processor Info	Intel Xeon E3-1280v3 3.6 GHz
	Memory Info	16GB (4x4GB) DDR3 1600 MT/s
	Graphics Info	NVIDIA Quadro K600 graphics
	Disks/Optical	2x 1.0TB 7200rpm SATA HDDs; DVD-RW SuperMulti ODD

Declared Noise Emissions (in accordance with ISO 7779 and ISO 9296)		Sound Power (LWAd, bels)	Deskside Sound Pressure (LpAm, decibels)
	Idle	3.4	
	Hard drive Operating (random reads)	3.5	
	DVD-ROM Operating (sequential reads)		

Environmental Requirements	Temperature	Operating: 40° to 95° F (5° to 35° C) Non-operating: -40° to 140° F (-40° to 60° C)
	Humidity	Operating: 8% to 85% RH, non-condensing Non-operating: 8% to 90% RH, non-condensing
	Maximum Altitude	Operating: 3,000 m (10,000 ft) Non-operating: 9,100 m (30,000 ft)
	Dynamic (new)	Shock Operating: ½-sine: 40g, 2-3ms Non-operating: ½-sine: 160 cm/s, 2-3ms (~100g) square: 422 cm/s, 20g Vibration Operating random: 0.5g (rms), 5-300 Hz Non-operating random: 2.0g (rms), 10-500 Hz NOTES: Values represent individual shock events and do not indicate repetitive shock events. Values do not indicate continuous vibration.
	Cooling	Above 1524 m (5,000 ft) altitude, maximum operating temperature is de-rated by 1.8° F (1° C) per 305 m (1000 ft) elevation increase

Physical Security and Serviceability

Access Panel	Tool-less Includes system board and memory information
Optical Drive	Tool-less
Hard Drives	Tool-less
Expansion Cards	Tool-less
Processor Socket	Tool-less
Green User Touch Points	Yes, on tool-less internal chassis mechanisms
Color-coordinated Cables and Connectors	Yes
Memory	Tool-less

System Technical Specifications

System Board	Screw-In
Dual Color Power and HD LED on Front of Computer	Yes
Configuration Record SW	Yes
Over-Temp Warning on Screen	Yes
Restore CD/DVD Set	Consists of an operating system DVD (OSDVD) and a driver DVD (DRDVD). OSDVD restores the original operating system. DRDVD will provide all drivers for the system. The DRDVD may also contain applications that originally shipped with the system for optional installation. Applications can also be obtained from HP.com. OSDVD and DRDVD are orderable with the system and available from HP Support.
Dual Function Front Power Switch	Yes, causes a fail-safe power off when held for 4 seconds
Padlock Support	Yes (optional): Locks side cover and secures chassis from theft 0.22-in diameter padlock loop at rear of system
Cable Lock Support	Yes, Kensington Cable Lock (optional): Locks side cover and secures chassis from theft 3 mm x 7 mm slot at rear of system
Universal Chassis Clamp Lock Support	Yes (optional): Locks side cover and locks cables to chassis. Secures chassis from theft and allows multiple units to be chained together when used with optional cable Threaded feature at rear of system
Solenoid Lock and Hood Sensor	Yes (optional) The Solenoid Hood Lock eliminates the need for a physical key by making the chassis lockable through software and a password. You can also lock and unlock the chassis remotely over the network. The Sensor Kit detects when the access panel has been removed.
Rear Port Control Cover	Yes, locks rear IO cables to prevent cable theft
Serial, Parallel, USB, Audio, Network, Enable/Disable Port Control	Yes, enables or disables serial, USB, audio, and network ports
Removable Media Write/Boot Control	Yes, prevents ability to boot from removable media on supported devices (and can disable writes to media)
Power-On Password	Yes, prevents an unauthorized person from booting up the workstation
Setup Password	Yes, prevents an unauthorized person from changing the workstation configuration
3.3V Aux Power LED on System PCA	Yes
NIC LEDs (integrated) (Green & Amber)	Yes
CPUs and Heatsinks	A T-15 Torx or flat blade screwdriver is needed to remove the CPU heatsink before the CPU can be removed. CPU removal is tool-less
Power Supply Diagnostic LED	Yes
Front Power Button	Yes, ACPI multi-function
Front Power LED	Yes, blue (normal), red (fault)
Front Hard Drive Activity LED	Yes, green
Front ODD Activity LED	Yes
Internal Speaker	Yes
System/Emergency ROM Flash Recovery	Recovers corrupted system BIOS.

System Technical Specifications

Cooling Solutions	Air cooled forced convection
Power Supply Fans	92mm x 92mm x 25mm 4-wire PWM (non-serviceable)
CPU Heatsink Fan	Mainstream (<=95W): 92 mm x 92 mm x 25 mm 4-wire PWM
Chassis Fan	92mm x 92mm x 25mm 4-wire PWM (non-serviceable)
Memory Heatsink Fan	No
HP PC Hardware Diagnostics UEFI	HP PC Hardware Diagnostics (UEFI) 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 HP Support.
Access Panel Key Lock	No
ACPI-Ready Hardware	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.
Integrated Chassis Handles	Rear Recessed Handle; optional Optical Bay Front Handle available.
Power Supply	Requires T15 Torx or flat blade screwdriver
PCI Card Retention	Yes, rear (all), middle (optional), front (full-length cards with extender)
Flash ROM	Yes
Diagnostic Power Switch LED on board	Yes
Clear Password Jumper	Yes
Clear CMOS Button	Yes
CMOS Battery Holder	Yes
DIMM Connectors	Yes

BIOS	
BIOS 32-bit Services	Standard BIOS 32-bit Service Directory Proposal v0.4
PCI 3.0 Support	Full BIOS support for PCI Express through industry standard interfaces.
ATAPI	ATAPI Removable Media Device BIOS Specification Version 1.0.
BBS	BIOS Boot Specification v1.01. Provides more control over how and from what devices the workstation will boot.
WMI Support	WMI is Microsoft's implementation of Web-Based Enterprise Management (WBEM) for Windows. WMI is fully compliant with the Distributed Management Task Force (DMTF) Common Information Model (CIM) and WBEM specifications.
BIOS Power On	Users can define a specific day-of-week and time for the system to power on.
ROM Based Computer Setup Utility (F10)	Review and customize system configuration settings controlled by the BIOS.
System/Emergency ROM Flash Recovery with Video	Recovers system BIOS in corrupted Flash ROM.
Replicated Setup	Saves BIOS settings to USB flash device in human readable file. Repsetup.exe utility can then replicate these settings on machines being deployed without entering Computer Configuration Utility (F10 Setup).
SMBIOS	System Management BIOS 2.7.1, for system management information.

System Technical Specifications

Boot Control	Disables the ability to boot from removable media on supported devices.
Memory Change Alert	Alerts management console if memory is removed or changed.
Thermal Alert	Monitors the temperature state within the chassis. Three modes: • NORMAL - normal temperature ranges. • ALERTED - excessive temperatures are detected. Raises a flag so action can be taken to avoid shutdown or provide for a smoother system shutdown. • SHUTDOWN - excessive temperatures are encountered. Automatically shuts down the computer without warning before hardware component damage occurs.
Remote ROM Flash	Provides secure, fail-safe ROM image management from a central network console. Updates can be performed before starting the OS. Updates can be periodically scheduled.
ACPI (Advanced Configuration and Power Management Interface)	Allows the system to enter and resume from low power modes (sleep states). Enables an operating system to control system power consumption based on the dynamic workload. Makes it possible to place individual cards and peripherals in a low-power or powered-off state without affecting other elements of the system. Supports ACPI 4.0 for full compatibility with 64-bit operating systems.
Ownership Tag	A user-defined string stored in non-volatile memory that is displayed in the BIOS splash screen.
Remote Wakeup/Remote Shutdown	System administrators can power on, restart, and power off a client computer from a remote location.
ASF 2.0 Compliant	No.
Instantly Available PC (Suspend to RAM - ACPI sleep state S3)	Allows for very low power consumption with quick resume time.
Remote System Installation via F12 (PXE 2.1) (Remote Boot from Server)	Allows a new or existing system to boot over the network and download software, including the operating system.
ROM revision levels	Reports the system BIOS revision level in Computer Configuration Utility (F10 Setup). Version is available through an industry standard interface (SMBIOS) so that management SW applications can use and report this information.
System board revision level	Allows management SW to read revision level of the system board. Revision level is digitally encoded into the HW and cannot be modified.
Start-up Diagnostics (Power-on Self-Test)	Assesses system health at boot time with selectable levels of testing.
Auto Setup when new hardware installed	System automatically detects addition of new hardware.
Keyboard-less Operation	The system can be booted without a keyboard.
Localized ROM Setup	Common BIOS image supports System Configuration Utility (F10 Setup) menus in 12 languages with local keyboard mappings.
Asset Tag	Enables the user or IT administrator to set a unique tag string in non-volatile memory.
Per-slot Control	Allows I/O slot parameters (option ROM enable/disable) to be configured individually.
Adaptive Cooling	Control parameters are set according to detected hardware configuration for optimal acoustics.
Pre-boot Diagnostics	(Pre-video) critical errors are reported via beeps and blinks on the power LED.
Intel® Active Management Technology (AMT)	AMT 9.0; Allows workstation status to be monitored on a remote console
Digitally and Cryptographically Signed	Helps to prevent the installation of unauthorized versions of a BIOS (a rogue BIOS) from a virus, malware, or other code that could lead to compromised system security, data access, physical service,

System Technical Specifications

BIOS	or even system board replacement.
Master Boot Record Protection	A feature in the HP BIOS that prevents changes and/or infections to the Master Boot Record. Useful in protecting from viruses
Boot Block Emergency Recovery Mode (BIOS Recovery)	The HP BIOS offers a write-protected boot block ROM that provides recovery from a failed flashing of the computer BIOS. This special recovery mode prevents the system from becoming unusable or "bricked" when a BIOS update is interrupted.
Industry Standard Specification Support	
Industry Standard	Revision Supported by the BIOS
UEFI Specification Revision	UEFI 2.3.1
ACPI	Advanced Configuration and Power Management Interface, Version 4.0
ASF	Alert Standard Format Specification, Version 2.0
ATA (IDE)	AT Attachment 6 with Packet Interface (ATA/ATAPI-6), Revision 3b
CD Boot	"El Torito" Bootable CD-ROM Format Specification Version 1.0
EDD	- Enhanced Disk Drive Specification Version 1.1 - BIOS Enhanced Disk Drive Specification Version 3.0
EHCI	Enhanced Host Controller Interface for Universal Serial Bus, Revision 1.0
PCI	PCI Local Bus Specification, Revision 2.3 PCI Power Management Specification, Revision 1.1 PCI Firmware Specification, Revision 3.0
PCI Express	PCI Express Base Specification, Revision 2.0; PCI Express Base Specification, Revision 3.0.
PMM	POST Memory Manager Specification, Version 1.01
SATA	- Serial ATA Specification, Revision 1.0a - Serial ATAII: Extensions to Serial ATA 1.0, Revision 1.0a - Serial ATAII Cables and Connectors Volume 2 Gold - SATA-IO SATA Revision 3.0 Specification
SPD	PC SDRAM Serial Presence Detect (SPD) Specification, Revision 1.2B
TPM	Trusted Computing Group TPM Specification Version 1.2
USB	Universal Serial Bus Revision 1.1 Specification Universal Serial Bus Revision 2.0 Specification Universal Serial Bus Revision 3.0 Specification

Social and Environmental Responsibility

Eco-Label Certifications & Declarations	This product has received or is in the process of being certified to the following approvals and may be labeled with one or more of these marks: - ENERGY STAR® (energy-saving features available on selected configurations-Windows only) - US Federal Energy Management Program (FEMP) - China Energy Conservation Program - IT ECO declaration
Batteries	The battery in this product complies with EU Directive 2006/66/EC Battery size: CR2032 (coin cell) Battery type: Lithium Metal The battery in this product does not contain:

System Technical Specifications

	- Mercury greater than 5ppm by weight - Cadmium greater than 10ppm by weight - Lead greater than 40ppm by weight
Restricted Material Usage	This product meets the material restrictions specified in HP's General Specification for the Environment. http://www.hp.com/hpinfo/globalcitizenship/environment/pdf/gse.pdf Hewlett-Packard is committed to compliance with all applicable environmental laws and regulations, including the European Union Restriction of Hazardous Substances (RoHS) Directive. HP's goal is to exceed compliance obligations by meeting the requirements of the RoHS Directive on a worldwide basis.
Low Halogen Statement	This product is low halogen except for power cords, cables and peripherals, as well as the following customer-configurable internal components: Creative Recon3D PCIe Audio Card is not Low Halogen. Service parts obtained after purchase may not be Low Halogen.
End-of-Life Management and Recycling	Hewlett-Packard offers end-of-life HP product return and recycling programs in many geographic areas. To recycle your product, please go to: http://www.hp.com/recycle or contact your nearest HP sales office. Products returned to HP will be recycled, recovered or disposed of in a responsible manner. This product is greater than 90% recyclable by weight when properly disposed of at end of life.
Hewlett-Packard 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://www.hp.com/hpinfo/globalcitizenship/environment/productdesign/ecolabels.html ISO 14001 certificates: http://www.hp.com/hpinfo/globalcitizenship/environment/operations/envmanagement.html
Additional Information	- This HP product is designed to comply with the Waste Electrical and Electronic Equipment (WEEE) Directive - 2002/96/EC. - Plastic parts weighing over 25 grams used in the product are marked per ISO 11469 and ISO1043. - This product is >90% recycle-able when properly disposed of at end of life - EPEAT Gold registered in the U.S. EPEAT registration varies by country. See http://www.epeat.net for registration status by country.
Packaging	HP Workstation product packaging meets the HP General Specification for the Environment at http://www.hp.com/hpinfo/globalcitizenship/society/gen_specifications.html - Does not contain restricted substances listed in HP Standard 011-1 General Specification for the Environment - Does not contain ozone-depleting substances (ODS) - Does not contain heavy metals (lead, mercury, cadmium or hexavalent chromium) in excess of 100 ppm sum total for all heavy metals listed - Maximizes the use of post-consumer recycled content materials in packaging materials - All packaging material is recyclable - All packaging material is designed for ease of disassembly - Reduced size and weight of packages to improve transportation fuel efficiency - Plastic packaging materials are marked according to ISO 11469 and DIN 6120 standards formatting
Packaging Materials	
Internal	Cushions made from fabricated recycled expanded-polyethylene (EPE) or recycled expanded-polypropylene (EPP). May also be made from recycled molded paper-pulp (MPP).
External	Carton made from corrugated fiberboard with at least 25% recycled content.

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Manageability	
Intel Active Management Technology (AMT)	An advanced set of remote management features and functionality which provides network administrators the latest and most effective tools to remotely discover, heal, and protect networked client systems regardless of the system's health or power state. AMT 8.0 includes the following advanced management functions: • Power Management (on, off, reset) • Hardware Inventory (includes BIOS and firmware revisions) • Hardware Alerting • Agent Presence • System Defense Filters • SOL/IDER • Cisco NAC/SDN Support • ME Wake-on-LAN • DASH 1.1 compliance • IPv6 Support • Fast Call for Help - a client inside or outside the firewall may initiate a call for help via BIOS screen, periodic connections, or alert triggered connection • Remote Scheduled Maintenance - pre-schedule when the PC connects to the IT or service provider console for maintenance. Remote PCs can get required patches, be inventoried, etc by connecting to their IT console or Service Provider when it's convenient • Remote Alerts - automatically alert IT or service provider if issues arise • Access Monitor - Provides oversight into Intel® AMT actions to support security requirements • PC Alarm Clock • Microsoft NAP Support • Host Base set-up and configuration • Management Engine (ME) firmware roll back • Wireless AMT functionality on Desktop (WoDT) • Enhanced KVM resolution
Intel® vPro™ Technology	The HP Z230 workstations support Intel vPro technology when purchased with a vPro technology capable CPU: Intel® Xeon® processor E3-1200v3 family or 4th Generation Intel Core i5/i7 processors with Intel VT and Intel TXT technology
Remote Manageability Software Solutions	Visit: http://www.hp.com/go/easydeploy
System Software Manager	Visit: http://www.hp.com/go/ssm
Service, Support, and Warranty	• Program to proactively communicate Product Change Notifications (PCNs) and CustomerAdvisories by email to customers, based on a user-defined profile. • PCNs provide advance notification of hardware and software changes to be implemented in the factory providing time to plan for transition. • Customer Advisories provide concise, effective problem resolution, greatly reducing the need to call technical support
	As part of its commitment to hardware, software, and solution innovation, HP is proud to introduce this breakthrough platform configuration stability to HP Workstation customers. HP Stable & Consistent Offerings are built on the foundation of a carefully chosen set of hardware and software designed and tested to work with all HP Z Workstation platforms through their end of life. These components and their corresponding HP Workstation platform compatibility are outlined in this section. HP Stable & Consistent Offerings are available worldwide to all HP Workstation customers—no special programs,

System Technical Specifications

	no additional cost—no kidding. Simply select your hardware and software components when you customize your HP Workstation and be assured that you’ll be able to buy that same configuration throughout the lifecycle of the product.
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Technical Specifications - Processors

Intel® Xeon® processor E3-1281v3, Quad-Core, 8 MB cache, 3.7 GHz, up to 4.1 GHz with Intel Turbo Boost Technology
Intel® Xeon® processor E3-1280v3, Quad-Core, 8 MB cache, 3.6 GHz, up to 4.0 GHz with Intel Turbo Boost Technology
Intel® Xeon® processor E3-1271v3, Quad-Core, 8 MB cache, 3.6 GHz, up to 4.0GHz with Intel Turbo Boost Technology
Intel® Xeon® processor E3-1270v3, Quad-Core, 8 MB cache, 3.5 GHz, up to 3.9 GHz with Intel Turbo Boost Technology
Intel® Xeon® processor E3-1246v3, Quad-Core, 8 MB cache, 3.5 GHz, up to 3.9 GHz with Intel Turbo Boost Technology
Intel® Xeon® processor E3-1245v3, Quad-Core, 8 MB cache, 3.4 GHz, up to 3.8 GHz with Intel Turbo Boost Technology
Intel® Xeon® processor E3-1241v3, Quad-Core, 8 MB cache, 3.5 GHz, up to 3.9 GHz with Intel Turbo Boost Technology
Intel® Xeon® processor E3-1240v3, Quad-Core, 8 MB cache, 3.4 GHz, up to 3.8 GHz with Intel Turbo Boost Technology
Intel® Xeon® processor E3-1231v3, Quad-Core, 8 MB cache, 3.4 GHz, up to 3.8 GHz with Intel Turbo Boost Technology
Intel® Xeon® processor E3-1230v3, Quad-Core, 8 MB cache, 3.3 GHz, up to 3.7 GHz with Intel Turbo Boost Technology
Intel® Xeon® processor E3-1226v3, Quad-Core, 8 MB cache, 3.3 GHz, up to 3.7 GHz with Intel Turbo Boost Technology
Intel® Xeon® processor E3-1225v3, Quad-Core, 8 MB cache, 3.2 GHz, up to 3.6 GHz with Intel Turbo Boost Technology

Intel® Core™ i7-4790 processor, Quad-Core, 8 MB cache, 3.6 GHz, up to 4.0 GHz with Intel Turbo Boost Technology
Intel® Core™ i5-4690 processor, Quad-Core, 6 MB cache, 3.5 GHz, up to 3.9 GHz with Intel Turbo Boost Technology
Intel® Core™ i5-4590 processor, Quad-Core, 6 MB cache, 3.3 GHz, up to 3.7 GHz with Intel Turbo Boost Technology
Intel® Core™ i3-4350 processor, Dual-Core, 4 MB cache, 3.6 GHz
Intel® Core™ i3-4170 processor, Dual-Core, 3 MB cache, 3.7 GHz
Intel® Core™ i3-4160 processor, Dual-Core, 3 MB cache, 3.6 GHz
Intel® Core™ i3-4150 processor, Dual-Core, 3 MB cache, 3.5 GHz

Intel® Pentium® G3240 processor, Dual-Core, 3 MB cache, 3.1 GHz

Technical Specifications - Hard Drives

500GB SATA 7200 rpm 6Gb/s 3.5" HDD

Capacity	500GB
Height	1 in; 2.54 cm
Width	Media Diameter 3.5 in; 8.9 cm
	Physical Size 4 in; 10.17 cm
Interface	Serial ATA (6.0Gb/s), NCQ enabled
Synchronous Transfer Rate (Maximum)	Up to 600MB/s
Buffer	16MB
Seek Time (typical reads, includes controller overhead, including settling)	Single Track 2 ms
	Average 11 ms
	Full Stroke 21 ms
Rotational Speed	7,200 rpm
Logical Blocks	976,773,168
Operating Temperature	41° to 131° F (5° to 55° C)

1TB SATA 7200 rpm 6Gb/s 3.5" HDD

Capacity	1 Terabyte (1000 GB)
Height	1 in; 2.54 cm
Width	Media Diameter 3.5 in; 8.9 cm
	Physical Size 4 in; 10.17 cm
Interface	Serial ATA (6.0Gb/s), NCQ enabled
Synchronous Transfer Rate (Maximum)	Up to 600 MB/s
Buffer	32MB
Seek Time (typical reads, includes controller overhead, including settling)	Single Track 2 ms
	Average 11 ms
	Full Stroke 21 ms
Rotational Speed	7,200 rpm
Logical Blocks	1,953,525,168
Operating Temperature	41° to 131° F (5° to 55° C)

2.0TB SATA 7200 rpm 6Gb/s 3.5" HDD

Capacity	2TB
Height	1 in; 2.54 cm
Width	Media Diameter 3.5 in; 8.9 cm
	Physical Size 4 in; 10.17 cm
Interface	Serial ATA (6.0 Gb/s), NCQ Enabled
Synchronous Transfer Rate (Maximum)	Up to 600MB/s
Buffer	64MB
Seek Time (typical reads, includes controller overhead, including settling)	Single Track 1.0 ms
	Average 11 ms
	Full Stroke 18 ms
Rotational Speed	7,200 rpm
Logical Blocks	3,907,029,168
Operating Temperature	41° to 131° F (5° to 55° C)

Technical Specifications - Hard Drives

3.0TB SATA 7200 rpm 6Gb/s 3.5" HDD

Capacity	3.0TB
Height	1 in; 2.54 cm
Width	Media Diameter 3.5 in; 8.9 cm
	Physical Size 4.0 in; 10.17 cm
Interface	Serial ATA (6.0Gb/s), NCQ enabled
Synchronous Transfer Rate (Maximum)	Up to 6.0 Gb/s
Buffer	64MB
Seek Time (typical reads, includes controller overhead, including settling)	Single Track 0.6 ms
	Average 11 ms
	Full Stroke Not specified
Rotational Speed	7200 rpm
Operating Temperature	41° to 140° F (5° to 60° C)

4TB SATA 7200 rpm 6Gb/s 3.5" HDD

Capacity	4TB
Height	1 in; 2.54 cm
Width	Media Diameter 3.5 in; 8.9 cm
	Physical Size 4 in; 10.17 cm
Interface	Serial ATA (6Gb/s)
Synchronous Transfer Rate (Maximum)	Up to 600MB/s
Buffer	32MB
Seek Time (typical reads, includes controller overhead, including settling)	Single Track 0.7ms
	Average 8.5ms
	Full Stroke 15.7ms
Rotational Speed	7,200 rpm
Operating Temperature	5° to 60° F (-15° to 15.56° C)

500GB SATA 7.2K SED SFF HDD

Capacity	500GB
Height	0.275 in; 0.7 cm
Width	Media Diameter 2.5 in; 6.36 cm
	Physical Size 2.75 in; 6.99 cm
Interface	Up to 600MB/s
Synchronous Transfer Rate (Maximum)	128MB
Buffer	64MB
Seek Time (typical reads, includes controller overhead, including settling)	Single Track 1ms
	Average 4.2ms
	Full Stroke 25ms (typical)
Rotational Speed	7,200 rpm
Operating Temperature	32° to 140° F (0° to 60° C)

Technical Specifications - Hard Drives

1TB SATA 7200 rpm 8GB 3.5" SSHD (hybrid)	Capacity	1TB	
	Height	1 in; 2.54 cm	
	Width		
	Media Diameter		3.5 in; 8.9 cm
	Physical Size		4 in; 10.17 cm
	Interface	6Gb/s SATA	
	Synchronous Transfer Rate (Maximum)	Up to 600MB/s	
	Buffer	64MB standard HDD cache buffer	
	Cache	8GB NAND flash	
	Rotational Speed	7,200 rpm	
	Operating Temperature	32° to 140° F (0° to 60° C)	

HP Solid State Drives (SSDs) for Workstations

HP 128GB SATA 6Gb/s SSD	Capacity	128GB	
	Height	0.28 in; 0.7 cm	
	Width		
	Physical Size		2.5 in; 6.36 cm
	Interface	SATA 6Gb/s	
	Synchronous Transfer Rate (Maximum)	Up to 500MB/s (Sequential Read)	
	Operating Temperature	32° to 158° F (0° to 70° C)	

HP 256GB SATA 6Gb/s SSD	Capacity	256GB	
	Height	0.28 in; 0.7 cm	
	Interface	SATA 6Gb/s	
	Synchronous Transfer Rate (Maximum)	Up to 500MB/s (Sequential Read)	
	Operating Temperature	32° to 158° F (0° to 70° C)	

HP 500 GB SATA 6Gb/s SSD	Capacity	500GB	
	Height	0.28 in; 0.7 cm	
	Width		
	Physical Size		2.5 in; 6.36 cm
	Interface	6Gb/s SATA	
	Synchronous Transfer Rate (Maximum)	Up to 500MB/s (Sequential Read)	
	Operating Temperature	32° to 158° F (0° to 70° C)	

HP 1TB SATA 6Gb/s SSD	Capacity	1TB	
	Height	0.28 in; 0.7 cm	
	Width		
	Physical Size		2.5 in; 6.36 cm
	Interface	6Gb/s SATA	
	Synchronous Transfer Rate (Maximum)	Up to 500MB/s (Sequential Read)	
	Operating Temperature	32° to 158° F (0° to 70° C)	

Intel Pro 1500 180GB SATA SSD	Capacity	180GB	
	Width		
	Physical Size		2.5 in; 6.36 cm

Technical Specifications - Hard Drives

	Samsung Enterprise 240GB SATA SSD	Interface	6Gb/s SATA	
		Synchronous Transfer Rate (Maximum)	600 Mb/s	
		Operating Temperature	32° to 158° F (0° to 70° C)	
	Samsung Enterprise 480GB SATA SSD	Capacity	240GB	
		Width	Physical Size	2.5 in; 6.36 cm
		Interface	SATA 6Gb/s	
	Samsung Enterprise 480GB SATA SSD	Synchronous Transfer Rate (Maximum)	Up to 600MB/s	
		Capacity	480GB	
		Width	Physical Size	2.5 in; 6.36 cm
	Samsung Enterprise 480GB SATA SSD	Interface	SATA 6Gb/s	
		Synchronous Transfer Rate (Maximum)	Up to 600MB/s	
	Intelligent Disk Caching 64GB SSD Disk Cache Module	Capacity	64GB	
		Height	0.28 in; 0.7 cm	
		Width	Physical Size	2.5 in; 6.36 cm
	Intelligent Disk Caching 64GB SSD Disk Cache Module	Interface	SATA 6Gb/s	
	PCIe SSDs for HP Workstations	HP Z Turbo Drive 256GB SSD	Capacity	256GB
			Interface	PCI Express 2.0 x4 electrical x4 physical
			Operating Temperature	32° to 158° F (0° to 70° C)
	PCIe SSDs for HP Workstations	HP Z Turbo Drive 512GB SSD	Capacity	512GB
			Interface	PCI Express 2.0 x4 electrical x4 physical
			Operating Temperature	32° to 158° F (0° to 70° C)

Technical Specifications - Graphics

Integrated Intel HD Graphics (Z230/Z1G2) Integrated Intel HD Graphics (Z230/Z1G2)	Form Factor	Integrated in select Intel Xeon E3, Intel Core i7, and Intel Core i5 processors. Check specific platform specifications for selections.
	Graphics Controller	Intel HD Graphics
	Memory	Unified Memory Architecture (UMA) frame buffer. Graphics memory is shared with system memory. Size selectable between 64 MB to 512 MB via BIOS setting. Default size is 64 MB. Additional memory is allocated for graphics as needed using Intel's Dynamic Video Memory Technology (Intel DVMT 5.0), to provide an optimal balance between graphics and system memory use.
	Connectors	Check system platform specifications where Intel HD Graphics are available.
	Maximum Resolution	Display Port: 2560 x 1600 DVI: 1920x1200 VGA: 2048x1536 Note: For DVI and VGA outputs, separate adapters may be required.
	Shading Architecture	Shader Model 5.0
	Supported Graphics APIs	OpenGL 4.0 DirectX 11.1
	Available Graphics Drivers	Windows 7 Windows 8.1
	Form Factor	Integrated in select Intel Xeon E3, Intel Core i7, and Intel Core i5 processors. Check specific platform specifications for selections.
	Graphics Controller	Intel HD Graphics
	Memory	Unified Memory Architecture (UMA) frame buffer. Graphics memory is shared with system memory. Size selectable between 64 MB to 512 MB via BIOS setting. Default size is 64 MB. Additional memory is allocated for graphics as needed using Intel's Dynamic Video Memory Technology (Intel DVMT 5.0), to provide an optimal balance between graphics and system memory use.
	Connectors	Check system platform specifications where Intel HD Graphics are available.
	Maximum Resolution	Display Port: 2560 x 1600

Technical Specifications - Graphics

DVI: 1920x1200
VGA: 2048x1536

Note: For DVI and VGA outputs, separate adapters may be required.

Shading Architecture Shader Model 5.0

Supported Graphics APIs OpenGL 4.0
DirectX 11.1

Available Graphics Drivers Windows 7
Windows 8.1

NVIDIA NVS 310 512MB Graphics

Form Factor Low Profile:
2.713 inches in height × 6.150 inches in length

Graphics Controller NVIDIA NVS 310

Bus Type PCI Express x16, 2.0 compliant

Memory Size: 512MB DDR3
Clock: 875Mhz
Memory Bandwidth: 14GB/s

Connectors 2 × DisplayPort 1.2

Maximum Resolution Up to 2560 × 1600 (digital display) per display.

Image Quality Features See Display Output section.

The following video formats are supported:

- MPEG2
- MPEG4 Part 2 Advanced Simple Profile
- H.264 SVC codec support
- Support for 3D Blu Ray
- VC1
- DivX version 3.11 and later
- MVC

A full range of video resolutions are supported including 1080p, 1080i, 720p, 480p and 480i. The NVS 310 GPU provides hardware acceleration for the computationally intensive parts of video processing, as well as provides improved video playback speeds via faster decode and transcode.

Display Output

Up to 2 displays in the following configurations:

DisplayPort output:

- 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 1.2 multi stream topology

Technical Specifications - Graphics

technology.

DVI-D output:

- 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:

- 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:

- Drives two analog display at resolutions up to 1920 × 1200 at 60 Hz using DisplayPort to VGA cable adaptors

Shading Architecture

Shader Model 5.0

Supported Graphics APIs

DX11, OpenGL 4.1

Available Graphics Drivers

Genuine Windows 7 Professional (64-bit and 32-bit)
Microsoft Windows XP Professional (64-bit and 32-bit)
Red Hat Enterprise Linux(RHEL)
SUSE Linux Enterprise Desktop 11 (64-bit and 32-bit)

HP qualified drivers may be preloaded or the latest HP qualified drivers are available from the HP support Web site:

<http://welcome.hp.com/country/us/en/support.html>

SUSE Linux Enterprise drivers may also be obtained from:

<ftp://download.nvidia.com/novell> or <http://www.nvidia.com>

Power Consumption

19.5 Watts

Note

The thermal solution used on this card is an active fan heatsink.

NVIDIA NVS 315 1GB Graphics (for HP Workstations)

Form Factor

Low Profile:
2.713 inches in height × 5.7 inches in length

Graphics Controller

NVIDIA NVS 315 (using GF119-825 GPU)
Number of Cores: 48 CUDA cores
Max. Power: 19.3W
Cooling Solution: Active fan heatsink

Bus Type

PCI Express x16, 2.0 compliant

Memory

Size: 1GB DDR3
Clock: 875Mhz
Memory Bandwidth: 14GB/s

Connectors

DMS-59 output

Cables included:

Technical Specifications - Graphics

	- For CTO: DMS-59 to DVI cable - For AMO: DMS-59 to DVI cable and DMS-59 to VGA cable
Maximum Resolution	Maximum number of displays supported: 2 Maximum Resolution Support: - DMS-59 to VGA: 2048 x 1536 @ 85Hz - DMS-59 to DVI: 1980 x 1200 @ 60Hz - DMS-59 to DP: 2560 x 1600 @ 60Hz
Image Quality Features	See Display Output section. The following video formats are supported: - MPEG2 - MPEG4 Part 2 Advanced Simple Profile - H.264 SVC codec support - Support for 3D Blu Ray - VC1 - DivX version 3.11 or later A full range of video resolutions are supported including 1080p, 1080i, 720p, 480p and 480i. The NVS 315 GPU provides hardware acceleration for the computationally intensive parts of video processing, as well as provides improved video playback speeds via faster decode and transcode.
Display Output	Up to 2 displays in the following configurations: DisplayPort output: • Drives two DisplayPort enabled digital displays at resolutions up to 2560 × 1600 at 60 Hz with reduced blanking, when connected via the DMS-59 to DP adapter. DVI-D output: • Drives two digital display at resolutions up to 1920 × 1200 at 60 Hz with reduced blanking using DMS-59 to DVI-D single-link cable adaptor VGA display output: • Drives two analog display at resolutions up to 2048 × 1536 at 85 Hz using DMS-59 to VGA cable adaptor.
Shading Architecture	Shader Model 5.0
Supported Graphics APIs	DX11, OpenGL 4.3
Available Graphics Drivers	Microsoft Windows 8 Microsoft Windows 7 Professional (64-bit and 32-bit) Microsoft Windows XP Professional (64-bit and 32-bit) Red Hat Enterprise Linux(RHEL) SUSE Linux Enterprise Desktop 11 (64-bit and 32-bit)

Technical Specifications - Graphics

HP qualified drivers may be preloaded or the latest HP qualified drivers are available from the HP support Web site:

<http://welcome.hp.com/country/us/en/support.html>

SUSE Linux Enterprise drivers may also be obtained from:

<ftp://download.nvidia.com/novell> or <http://www.nvidia.com>

Notes

1. The thermal solution used on this card is an active fan heatsink.
2. Factory configured graphics card includes DMS-59 to DVI cable.
3. Option kit graphics card includes DMS-59 to DVI and DMS-59 to VGA cables (one each).

NVIDIA NVS 510 2GB Graphics

Form Factor Graphics Controller

Low Profile, 2.713 inches × 6.3 inches, single slot

Bus Type Memory Connectors

NVS 510 GPU

Core Clock: 797 Mhz

Memory Clock: 891 Mhz

CUDA Cores: 192

PCI Express x16, Generation 2.0

2GB DDR3

Four mini-DisplayPort.

Four mini-DisplayPort to DisplayPort adapters included.

(DisplayPort to DVI-D, DisplayPort to VGA, DisplayPort to HDMI, and DisplayPort to Dual-Link DVI adapters available as separate accessories)

Maximum Resolution

Mini-DisplayPort connectors support ultra-high-resolution panels (up to 3840 × 2160 @ 60Hz)

NOTE: This card supports up to four displays. For Windows XP, only 2 active displays are supported.

Image Quality Features

10-bit internal display processing, including hardware support for 10-bit scan-out

Display Output

DisplayPort with Multi-Stream Technology (MST) and High Bit Rate 2 (HBR2) support.

Digital Display Support

1. DisplayPort Output

- Drives four DisplayPort enabled digital display at resolutions up to 3840 × 2160 at 60 Hz with reduced blanking, when connected natively using the 4 DisplayPort connectors on the NVS 510 graphics card.
- DisplayPort Multi-Stream Topology (MST) Technology: Supports various combinations of display resolutions and number of displays when using DisplayPort multi stream topology technology - up to a maximum of 4 monitors at a resolution of 1920 × 1200 at 60 Hz with reduced blanking.

2. DVI-D Output

- Drives four digital displays at resolutions up to 1920 × 1200 at 60 Hz with reduced blanking using DisplayPort to DVI-D single-link cable adaptors.
- Drives four digital displays at resolutions up to 2560 × 1600 at 60 Hz with reduced blanking using DisplayPort to DVI-D dual-link cable adaptors.

3. HDMI Output

- The NVS 510 graphics board is capable of driving four high definition (HD)

Technical Specifications - Graphics

panels up to resolutions of 1920 × 1080P at 60 Hz using DisplayPort to HDMI cable adaptors.

Analog Display Support

1. VGA display output
- Drives four analog displays at resolutions up to 1920 × 1200 at 60 Hz using DisplayPort to VGA cable adaptors.

Supported Graphics APIs

Full Microsoft DirectX 11, Shader Model 5.0 support
Full OpenGL 4.3 support

Available Graphics Drivers

Genuine Windows 7 Professional (64-bit and 32-bit)
Microsoft Windows XP Professional (64-bit and 32-bit)
Red Hat Enterprise Linux(RHEL) 6 Desktop/Workstation
SUSE Linux Enterprise Desktop 11 (64-bit and 32-bit)

HP qualified drivers may be preloaded or available from the HP support Web site:

<http://welcome.hp.com/country/us/en/support.html>

Power Consumption Note

33.4 Watts
Heatsink cooler design is active.

Graphics Cable Adapters Notes

Graphics Cable Adapter option choice is available starting Feb 1 2013 for the following graphics cards:
NVS 310, Quadro 410, Quadro K5000, FirePro V3900, FirePro W7000

New Graphics Cards introduced after Feb 1 2013 will be eligible for choosing Graphics Cable Adapters, unless otherwise specified.

No cable choice for NVS 300, NVS 510.

Maximum number of cables allowed is 8.

NVIDIA Quadro 410 512MB Graphics

Form Factor

Low Profile:
2.713 inches × 5.7 inches, single slot

Graphics Controller

NVIDIA Quadro 410

Bus Type

PCI Express x16, 3.0 compliant

Memory

Size: 512MB DDR3
Clock: 900MHz
Memory Bandwidth: 14GB/s

Connectors

One dual-link DVI-I connector
One DisplayPort connector

Maximum Resolution

Up to 2560 × 1600 (digital display) per display.

RAMDAC

400 MHz integrated RAMDAC

Display Output

Maximum resolution over DisplayPort: 2560 × 1600 × 32 bpp at 60 Hz (reduced blanking)

Maximum resolution over DVI port: 2560 × 1600 × 32 bpp at 60 Hz (reduced blanking)

Maximum resolution over VGA (through DVI to VGA cable): 2048 × 1536 × 32 bpp at 85 Hz

Technical Specifications - Graphics

Shading Architecture	Shader Model 5.0
Supported Graphics APIs	DX11, OpenGL 4.2
Available Graphics Drivers	Genuine Windows 7 Professional (64-bit and 32-bit) Microsoft Windows XP Professional (64-bit and 32-bit) Red Hat Enterprise Linux(RHEL) SUSE Linux Enterprise Desktop 11 (64-bit and 32-bit)

HP qualified drivers may be preloaded or the latest HP qualified drivers are available from the HP support Web site:

<http://welcome.hp.com/country/us/en/support.html>

SUSE Linux Enterprise drivers may also be obtained from:

<ftp://download.nvidia.com/novell> or <http://www.nvidia.com>

NVIDIA Quadro K420 1GB Form Factor Graphics

Low Profile, single slot
Dimensions: 2.713 inches × 6.3 inches
Cooling: Active

Graphics Controller	NVIDIA Quadro K420 GPU: GK107 with 192 CUDA cores Power: 41W
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Bus Type	PCI Express x16, 2.0 compliant
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Memory	Size: 1GB DDR3 Clock: 891MHz Memory Bandwidth: 29GB/s Memory Width: 128 bit
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Connectors	One dual-link DVI-I connector One DisplayPort connector
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Factory Configured: No video cable adapter included
After market option kit: One DP-to-DVI adapter included with card

Additional DisplayPort-to-VGA or DisplayPort-to-DVI adapters are available as Factory Configuration or Option Kit accessories.

Maximum Resolution	VGA (via adapter cable): - 2048 × 1536 × 32 bpp at 85 Hz Dual-link DVI - 2560 × 1600 × 32 bpp at 60 Hz (reduced blanking) Single-link DVI - 1920 × 1200 × 32 bpp at 60 Hz (reduced blanking) DisplayPort 1.2 - 3840 × 2160 × 30 bpp at 60 Hz
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Image Quality Features	12-bit internal display pipeline (hardware support for 12-bit scanout on supported panels, applications and connection)
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Technical Specifications - Graphics

Stereoscopic 3D display support including NVIDIA® 3D Vision™ technology, 3D DLP, Interleaved, and passive stereo

Display Output

Maximum number of displays:

- 2 direct attached monitors
- 4 using DP 1.2a with MST and HBR2 enabled monitors

Maximum number of DisplayPort displays possible (may require MST and/or HBR2):

- 4 1920x1200
- 2 2560x1600
- 1 3840x2160

Maximum number of monitors across all available Quadro K420 outputs is 4.

Shading Architecture

Shader Model 5.0

Supported Graphics APIs

DX11, OpenGL 4.4

Programming support for CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Python, and Fortran

Available Graphics Drivers

Microsoft Windows 8.1

Microsoft Windows 8

Microsoft Windows 7

Linux - Full OpenGL implementation, complete with NVIDIA and ARB extensions

Notes

1. Factory configured Quadro K420 does not include any video adapters. Adapters must be ordered separately.

2. Option kit Quadro K420 includes one DP to DVI-D adapter.

3. Full Height Profile bracket installed. Low Profile bracket included in after market kit.

NVIDIA Quadro K620 2GB Graphics Form Factor

Dimensions: 2.713" H x 6.3" L

Single Slot, Low Profile

Cooling: Active

Weight: 133 grams

Graphics Controller

NVIDIA Quadro K620

GPU: GM107 GPU with 384 CUDA cores

Power: 45 Watts

Bus Type

PCI Express 2.0 x16

Memory

Size: 2GB GDDR3

Memory Bandwidth: 29 GB/s

Memory Width: 128-bit

Connectors

1 DL-DVI(I)

1 DisplayPort

Factory Configured: No video cable adapter included

Technical Specifications - Graphics

After market option kit: One DP-to-DVI adapter included with card

Additional DVI-to-VGA, DisplayPort-to-VGA or DisplayPort-to-DVI adapters are available as Factory Configuration or Option Kit accessories.

Maximum Resolution

DisplayPort 1.2:
 - up to 4096x2160 x 30 bpp @ 60Hz
 - supports High Bit Rate 2 (HBR2) and Multi-Stream Transport (MST)

Dual Link DVI(I) output:
 - up to 2560 x 1600 x 32 bpp @ 60Hz

Single Link-DVI(I) output:
 - up to 1920 x 1200 x 32 bpp @ 60Hz

VGA (via adapter cable):
 - 2048 x 1536 x 32 bpp at 85 Hz

Image Quality Features

12-bit internal display pipeline (hardware support for 12-bit scanout on supported panels, applications and connection)

Stereoscopic 3D display support including NVIDIA® 3D Vision™ technology, 3D DLP, Interleaved, and passive stereo

Display Output

Maximum number of displays:
 - 2 direct attached monitors
 - 4 using DP 1.2a with MST and HBR2 enabled monitors

Maximum number of DisplayPort displays possible (may require MST and/or HBR2):
 - 4 1920x1200
 - 2 2560x1600
 - 1 4096x2160

Maximum number of monitors across all available Quadro K620 outputs is 4.

Shading Architecture

Shader Model 5.0

Supported Graphics APIs

OpenGL 4.4
 DirectX 11

API support includes:
 CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran

Available Graphics Drivers

Microsoft Windows 8.1
 Microsoft Windows 8
 Microsoft Windows 7
 Linux - Full OpenGL implementation, complete with NVIDIA and ARB

Technical Specifications - Graphics

		extensions
		HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html
	Notes	1. Factory configured Quadro K620 does not include a video cable adapter. Video cable adapters must be ordered separately. 2. Quadro K620 offered as an Option Kit (AMO) includes one DP-to-DVI video cable adapter. Additional cables must be ordered separately. 3. Full Height Profile bracket installed. Low Profile bracket included in after market kit.
AMD FirePro W5100 4GB Graphics	Form Factor	Dimensions: 2.713" H x 6.3" L Single Slot, Low Profile Cooling: Active Weight: 133 grams
	Graphics Controller	AMD FirePro W5100 graphics GPU Frequency: 930Mhz GPU: 768 Stream Processors organized into 12 Compute Units Power: <75 Watts Cooling: Active
	Bus Type	PCI Express® x16, Generation 3.0
	Memory	4GB GDDR5 memory Memory Bandwidth: up to 96 GB/s Memory Width: 128 bit
	Connectors	4x Display Port 1.2 connectors with HBR2 and MST support. Factory Configured: No video cable adapter included After market option kit: No video cable adapter included Additional DisplayPort-to-VGA or DisplayPort-to-DVI adapters are available as Factory Configuration or Option Kit accessories.
	Maximum Resolution	DisplayPort: - 4096x2160 @24bpp 60Hz Dual Link DVI: - 2560x1600 (requires DP to DL-DVI adapter) Single Link DVI: - 1920x1200 (requires DP to DVI adapter) VGA: - 1920x1200 (requires DP to VGA adapter)
	Image Quality Features	Advanced support for 8-bit, 10-bit, and 16-bit per RGB color component.

Technical Specifications - Graphics

	High bandwidth scaler for high quality up and downscaling
Display Output	Max number of monitors supported using DisplayPort 1.2a: - 4 direct attached monitors - 6 using DP 1.2a with MST and HBR2 enabled monitors Monitor chaining from a single DisplayPort (subject to a max of 6 total monitors across all outputs, requires use of DisplayPort enabled monitors supporting MST and HBR2): - one 4096x2160 display - two 2560x1600 displays - four 1920x1200 displays
Shading Architecture	Shader Model 5.0
Supported Graphics APIs	OpenGL 4.4 OpenCL 1.2 and 2.0 DirectX 11.2 / 12 AMD Mantle
Available Graphics Drivers	Windows 8.1 / 8 (64-bit and 32-bit) Windows® 7 (64-bit and 32-bit) Linux HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html
Notes	1. AMD Eyefinity technology supports up to six DisplayPort™ monitors on an enabled graphics card. Supported display quantity, type and resolution vary by model and board design; confirm specifications with manufacturer before purchase. To enable more than two displays, or multiple displays from a single output, additional hardware such as DisplayPort-ready monitors or DisplayPort 1.2 MST-enabled hubs may be required. A maximum of two active adapters is recommended for consumer systems. See www.amd.com/eyefinityfaq for full details. 2. Configurations of two FirePro W5100 graphics cards in HP Z440 Workstation require the HP Z440 Fan and Front Card Guide Kit, configurable from the factory (CTO PN: G8T99AV) or as an Aftermarket Option (AMO PN: J9P80AA).

NVIDIA Quadro K2000 2GB Graphics	Form Factor	4.38" H x 7.97" L Single Slot, Full Height
	Graphics Controller	NVIDIA Quadro K2000 Graphics Card Kepler GK107 GPU 384 CUDA cores Max Power: 51.1 Watts
	Bus Type	PCI Express 2.0 x16
	Memory	2 GB GDDR5, 2000 Mhz 128-bit memory I/O path 64 GB/s memory bandwidth
	Connectors	1 DL-DVI(I) output, 2 DisplayPort outputs

Technical Specifications - Graphics

	CTO: No video cable adapter included AMO: One DP-to-DVI adapter included with card
Maximum Resolution	Additional DVI-to-VGA, DisplayPort-to-VGA or DisplayPort-to-DVI adapters are available as accessories DisplayPort: - up to 3840 x 2160 x 30 bpp @ 60Hz - supports High Bit Rate 2 (HBR2) and Multi-Stream Transport (MST)
Image Quality Features	DL-DVI(I) output: - up to 2560 x 1600 x 32 bpp @ 60Hz • 10-bit internal display processing pipeline • 10-bit scan-out support
Display Output	VGA: - requires use of DVI-to-VGA and/or DP-to-VGA video cable adapters - 400 Mhz integrated RAMDAC - Max resolution: 2048 x 1536 x 32 bpp @ 85 Hz DL-DVI(I): - Max resolution: 2560 x 1600 x 32 bpp @ 60 Hz SL-DVI(I): - Max resolution: 1920 x 1200 x 32 bpp @ 60 Hz DisplayPort: - Supports HBR2 and MST - Max resolution: 3840 x 2160 x 30 bpp @ 60 Hz (only one monitor can be connected to a Quadro K2000 DisplayPort connector at this resolution) - Max number of DisplayPort daisy-chained monitors or hub connected monitors from a single Quadro K2000 DisplayPort connector: 4 with maximum resolution of 1920 x 1200 Maximum number of monitors across all available Quadro K2000 outputs is 4.
Shading Architecture	Full Microsoft DirectX 11 Shader Model 5
Supported Graphics APIs	OpenGL 4.3 DirectX 11 API support includes: CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran
Available Graphics Drivers	Windows 8 Pro 64-bit Windows 8 (China) 64-bit Genuine Windows 7 Professional (64-bit and 32-bit) Red Hat Enterprise Linux (RHEL) 5 Desktop/Workstation (64-bit) Red Hat Enterprise Linux(RHEL) 6 Desktop/Workstation SUSE Linux Enterprise Desktop 11 (64-bit) HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html

Technical Specifications - Graphics

SUSE Linux Enterprise drivers may also be obtained from:

<ftp://download.nvidia.com/novell> or <http://www.nvidia.com>

Notes

1. Quadro K2000 offered as CTO does not include a video cable adapter. Video cable adapters must be ordered separately.
2. Quadro K2000 offered as AMO includes one DP-to-DVI video cable adapter. Additional cables must be ordered separately.

NVIDIA Quadro K2200 4GB Graphics

Form Factor

Dimensions: 4.376" H x 7.97" L
Single Slot, Full Height
Cooling: Active
Weight: 240 grams

Graphics Controller

NVIDIA Quadro K2200 Graphics Card
GPU: GM107 with 640 CUDA cores
Power: 68 Watts

Bus Type

PCI Express 2.0 x16

Memory

Size: 4GB GDDR5
Memory Bandwidth: 80 GB/s
Memory Width: 128-bit

Connectors

1 DL-DVI(I)
2 DisplayPort 1.2a

Factory Configured Option: No video cable adapter included
Option Kit: One DP-to-DVI adapter included with card

Additional DVI-to-VGA, DisplayPort-to-VGA or DisplayPort-to-DVI adapters are available as accessories

Maximum Resolution

DisplayPort:
- up to 4096 x 2160 x 30 bpp @ 60Hz
- supports High Bit Rate 2 (HBR2) and Multi-Stream Transport (MST)

DL-DVI(I) output:
- up to 2560 x 1600 x 32 bpp @ 60Hz

Single Link-DVI(I) output:
- up to 1920 x 1200 x 32 bpp @ 60Hz

VGA (via adapter cable):
- 2048 x 1536 x 32 bpp at 85 Hz

Image Quality Features

12-bit internal display pipeline (hardware support for 12-bit scanout on supported panels, applications and connection)

Stereoscopic 3D display support including NVIDIA® 3D Vision™ technology, 3D DLP, Interleaved, and passive stereo

Technical Specifications - Graphics

Display Output	Maximum number of displays
	- 3 direct attached monitors
	- 4 using DP 1.2a with MST and HBR2 enabled monitors
	Maximum number of DisplayPort displays possible (may require MST and/or HBR2):
	- 4 1920x1200
	- 4 2560x1600
	- 2 4096x2160
	Maximum number of monitors across all available Quadro K2200 outputs is 4.
Shading Architecture	Shader Model 5.0
Supported Graphics APIs	OpenGL 4.4
	DirectX 11.1
	API support includes: CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran
Available Graphics Drivers	Microsoft Windows 8.1
	Microsoft Windows 8
	Microsoft Windows 7
	Linux - Full OpenGL implementation, complete with NVIDIA and ARB extensions
	HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html
Notes	1. Quadro K2200 offered as Factory Configured Option does not include a video cable adapter. Video cable adapters must be ordered separately. 2. Quadro K2200 offered as an Option Kit includes one DP-to-DVI video cable adapter. Additional cables must be ordered separately. 3. A total maximum of 4 active monitors are supported across all display output types. This may be accomplished by using daisy chained DisplayPort 1.2 displays (displays must support MST and HBR2).

AMD FirePro W7000 4GB Graphics	Form Factor	Full height, full length, single slot
	Graphics Controller	AMD FirePro™ W7000 Professional Graphics Max Power: <150 Watts
	Bus Type	PCI Express™ x16, Generation 3.0
	Memory	4GB GDDR5, 153.6 GB/s bandwidth, ECC support
	Connectors	4 x DisplayPort with HBR2 and MST support. No video adapters included.
	Maximum Resolution	DisplayPort: 4096x2160 @24bpp 60Hz Dual Link DVI: 2560x1600 (requires DP to DL-DVI adapter) Single Link DVI: 1920x1200 (requires DP to DVI adapter) VGA: 1920x1200 (requires DP to VGA adapter)

Technical Specifications - Graphics

Image Quality Features	Advanced support for 8-bit, 10-bit, and 16-bit per RGB color component
Display Output	Max number of monitors supported using DisplayPort: 6 Monitor chaining from a single DisplayPort options(subject to a max of 6 total monitors across all outputs, requires use of DisplayPort Monitors supporting MST or the use of DisplayPort hubs) • 1 4096x2169 display • 2 2560x1600 displays • 4 1920x1200 displays
Shading Architecture	Shader Model 5.0
Supported Graphics APIs	OpenGL® 4.2 with OpenGL Shading Language OpenCL 1.1 Microsoft® DirectX® 11.1
Available Graphics Drivers	Windows 7 Professional (64-bit and 32-bit) Windows 8 (64-bit and 32-bit) Red Hat Enterprise Linux(RHEL) SUSE Linux Enterprise Desktop 11 (64-bit and 32-bit)
Note	HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html AMD Eyefinity technology can support multiple displays using a single enabled AMD FirePro™ professional graphics card; the number of supported displays varies by card model. Microsoft® Windows® 7, Windows Vista®, or Linux® is required in order to support more than 2 displays. Depending on the card model, native DisplayPort™ connectors and/or certified DisplayPort™ active or passive adapters to convert your monitor's native input to your card's DisplayPort™ or Mini-DisplayPort™ connector(s) may be required. See http://www.amd.com/firepro for details.

AMD FirePro W7100 8GB Graphics	Form Factor	Full height, single slot (9.5" X 4.376")
	Graphics Controller	AMD FirePro W7100 graphics GPU: 1792 Stream Processors organized into 28 Compute Units Power: <75 Watts Cooling: Active
	Bus Type	PCI Express® x16, Generation 3.0
	Memory	8GB GDDR5 memory Memory Bandwidth: up to 176 GB/s Memory Width: 256 bit
	Connectors	4x Display Port 1.2a connectors with HBR2 and MST support. Factory Configured: No video cable adapter included After market option kit: No video cable adapter included Additional DisplayPort-to-VGA or DisplayPort-to-DVI adapters are

Technical Specifications - Graphics

available as Factory Configuration or Option Kit accessories.

Maximum Resolution	DisplayPort: - 4096x2160 @24bpp 60Hz Dual Link DVI: - 2560x1600 (requires DP to DL-DVI adapter) Single Link DVI: - 1920x1200 (requires DP to DVI adapter) VGA: - 1920x1200 (requires DP to VGA adapter)
Image Quality Features	Advanced support for 8-bit, 10-bit, and 16-bit per RGB color component. High bandwidth scaler for high quality up and downscaling
Display Output	Max number of monitors supported using DisplayPort 1.2a: - 4 direct attached monitors - 6 using DP 1.2a with MST and HBR2 enabled monitors Monitor chaining from a single DisplayPort (subject to a max of 6 total monitors across all outputs, requires use of DisplayPort enabled monitors supporting MST and HBR2): - one 4096x2160 display - two 2560x1600 displays - four 1920x1200 displays
Shading Architecture	Shader Model 5.0
Supported Graphics APIs	OpenGL 4.4 OpenCL 1.2 and 2.0 DirectX 11.2 / 12 AMD Mantle
Available Graphics Drivers	Windows 8.1 / 8 (64-bit and 32-bit) Windows® 7 (64-bit and 32-bit) Linux HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html

- Note**
1. AMD Eyefinity technology supports up to six DisplayPort™ monitors on an enabled graphics card. Supported display quantity, type and resolution vary by model and board design; confirm specifications with manufacturer before purchase. To enable more than two displays, or multiple displays from a single output, additional hardware such as DisplayPort-ready monitors or

Technical Specifications - Graphics

DisplayPort 1.2 MST-enabled hubs may be required. See www.amd.com/eyefinityfaq for full details.

2. OpenGL 4.4 support available with driver 14.301.xxx or later.
3. OpenCL 2.0 support planned in driver updates for early 2015.
4. For HP Z440 Workstation configurations, the HP Z4 Fan and Front Card Guide Kit, which is available both CTO (G8T99AV) and AMO (J9P80AA), is required.

NVIDIA Quadro K4200 4GB Graphics

Form Factor Graphics Controller Bus Type Memory Connectors

Dimensions: 4.376" H x 9.5" L
Single Slot, Full Height
Cooling: Active
Weight: 461 grams (without extender)
1 DL-DVI(I)
2 DisplayPort 1.2a

Factory Configured Option: No video cable adapter included
After market option kit: One DP-to-DVI adapter included with card

Additional DVI-to-VGA, DisplayPort-to-VGA or DisplayPort-to-DVI adapters are available as accessories

Maximum Resolution

DisplayPort:
- up to 3840 x 2160 x 30 bpp @ 60Hz
- supports High Bit Rate 2 (HBR2) and Multi-Stream Transport (MST)

DL-DVI(I) output:
- up to 2560 x 1600 x 32 bpp @ 60Hz

Single Link-DVI(I) output:
- up to 1920 x 1200 x 32 bpp @ 60Hz

VGA (via adapter cable):
- 2048 x 1536 x 32 bpp at 85 Hz

Image Quality Features

10-bit internal display processing (hardware support for 10-bit scanout for both windowed desktop and full screen, only available on Windows with Aero disabled and Linux)

NVIDIA® 3D Vision™ technology, 3D DLP, Interleaved, and other 3D stereo format support

Full OpenGL quad buffered stereo support

Support for large-scale, ultra-high resolution visualization using the NVIDIA® SVS platform which includes NVIDIA® Mosaic, NVIDIA® Sync and NVIDIA® Warp/Blend technologies

Display Output

Maximum number of displays
- 3 direct attached monitors
- 4 using DP 1.2a with MST and HBR2 enabled monitors

Maximum number of DisplayPort displays possible (may require MST and/or HBR2):

Technical Specifications - Graphics

- 4 1920x1200
- 4 2560x1600
- 2 3840x2160

Maximum number of monitors across all available Quadro K4200 outputs is 4.

Shading Architecture Shader Model 5.0

Supported Graphics APIs OpenGL 4.4
DirectX 11.1

API support includes:
CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran

Available Graphics Drivers Microsoft Windows 8.1
Microsoft Windows 8
Microsoft Windows 7
Linux - Full OpenGL implementation, complete with NVIDIA and ARB extensions

HP qualified drivers may be preloaded or available from the HP support Web site:

<http://welcome.hp.com/country/us/en/support.html>

Notes

1. Quadro K4200 offered as CTO does not include a video cable adapter. Video cable adapters must be ordered separately.
2. Quadro K4200 offered as After Market Kits includes one DP-to-DVI video cable adapter. Additional cables must be ordered separately.
3. A total maximum of 4 active monitors are supported across all display output types. This may be accomplished by using daisy chained DisplayPort 1.2 displays (displays must support MST and HBR2).
4. For HP Z440 Workstation applications, the HP Z4 Fan and Front Card Guide Kit, which is available both CTO (G8T99AV) and AMO (J9P80AA), is required.

Technical Specifications - Multimedia and Audio Devices

HP Thin USB Powered Speakers	Frequency Response	F0 to 20kHz
	(-3dB, 24-bit/96kHz input)	
	Dimensions (H x W x D)	Speakers: 14.52 x 9.50 x 2.45 cm (5.72 x 3.74 x 0.96 in) per speaker

Technical Specifications - Optical and Removable Storage

HP Slim DVD-ROM Drive	Description	12.7mm high, tray-load
	Mounting Orientation	Either horizontal or vertical
	Interface Type	SATA/ATAPI
	Dimensions (WxHxD)	128 x 14 x 128mm
	Disc Capacity	DVD-ROM Single layer: Up to 4.7 GB Double layer: Up to 8.5 GB
	Access Times	DVD-ROM Single Layer <110 ms (typical) CD-ROM Mode 1 <110 ms (typical) Full Stroke DVD <230 ms (seek) Full Stroke CD <220 ms (seek)
	Power	Source SATA DC power receptacle DC Power Requirements 5 VDC $\pm$ 5%-100 mV ripple p-p DC Current 5 VDC - <800mA typical, < 1600 mA maximum
	Operating Environmental (all conditions non-condensing)	Temperature 41° to 122° F (5° to 50° C) Relative Humidity 10% to 80% Maximum Wet Bulb Temperature 84° F (29° C)
	Operating Systems Supported	Windows 8 32-bit and 64-bit, Windows 7 Professional 32-bit and 64-bit, Windows Vista Business 64*, Windows Vista Business 32*, Windows Vista Home Basic 32*, Windows 2000, Windows XP Professional or Windows XP Home 32*. Red Hat Enterprise Linux(RHEL) WS4**, 5, 6 Desktop/Workstation, Removed reference to "Novell" because of acquisition and changed product reference to "SUSE Linux Enterprise Desktop 10 & 11", No driver is required for this device. Native support is provided by the operating system.

HP Slim SuperMulti DVDRW SATA Drive	Description	12.7mm high, tray-load
	Mounting Orientation	Either horizontal or vertical
	Interface Type	SATA/ATAPI
	Dimensions (WxHxD)	128 x 14 x 128mm
	Disc Formats	DVD-RAM DVD+R DVD+RW DVD+R DL DVD-R DL DVD-R DVD-RW CD-R CD-RW
	Disc Capacity	DVD-ROM 8.5 GB DL or 4.7 GB standard Full Stroke DVD < 230 ms (seek) Full Stroke CD < 220ms (seek)
	Maximum Data Transfer	CD ROM Read CD-ROM, CD-R Up to 24X

Technical Specifications - Optical and Removable Storage

Rates	DVD ROM Read	CD-RW Up to 24X
		DVD-RAM Up to 8X
		DVD+RW Up to 8X
		DVD-RW Up to 8X
		DVD+R DL Up to 8X
		DVD-R DL Up to 8X
		DVD-ROM Up to 8X
		DVD-ROM DL Up to 8X
		DVD+R Up to 8X
		DVD-R Up to 8X
Power	Source	SATA DC power receptacle
	DC Power Requirements	5 VDC $\pm$ 5%-100 mV ripple p-p
	DC Current	5 VDC $\leq$ 800 mA typical, $\leq$ 1600 mA maximum
Operating Environmental (all conditions non-condensing)	Temperature	41° to 122° F (5° to 50° C)
	Relative Humidity	10% to 80%
	Maximum Wet Bulb Temperature	84° F (29° C)
	Operating Systems Supported	Windows 8 32-bit and 64-bit, Windows 7 Professional 32-bit and 64-bit, Windows Vista Business 64*, Windows Vista Business 32*, Windows Vista Home Basic 32*, Windows 2000, Windows XP Professional or Windows XP Home 32*. Red Hat Enterprise Linux(RHEL) WS4**, 5, 6 Desktop/Workstation SUSE Linux Enterprise Desktop 10 & 11
	Kit Contents	No driver is required for this device. Native support is provided by the operating system. HP SATA SuperMulti DVD Writer drive, Cyberlink Power2Go Software, Cyberlink PowerDVD Software, installation guide, and DVD+R media.
	Approvals	© Copyright 2015 Hewlett-Packard Development Company, L.P. The only warranties for HP products and services are set forth in the express warranty statements accompanying such products and services. Nothing herein should be construed as constituting an additional warranty. HP shall not be liable for technical or editorial errors or omissions contained herein. The information contained herein is subject to change without notice.

HP Slim Blu-ray Writer	Description	HP Slim Blu-ray Writer
	Mounting Orientation	Horizontal
	Interface Type	SATA
	Dimensions (WxHxD)	128 x 14 x 128mm
	Disc Formats	BD-ROM BD-R

Technical Specifications - Optical and Removable Storage

	BD-RE DVD-RAM DVD+R DVD+RW DVD+R DL DVD-R DL DVD-R DVD-RW CD-R CD-RW		
Disc Capacity	DVD-ROM CD-ROM	8.5 GB DL or 4.7 GB standard 650MB CD-ROM (Read Only) 800/700/650MB CD-Recordable (Read & Write) 700/650MB CD-Rewritable (Read & Write) 700/650MB High Speed CD-Rewritable (Read & Write) 700/650MB Ultra & Ultra+ Speed CD-Rewritable (Read & Write)	
Access Times	Blu-ray Full Stroke DVD Full Stroke CD Blu-ray Startup Time (Time to drive ready from tray loading)	50 GB DL or 25 GB standard < 200ms (seek) < 200ms (seek) < 230ms (seek) BD-ROM (SL/DL) BD-R (SL/DL) BD-RE (SL/DL) DVD-ROM (SL/DL) DVD-R (SL/DL) DVD-RW DVD+R (SL/DL) DVD+RW DVD-RAM CD-ROM	25S / 28S 25S / 28S 25S / 28S 18S / 18S 25S / 25S 25S 25S / 25S 25S 45S 15S
Maximum Data Transfer Rates	CD ROM Read DVD ROM Read Blu-Ray	CD-ROM CD-R CD-RW DVD-RAM DVD+RW DVD-RW DVD+R DL DVD-R DL DVD-ROM DVD-ROM DL DVD+R DVD-R BD-ROM BD-ROM DL BD-R BD-R DL	Up to 24X Up to 24X Up to 24X Up to 8X UUp to 8X Up to 8X Up to 8X Up to 8X Up to 8X Up to 8X Up to 8X Up to 8X Up to 6X Up to 6X Up to 6X Up to 6X

Technical Specifications - Optical and Removable Storage

Power	Source	BD-R	Up to 6X
	DC Power Requirements	BD-RE SL/DL	Up to 6X
	DC Current	BD-RE TL	4.8x
	Operating Environmental (all conditions non-condensing)	SATA DC power receptacle	
Operating Environmental (all conditions non-condensing)	Temperature	5 VDC $\pm$ 5%-100 mV ripple p-p	
	Relative Humidity	5 VDC -900 mA typical, 2000mA maximum	
	Maximum Wet Bulb Temperature	41° to 122° F (5° to 50° C)	
	Operating Systems Supported	15% to 80%	
Kit Contents	Kit Contents	84° F (29° C)	
		Windows 8 32-bit and 64-bit, Windows 7 Professional 32-bit and 64-bit, Windows Vista Business 64*, Windows Vista Business 32*, Windows Vista Home Basic 32*, Windows 2000, Windows XP Professional or Windows XP Home 32*.	
		Red Hat Enterprise Linux(RHEL) WS4, 5, 6 Desktop/Workstation,	
		SUSE Linux Enterprise Desktop 10 & 11	
Disclaimer	Disclaimer	* No driver is required for this device. Native support is provided by the operating system.	
		HP Blue Laser RW Drive, Cyberlink Power2Go Software, Cyberlink PowerDVD Software, installation guide.	
		As Blu-Ray is a new format containing new technologies, certain disc, digital connection, compatibility and/or performance issues may arise, and do not constitute defects in the product. Flawless playback on all systems is not guaranteed. In order for some Blu-Ray titles to play, they may require a DVI or HDMI digital connection and your display may require HDCP support. HD-DVD movies cannot be played on this workstation.	
HP DVD-ROM Drive	Description	5.25-inch, half-height, tray-load	
	Mounting Orientation	Either horizontal or vertical	
	Interface Type	SATA/ATAPI	
	Dimensions (WxHxD)	15.0 x 4.4 x 20.3 cm (5.9 x 1.7 x 8.0 in)	
	Disc Capacity	DVD-ROM	Single layer: Up to 4.7 GB Double layer: Up to 8.5 GB
	Access Times	DVD-ROM Single Layer	< 140 ms (typical)
		CD-ROM Mode 1	< 125 ms (typical)
		Full Stroke DVD	< 250 ms (seek)
		Full Stroke CD	< 210 ms (seek)
	Power	Source	SATA DC power receptacle
		DC Power Requirements	5 VDC $\pm$ 5%-100 mV ripple p-p 12 VDC $\pm$ 5%-200 mV ripple p-p
		DC Current	5 VDC - <1000 mA typical, < 1600 mA maximum 12 VDC - < 600 mA typical, < 1400 mA maximum
Operating Environmental (all conditions non-	Temperature	41° to 122° F (5° to 50° C)	
	Relative Humidity	10% to 90%	

Technical Specifications - Optical and Removable Storage

condensing)	Maximum Wet Bulb Temperature	86° F (30° C)
	Operating Systems Supported	Windows 7 Professional 32-bit and 64-bit, Windows Vista Business 64*, Windows Vista Business 32*, Windows Vista Home Basic 32*, Windows 2000, Windows XP Professional or Windows XP Home 32*. Red Hat Enterprise Linux(RHEL) WS4**, 5, 6 Desktop/Workstation, Removed reference to "Novell" because of acquisition and changed product reference to "SUSE Linux Enterprise Desktop 10 & 11", No driver is required for this device. Native support is provided by the operating system.

HP DVD+/-RW Drive	Description	5.25-inch, half-height, tray-load	
	Mounting Orientation	Either horizontal or vertical	
	Interface Type	SATA/ATAPI	
	Dimensions (WxHxD)	15.0 x 4.4 x 20.3 cm (5.9 x 1.7 x 8.0 in)	
	Disc Formats	DVD-RAM DVD-R DVD+RW DVD+R DL DVD-R DL DVD-R DVD-RW CD-R CD-RW	
	Disc Capacity	DVD-ROM	8.5 GB DL or 4.7 GB standard
		Full Stroke DVD	< 250 ms (seek)
		Full Stroke CD	< 210 ms (seek)
	Maximum Data Transfer Rates	CD ROM Read	CD-ROM, CD-R Up to 40X CD-RW Up to 32X
		DVD ROM Read	DVD-RAM Up to 12X DVD+RW Up to 8X DVD-RW Up to 8X DVD+R DL Up to 8X DVD-R DL Up to 8X DVD-ROM Up to 16X DVD-ROM DL Up to 8X DVD+R Up to 16X DVD-R Up to 16X
Power	Source	SATA DC power receptacle	
	DC Power Requirements	5 VDC ± 5%-100 mV ripple p-p 12 VDC ± 5%-200 mV ripple p-p	
	DC Current	5 VDC -1000 mA typical, 1600 mA maximum 12 VDC -600 mA typical, 1400 mA maximum	
Operating Environmental (all conditions non-)	Temperature	41° to 122° F (5° to 50° C)	
	Relative Humidity	10% to 90%	

Technical Specifications - Optical and Removable Storage

condensing)	Maximum Wet Bulb Temperature	86° F (30° C)
	Operating Systems Supported	Windows 7 Professional 32-bit and 64-bit, Windows Vista Business 64*, Windows Vista Business 32*, Windows Vista Home Basic 32*, Windows 2000, Windows XP Professional or Windows XP Home 32*. Red Hat Enterprise Linux(RHEL) WS4**, 5, 6 Desktop/Workstation SUSE Linux Enterprise Desktop 10 & 11
	Kit Contents	No driver is required for this device. Native support is provided by the operating system. HP SATA SuperMulti DVD Writer Drive, Roxio Easy Media Creator software, Intervideo WinDVD Software, installation guide, and DVD+R media.

HP 14-in-1 Media Card Reader	Description	Supports hardware ECC (Error Correction Code) function Supports hardware CRC (Cyclic Redundancy Check) function Supports MS 4-bit parallel transfer mode Supports MS-PRO 4-bit parallel transfer mode Supports MS PRO-HG Duo 4-bit parallel transfer mode Supports SD 4-bit parallel transfer mode Supports UHS-104 SD 4-bit card (version 3.0) Supports CF v6.0 with PIO mode 6 and Ultra DMA 7 mode
	Interface Type	USB 3.0 High-speed interface Note: If there is a USB2 connection, USB2 transfer speeds are supported.
	Dimensions (WxHxD)	4.9 x 4 x 1 in (124.5 x 101.6 x 25.4 mm)
	Supported Media Types	CompactFlash Type I CompactFlash Type II Microdrive Secure Digital Card (SD) Secure Digital High Capacity (SDHC) SD Extended Capacity Memory Card (SDXC) Memory Stick Memory Stick Select Memory Stick Duo (MS Duo) Memory Stick PRO (MS PRO) Memory Stick PRO Duo (MS PRO Duo) Memory Stick PRO-HG Duo MagicGate Memory Stick (MG) MagicGate Memory Stick Duo Note: These additional media types are supported with a card adapter. Memory Stick Micro (M2) miniSD miniSD High Capacity Micro SD Memory Card (MicroSD) Micro SD High Capacity Memory Card (MicroSDHC)
	Operating Environmental (all conditions non-condensing)	10°C 10% R.H. ≥ 24 hours 10°C 90% R.H. ≥ 24 hours 20°C 90% R.H. ≥ 24 hours 30°C 90% R.H. ≥ 24 hours 40°C 90% R.H. ≥ 24 hours

Technical Specifications - Optical and Removable Storage

50°C 90% R.H. ≥ 24 hours
50°C 10% R.H. ≥ 24 hours

Extremes:

140°F (60°C) @ 80% R.H. for 96 hours
-22°F (-30°C) @ 20% R.H. for 48 hours

No power applied

Delta °C < 1.0°C/min

Delta % R.H. < 1.5% R.H./min

Note: Test Parameters/Conditions - Power applied, unit operating on system ±5%

Operating Systems Supported

Windows 8 Pro (64-bit)*

Windows 8 (64-bit)*

Windows 7 Ultimate (32-bit)**

Windows 7 Ultimate (64-bit)**

Windows 7 Professional (32-bit)**

Windows 7 Professional (64-bit)**

Windows 7 Home Basic**

Windows 7 Home Premium (32-bit)**

Windows 7 Home Premium (64-bit)**

Windows Vista Business 64

Windows Vista Business 32

Windows Vista Home Basic 32

Windows XP Professional

Windows XP Home 32

No driver is required for this device. Native support is provided by the operating system.

Note: Not all features are available in all editions of Windows 8. Systems may require upgraded and/or separately purchased hardware, drivers and/or software to take full advantage of Windows 8 functionality. See <http://www.microsoft.com>.

Note: Not all features are available in all editions of Windows 7. This system may require upgraded and/or separately purchased hardware to take full advantage of Windows 7 functionality. See <http://www.microsoft.com/windows/windows-7/> for details.

Kit Contents

Media card reader, 5.25" bracket/rails/bezel, Install Guide, IO & Security Software and Documentation CD

Approvals

USB-IF, WHQL, Compliant with USB Mass Storage Class Bulk only

Technical Specifications - Controller Cards

HP IEEE 1394b FireWire PCIe Card	Data Transfer Rate	Supports up to 800 Mb/s
	Devices Supported	IEEE-1394 compliant devices
	Bus Type	PCIe card full height PCIe slots
	Ports	Two IEEE-1394b external 9-Pin connectors (Rear)
	Internal Connectors	One 10-Pin header connector
	System Requirements	Windows 8.1 64-bit, Windows 7 Professional 32-bit and 64-bit, SLED 11 and RHEL 6. Intel i5 series or higher processor, min 2GB of RAM, 20GB Hard Drive, CD-ROM drive, built in sound system, Available PCIe slot.
	Temperature - Operating	50° to 131° F (10° to 55° C)
	Temperature - Storage	-22° to 140° F (-30° to 60° C)
	Relative Humidity - Operating	20% to 80%
	Compliances	FCC Part 15B, cULus 60950, CE Mark EN55022B(1995)/EN55024-1998 STD, Taiwan BSMI CNS13438, Korea MIC
HP Thunderbolt-2 PCIe 1-port I/O Card	Operating Systems Supported	Windows 8.1 64-bit, Windows 7 Professional 32-bit and 64-bit
	Data Transfer Rate	Supports up to 20 Gb/s (20,000 Mb/s)
	Devices Supported	Thunderbolt™ certified devices
	Bus Type	PCIe card, full or half height PCIe slots
	Ports	One Thunderbolt™ 2 external 20-Pin output connectors (Rear) One full size DisplayPort input connector (Rear)
	Internal Connectors	One 5-Pin header connector
	System Requirements	Genuine Windows 7 Professional 64-bit, Genuine Windows 8.1 64-bit, Intel i5 series or higher processor, 4-GB RAM, 20-GB Hard Drive, available PCIe slot.
	Temperature - Operating	50° to 131° F (10° to 55° C)
	Temperature - Storage	-22° to 140° F (-30° to 60° C)
	Relative Humidity - Operating	20% to 80%
	Compliances	FCC Part 15B, cULus 60950, CE Mark EN55022B(1995)/EN55024-1998 STD, Taiwan BSMI CNS13438, Korea MIC
	Operating Systems Supported	Genuine Windows 7 Professional 64-bit, Genuine Windows 8.1 64-bit.
	Kit Contents	HP Thunderbolt™ 2 PCIe 1-port I/O Card, full height and half height bulkhead bracket, DisplayPort cable, GPIO (General-Purpose Input/Output) cables(2), Installation documentation and warranty card.
	Data Transfer Rate	Supports up to 20 Gb/s (20,000 Mb/s)
	Devices Supported	Thunderbolt™ certified devices
	Bus Type	PCIe card, full or half height PCIe slots
	Ports	One Thunderbolt™ 2 external 20-Pin output connectors (Rear) One full size DisplayPort input connector (Rear)
	Internal Connectors	One 5-Pin header connector
	System Requirements	Genuine Windows 7 Professional 64-bit, Genuine Windows 8.1 64-bit, Intel i5 series or higher processor, 4-GB RAM, 20-GB Hard Drive, available PCIe slot.
	Temperature - Operating	50° to 131° F (10° to 55° C)
	Temperature - Storage	-22° to 140° F (-30° to 60° C)

Technical Specifications - Controller Cards

Relative Humidity - Operating	20% to 80%
Compliances	FCC Part 15B, cULus 60950, CE Mark EN55022B(1995)/EN55024-1998 STD, Taiwan BSMI CNS13438, Korea MIC
Operating Systems Supported	Genuine Windows 7 Professional 64-bit, Genuine Windows 8.1 64-bit.
Kit Contents	HP Thunderbolt™ 2 PCIe 1-port I/O Card, full height and half height bulkhead bracket, DisplayPort cable, GPIO (General-Purpose Input/Output) cables(2), Installation documentation and warranty card.

Technical Specifications - Networking and Communications

Integrated Intel I217LM PCIe GbE Controller (Intel vPro with Intel AMT 9.0)	Connector	RJ-45
	Controller	Intel I217LM GbE platform LAN connect networking controller
	Memory	3 KB Tx and 3KB Rx FIFO packet buffer memory
	Data Rates Supported	10/100/1000 Mbps
	Compliance	802.1as/1588, 802.1p, 802.1Q, 802.3, 802.3ab, 802.3az, 802.3i, 802.3u, 802.3z
	Bus Architecture	PCI Express and SMBus
	Data Transfer Mode	PCIe-based interface for active state operation (S0 state) and SMBus for host and management traffic (Sx low power state)
	Power Requirement	Requires 3.3V (integrated regulators for core Vdc)
	Boot ROM Support	Yes
	Network Transfer Mode	Full-duplex; Half-duplex (not supported for the 1000BASE-T transceiver)
HP X520 10GbE Dual Port Adapter	Network Transfer Rate	10BASE-T (half-duplex) 10 Mbps 10BASE-T (full-duplex) 20 Mbps 100BASE-TX (half-duplex) 100 Mbps 100BASE-TX (full-duplex) 200 Mbps 1000BASE-T (full-duplex) 2000 Mbps
	Management Capabilities	vPro, WOL, auto MDI crossover, PXE, iSCSI Boot, Multi-port teaming, RSS, ACPI, Advanced cable diagnostic, loopback modes, AMT 9.0 support, Circuit Breaker, VLAN, Multicast Listener Discovery (MLD)
	Hardware Certifications	FCC B, UL, CE, VCCI, BSMI, CTICK, KCC
	Operating Temperature	0°C to 45°C (32°F to 113°F)
	Operating Humidity	0% to 85%, noncondensing
	Dimensions (H x W x D)	0.47(h) x 0.54(w) x 2.19(d) inches (1.19 x 1.38 x 5.57 cm)

Summary of Changes

Date of change:	Version History:		Description of change:
	From v1 to v2		
June 1	v17 to v18	Added	IdNumber
Sept 4	From v18 to v19	Added	New and updated components, drives, GPU cards, and networking
November 1, 2014	From v19 to v20	Added	NVIDIA Quadro K620 2GB Graphics, NVIDIA Quadro K2200 4GB Graphics, HP 15-in-1 Media Card Reader, Ubuntu Linux 14.04
		Removed	Intel® Xeon® processor E3-1270v3, Intel® Xeon® processor E3-1230v3, Intel® Core™ i7-4771 processor, Intel® Core™ i3-4330 processor, Intel® Pentium® G3220 processor, NVIDIA Quadro 410 512MB Graphics, HP 14-in-1 Media Card Reader, Genuine Windows® 7 Ultimate 64-bit, Genuine Windows® 7 Home Premium 32-bit, Genuine Windows® 7 Home Premium 64-bit
December 1, 2014	From v20 to v21	Removed	NVIDIA Quadro K4200 4GB Graphics
January 1, 2014	From v21 to v22	Removed	Core i7, i5 and Intel Pentium Processors, 250, 500 and 1TB SATA 10k rpm HDDs
February 1, 2015	From v22 to v23	Added	Overview Operative Systems, Supported components, Graphics: AMD FirePro W5100 4GB Graphics, AMD FirePro W7100 8GB Graphics, NVIDIA Quadro K4200 4GB Graphics
April 1, 2015	From v23 to v24	Added	Operative Systems in Overview and Supported Components. 4TB SATA HDD
		Changed	Memory Speed nomenclature throughout the document. 500GB SATA SED SFF HDD
May 1, 2015	From v24 to v25	Removed	HP 256GB SATA 6Gb/s SED Opal 1 SSD and NVIDIA Quadro K4000 3GB Graphics
June 1, 2015	From v25 to v26	Added	Intel® Core™ i3-4170 processor, 1TB SATA 7200 rpm 8GB 3.5" SSHD (hybrid), 3Dconnexion CADMouse
		Removed	AMD FirePro V3900 1GB Graphics, NVIDIA Quadro K600 1GB Graphics, Removed 256GB SED Opal 1 SSD
August 1, 2015	From v26 to v27	Added	Windows 10 support from OS Overview
		Changed	Preinstalled and supported from Overview OS
November 1, 2015	From v27 to v28	Changed	AMD FirePro W5100 4GB Graphics full specs

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