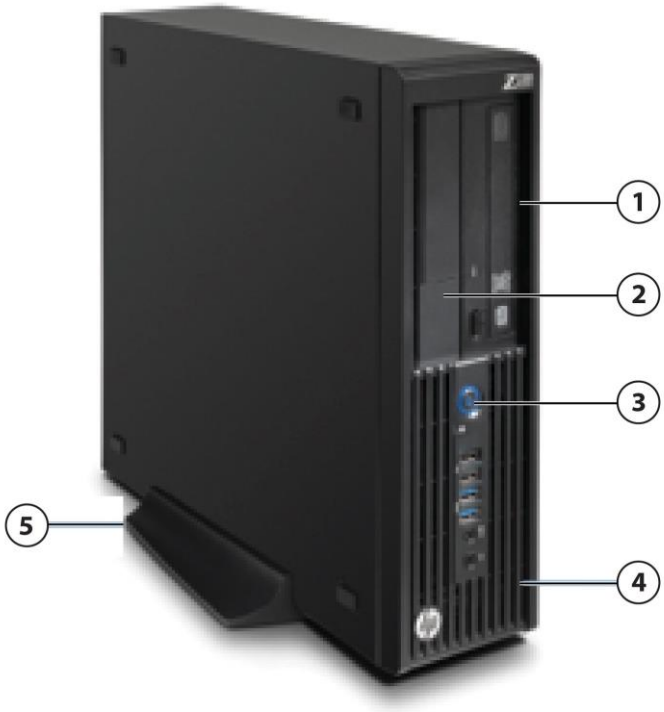
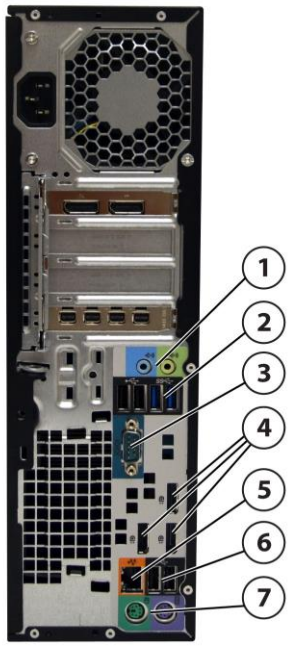
Overview

HP Z230 SFF Workstation



1. External 5.25" bay
2. External/internal shared 3.5" bay
3. Power button
4. Front I/O (top to bottom order): 2 USB 2.0 ports, 2 USB 3.0 ports, Microphone/Headphone, Headphone
5. Optional SFF tower stand

Overview



1. 1 Audio Line In, 1 Audio Line Out
2. 2 USB 3.0, 2 USB 2.0
3. 1 serial port
4. 3 DisplayPort (DP 1.2) outputs from Intel HD graphics (available on specific processors only)
5. RJ-45 to integrated GBE
6. 2 USB 2.0
7. PS/2 ports (keyboard, mouse)

Form Factor	Small Form Factor
Operating Systems	Preinstalled: • Windows 7 Professional 32/64 • • Windows 8.1 Pro 64-bit • Windows 8.1 Pro 64 Downgrade to Windows 7 Professional 32/64 • Windows 8.1 64-bit • Windows 8.1 Standard 64-bit • Windows 8.1 Simplified Chinese Edition 64-bit • Windows 8.1 Single Language (EM) • Ubuntu Linux 14.04 • HP Installer Kit for Linux (includes drivers for 64-bit OS versions of RHEL 6.6, RHEL 7, SUSE Linux Enterprise Desktop 11, Ubuntu 14.04) • • Windows 8.1 Pro 64 Downgrade to Windows 7 Professional 32/64 • Windows 8.1 64-bit

Overview

- Windows 8.1 Simplified Chinese Edition 64-bit
- Windows 8.1 Single Language (EM)
- Ubuntu Linux 14.04
- HP Installer Kit for Linux [includes drivers for 64-bit OS versions of Red Hat Enterprise Linux 6 and SUSE Linux Enterprise Desktop (SLED) 11]
- 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 7 Enterprise 32/64
- Windows 8/8.1 Enterprise 64-bit
- Red Hat Enterprise Linux Desktop 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
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

Overview

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

[1]The 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
Convertibility	The Z230 SFF can either be placed flat on the desktop or made to stand on the desk with the optional tower stand.
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 (all slots are Low Profile) **Note:** 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)	• 1 external Half Height 5.25" bay • 1 shared internal/external 3.5" bay • 1 internal 3.5" bay • 1 internal 2.5" bay (for SSD only)
Front I/O	2 USB 3.0, 2 USB 2.0, 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:

Overview

	supports one HP Internal USB 2.0 Port Kit and one USB 3.0 Media Card Reader.
Rear I/O	3 DisplayPort (DP 1.2) outputs from Intel HD graphics (available on specific processors only); 2 USB 3.0 ports, 4 USB 2.0 ports, 2 serial ports (1 standard, 1 optional), 1 parallel port (optional), 2 PS/2, RJ-45 (LoM), 1 Audio Line-in, and 1 Audio Line-out; 2 IEEE 1394b ports (optional).
Interfaces Supported	14-in-1 Media Card Reader (optional)
Chassis Dimensions (H x W x D)	Standard desktop orientation: 100 x 337 x 384 mm (3.95 x 13.3 x 15.1 in); Optional SFF Tower orientation (excluding stand dimension): 337 x 100 x 384 mm (13.3 x 3.95 x 15.1 in)
Weight	Exact weights depend upon configuration; Typical Weight* 7.2 kg (15.87 lbs) Shipping Weight* 9.8 kg (21.6 lbs) Max Supported Weight (desktop orientation) 35 kg (77 lb) **Note***: Configured with 2 3.5" hard drives, 1 optical drive, 2 DIMMs and 1 NVIDIA Quadro K600 graphics card
Temperature	Operating: 5° to 35°C (40° to 95°F) Non-operating: -40° to 60°C (-40° to 140°F) **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	240W 92% Efficiency wide-ranging, active Power Factor Correction (PFC) 240W Standard Efficiency wide-ranging, active PFC Power Supply option available in some countries. The Power Supply Efficiency Report for the 240W, 92% efficiency power supply may be found at these links: http://www.plugloadsolutions.com/psu_reports/HEWLETT-PACKARD%20COMPANY_PS-4241-1HA_240W_ECOS%203449_Report.pdf http://www.plugloadsolutions.com/psu_reports/HEWLETT-PACKARD_D12-240P2A_240W_ECOS%203384_Report.pdf http://www.plugloadsolutions.com/psu_reports/Hewlett-Packard%20Company_DPS-240AB-3%20A_240W_ECOS%203416_Report.pdf http://www.plugloadsolutions.com/psu_reports/HEWLETT-PACKARD%20COMPANY_PCC002-020H2_240W_ECOS%203440_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 1600 MT/s capable CPU is used in the system, the maximum speed the memory will run at is 1333 1600 MT/s regardless of the specified speed of the memory. **NOTE:** transfer rates up to 1600 MT/s
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
	Intel® Core™ i3-4130 processor, Dual-Core, 4 MB cache,	Y	N	See Note 2

Supported Components

	3.4 GHz			
	Dual Core Intel® Pentium® Processors (Z230)			
	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 DreamColor LP2480zx Professional Display 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	
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	

Sub-Section Description/Notes

NOTE: The 2.5" internal drive bay on the Z230 SFF only supports a Solid State Drive, and not a 10K rpm HDD.

SATA Solid State Drives

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
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	

Supported Components

	HP 256GB SATA 6Gb/s SED SSD	Y	Y	(not available as After Market Option)
	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	TBD

Intelligent Disk Caching	**Intelligent Disk Caching**	**Factory Configured**	**Option Kit**	**Option Kit Part Number**	**Support Notes**
	64GB SSD Disk Cache Module	Y	N	(not available today as After Market Option)	

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

***** Each drive requires a PCIe x4 (minimum) slot to be available. Full performance is obtained only when using PCIe slots connected to the CPU. Non-CPU PCIe slots may see a decrease of up to 10%. Please see slot configuration recommendations at www.hp.com/go/zturbo. Note that graphics cards, Thunderbolt™, and other devices will require PCIe slots.

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	

NOTE 1: Windows OS only; Supported only with two drives of identical type and capacity.

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. Please visit http://h20000.www2.hp.com/bc/docs/support/SupportManual/c00060684/c00060684.pdf for RAID capabilities with Linux.

Graphics	**Factory Configured**	**Option Kit**	**Option Kit Part Number**	**Support Notes**	**Supported # of cards**	**Supported Mixed**
Integrated Intel HD Graphics Media Accelerators (Z230)						
Intel HD Graphics P4600	Y	N		Available on Intel® Xeon® E3-12x5 v3	1	NO

Supported Components

				processors only. See Note 1.		
	Intel HD Graphics 4600	Y	N	Available on Intel CoreTM i7-4xxx/ Core i5-4xxx/ Core i3-4330 processors. See Note 1.Available on Intel CoreTM i7-4xxx/ Core i5-4xxx/ Core i3-4330 processors. See Note 1.	1	NO
	Intel HD Graphics 4400	Y	N	Available on Intel Core i3-4130 processor. See Note 1.	1	NO
	Intel HD Graphics	Y	N	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		2	NO
	NVIDIA NVS 510 2GB Graphics	Y	Y	C2J98AA	Can be mixed with one NVS 310	1	YES
	Graphics Cable Adapters						
	HP DisplayPort To DVI-D Adapter	Y	Y	FH973AA		1	
	HP DisplayPort To DVI-D Adapter (2-Pack)	Y	N			1	
	HP DisplayPort To DVI-D Adapter (4-Pack)	Y	N			1	
	HP DisplayPort To VGA Adapter	Y	Y	AS615AA		1	

Supported Components

HP DisplayPort to Dual Link DVI Adapter	Y	Y	NR078AA	1	
Entry 3D					
AMD FirePro V3900 1GB Graphics	Y	Y	A6R69AA	1	NO
AMD FirePro W2100 2GB Graphics	Y	Y	J3G91AA	2	
NVIDIA Quadro K420 1GB Graphics	Y	Y	J3G86AA	1	NO
NVIDIA Quadro K600 1GB Graphics	Y	Y	C2J92AA	1	NO
NVIDIA Quadro K620 2GB Graphics	Y	Y	J3G87AA	1	
Mid-range 3D					
NVIDIA Quadro K1200 4GB Graphics	Y	Y	L4D16AA	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 cards 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 8GB (1x8GB) 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.
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 the memory.
NOTE: Transfer rates up to 1600 MT/s

AMO	Option Kit Part Number	Support Notes
DDR3-1600 nECC Unbuffered DIMMs AMO		
HP 8GB (1x8GB) DDR3-1600 non-ECC RAM	B1S54AA	
HP 4GB (1x4GB) DDR3-1600 nECC RAM	B1S53AA	

Supported Components

DDR3-1600 ECC Unbuffered DIMMs - AMO	
HP 8GB (1x8GB) DDR3-1600 ECC RAM	A2Z50AA
HP 4GB (1x4GB) DDR3-1600 ECC RAM	A2Z48AA

NOTE: Only unbuffered DDR3 DIMMs are supported.

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

Optical and Removable Storage	**Factory Configured**	**Option Kit**	**Option Kit Part Number**	**Support Notes**
HP 16X DVD-ROM SATA Drive (non Lightscribe)	Y	Y	AR629AA	
HP 16X DVD+/-RW SuperMulti SATA Drive	Y	Y	QS208AA	
HP Blu-ray Writer	Y	Y	AR482AA	
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: Four USB 3.0 ports are available integrated on the motherboard (2 front, 2 rear). Integrated USB 3.0 ports are supported under Microsoft Windows 7 or Microsoft Windows 8 operating systems only.

NOTE 2: Thunderbolt™ 2 is available via an optional add-in card. Thunderbolt is new technology. Thunderbolt cable and Thunderbolt device (sold separately) must be compatible with Windows. To determine whether your device is Thunderbolt Certified for Windows, see https://thunderbolttechnology.net/products

Networking and Communications	**Factory Configured**	**Option Kit**	**Option Kit Part Number**	**Support Notes**
Integrated Intel I217LM PCIe GbE Controller	Y	N	N	See Notes 1, 2, 3
Intel Ethernet I210-T1 PCIe NIC	Y	Y	E0X95AA	See Notes

Supported Components

				3, 4
	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 Solenoid Lock and Hood (SFF) Sensor	Y	Y	E0X97AA	
	HP Business PC Security Lock Kit	N	Y	PV606AA	The HP Business PC Security Lock Kit does not work with the Integrated Work Center stand.
	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	

Other Hardware		Factory Configured	Option Kit	Option Kit Part Number	Support Notes

Supported Components

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	
HP (SFF) Tower Stand	Y	Y	VN569AA	

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 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)	
HP Linux Installer Kit	See http://h20331.www2.hp.com/hpsub/cache/537200-0-0-225-121.html
SUSE Linux Enterprise Desktop 11	See http://www.suse.com/products/desktop/

Supported Components

Red Hat Enterprise Linux (RHEL) Workstation - Paper License (1yr)	See http://www.redhat.com/rhel/desktop/
Ubuntu Linux 14.04	
Windows 8.1 Standard 64-bit	

System Technical Specifications

System Board		
System Board Form Factor	ATX 24.38 x 24.38 mm (9.6 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 x16 LP slot (x16 electrical/x16 mechanical) • 1 PCI Express Gen2 x16 LP slot (x4 electrical/x16 mechanical) • 1 PCI Express Gen2 x1 LP slot (x1 electrical/x4 mechanical) • 1 PCI Express Gen2 x1 LP slots (x1 electrical/x1 mechanical) **NOTE:** LP = Low Profile **NOTE:** In the PCIe Gen3 slot (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.	
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.
	Serial Attached SCSI	None
	Integrated RAID	**NOTE:** Requires identical hard drives (speeds, capacity, interface)
	Integrated Graphics	Integrated Intel HD Graphics 4600 (on Core i5/i7-4xxx processors); Integrated 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; 3 DP 1.2 graphics ports integrated in motherboard; Supports up to three simultaneous displays across DP outputs. Max. resolution supported: 3840x2160 @60Hz
	Network Controller	Integrated Ethernet PHY Connection I217LM. Management capabilities: WOL, PXE 2.1 and AMT 9.0
	External SATA (eSATA)	1 port eSATA capable with optional eSATA After-Market

System Technical Specifications

		Option cable kit.
	IDE connector	No
	Floppy connector	No
	Serial	1 rear port
	2nd Serial	Yes- requires optional Serial Port Adapter Kit
	Parallel	1 internal header (optional Parallel Port Adapter required)
	CD-ROM input (Audio)	No
	AUX input (Audio)	No
IEEE 1394 Connector(s)	**Rear**	2 IEEE 1394b (requires optional PCIe 1394b card)
	Internal	No
USB Connector(s)	**Front**	2 USB 3.0, 2 USB 2.0
	Rear	2 USB 3.0, 4 USB 2.0
	Internal	1 USB 3.0, 2 USB 2.0
HD Integrated Audio	Yes	
Flash ROM	Yes, 16MB	
Chassis Fan Header	Not applicable	
Front Control Panel/Speaker Header	Yes	
CMOS Battery Holder - Lithium	Yes	
Integrated Trusted Platform Module	Integrated TPM 1.2.	
Power Supply Headers	Yes	
Power Switch, Power LED & Hard Drive LED Header	Yes	
Clear Password Jumper	Yes	
Keyboard/Mouse	USB or PS/2	
	240W, 92% efficiency, wide-ranging, active PFC Power Supply; (Note: 240W Standard Efficiency wide-ranging, active PFC Power Supply option available in some countries). The Z230 SFF 92% PSU Efficiency Report can be found at these links: http://www.plugloadsolutions.com/psu_reports/HEWLETT-PACKARD%20COMPANY_PS-4241-1HA_240W_ECOS%203449_Report.pdf http://www.plugloadsolutions.com/psu_reports/HEWLETT-PACKARD_D12-240P2A_240W_ECOS%203384_Report.pdf http://www.plugloadsolutions.com/psu_reports/Hewlett-Packard%20Company_DPS-240AB-3%20A_240W_ECOS%203416_Report.pdf http://www.plugloadsolutions.com/psu_reports/HEWLETT-PACKARD%20COMPANY_PCC002-020H2_240W_ECOS%203440_Report.pdf	
Operating Voltage Range	90-269 VAC	
Rated Voltage Range	100-240 VAC	
Rated Line Frequency	50-60 Hz	

System Technical Specifications

Operating Line Frequency Range	47-63 Hz
Rated Input Current	4A @ 100-240V
Heat Dissipation	Typical: 444 btu/hr (112 kcal/hr) Maximum: 890 btu/hr (224 kcal/hr)
Power Supply Fan	70x25 mm variable speed
ENERGY STAR® qualified (Config Dependent)	Yes
FEMP Standby Power Compliant	Yes, with Wake-on-LAN disabled: <2W in S5- Power Off
Built-in Self Test (BIST) **LED**	No
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

System Configurations

Z230 SFF Configuration #1	**Processor Info**	1x Intel Core i3-4xxx 3.x xMB 2C HT xxW GT1 CPU
	Memory Info	4GB (1x 4GB) 1600 MT/s DDR3 non-ECC
	Graphics Info	Intel Integrated Graphics
	Disks/Optical/Floppy	1x SATA 500 GB 7.2k rpm/ 1x DVD-RW
	PSU	240W 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)						
	Windows Busy Typ (S0)						
	Windows Busy Max (S0)						
	Sleep (S3)						
	Off (S5)						
	Zero Power Mode (EuP)						
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)						
	Windows Busy Typ (S0)						
	Windows Busy Max (S0)						
	Sleep (S3)						

System Technical Specifications

	Off (S5)						
	Zero Power Mode (EuP)						

Z230 SFF 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 K600 1GB Graphics
	Disks/Optical/Floppy	1x SATA 2 TB 7.2k rpm/ 1xDVD-RW
	PSU	240W 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)	32.7 W		32.7 W		32.6 W	
	Windows Busy Typ (S0)	131 W		130 W		130 W	
	Windows Busy Max (S0)	154 W		151 W		155 W	
	Sleep (S3)	2.05 W	1.95 W	2.18 W	2.08 W	2.03 W	1.93 W
	Off (S5)	0.83 W	0.76 W	0.95 W	0.88 W	0.82 W	0.75 W
	Zero Power Mode (EuP)	0.23 W		0.34 W		0.22 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)	112 btu/hr		112 btu/hr		111 btu/hr	
	Windows Busy Typ (S0)	447 btu/hr		444 btu/hr		444 btu/hr	
	Windows Busy Max (S0)	525 btu/hr		515 btu/hr		529 btu/hr	
	Sleep (S3)	6.99 btu/hr	6.65 btu/hr	7.44 btu/hr	7.10 btu/hr	6.93 btu/hr	6.95 btu/hr
	Off (S5)	2.83 btu/hr	2.59 btu/hr	3.24 btu/hr	3.00 btu/hr	2.80 btu/hr	2.56 btu/hr
	Zero Power Mode (EuP)	0.78 btu/hr		1.16 btu/hr		0.75 btu/hr	

Z230 SFF Configuration #3	**Processor Info**	1x Intel Xeon E3-1280v3 3.6 8MB 4C HT 84W GT0 CPU
	Memory Info	32GB (4x 8GB) 1600 MT/s DDR3 ECC
	Graphics Info	1x NVIDIA Quadro K600 1GB Graphics
	Disks/Optical/Floppy	2x SATA 2 TB 7.2k rpm/ 1xDVD-RW
	PSU	240W 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)	38.8 W		38.7 W		38.9 W	
	Windows Busy Typ (S0)	142 W		140 W		141 W	
	Windows Busy Max (S0)	164 W		161 W		165 W	
	Sleep (S3)	2.87 W	2.75 W	3.01 W	2.90 W	2.86 W	2.75 W
	Off (S5)	0.83 W	0.76 W	0.95 W	0.88 W	0.82 W	0.75 W
	Zero Power Mode (EuP)	0.23 W		0.34 W		0.22 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)	132 btu/hr		132 btu/hr		133 btu/hr	

System Technical Specifications

	Windows Busy Typ (S0)	485 btu/hr		478 btu/hr		481 btu/hr	
	Windows Busy Max (S0)	560 btu/hr		549 btu/hr		563 btu/hr	
	Sleep (S3)	9.79 btu/hr	9.38 btu/hr	10.3 btu/hr	9.90 btu/hr	9.76 btu/hr	9.38 btu/hr
	Off (S5)	2.83 btu/hr	2.59 btu/hr	3.24 btu/hr	3.00 btu/hr	2.80 btu/hr	2.56 btu/hr
	Zero Power Mode (EuP)	0.78 btu/hr		1.16 btu/hr		0.75 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 Configuration (High-end)		
	Processor Info	Intel Xeon E3-1280v3 3.6 GHz
	Memory Info	4 x 4GB DDR3 1600 MT/s
	Graphics Info	NVIDIA Quadro K600 graphics
	Disks/Optical	2x 500GB 10K rpm SATA HDDs; SATA Blu-ray 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: 10,000 feet (3,000 m) Non-operating: 30,000 feet (9,100 m)
	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 5,000 ft (1524 m) altitude, maximum operating temperature is de-rated by 1.8° F (1° C) per 1,000 ft (305 m) elevation increase

Physical Security and Serviceability	
Access Panel	Tool-less Includes system board and memory information
Hard Drives	Tool-less (Internal bays)
Expansion Cards	Tool-less
Processor Socket	Tool-less, except for the processor heatsink.
Green User Touch Points	Yes, on tool-free internal chassis mechanisms
Color-coordinated Cables and Connectors	Yes
Memory	Tool-less
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	Yes, enables or disables serial, USB, audio, and network ports

System Technical Specifications

Control	
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	No
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.
Cooling Solutions	Air cooled forced convection
Power Supply Fans	70mm x 70mm x 25mm 4-wire PWM (non-serviceable)
CPU Heatsink Fan	Not applicable- CPU heatsink is passive.
Chassis Fan	Not applicable. CPU heatsink fan also operates as the chassis fan.
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
Trusted Platform Module Chip with optional ProtectTools Software	Yes
Integrated Chassis Handles	No
Power Supply	Requires T15 Torx or flat blade screwdriver
PCI Card Retention	Yes, rear (all), middle (none), front (none)
Flash ROM	Yes
Diagnostic Power Switch LED on board	Yes
Clear Password Jumper	Yes

System Technical Specifications

Clear CMOS Button	Yes
CMOS Battery Holder	Yes
DIMM Connectors	Yes
HP ProtectTools Security Manager	Yes - Not supported on Microsoft XP x64 or Linux

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. Repset.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.
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	Allows for very low power consumption with quick resume time.

System Technical Specifications

(Suspend to RAM - ACPI sleep state S3)	
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	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 BIOS	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, 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;

System Technical Specifications

	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 (CECP) • 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: • 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:

System Technical Specifications

	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 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.

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

System Technical Specifications

	• 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 E3-1200v2 family or 3rd 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 Customer Advisories 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.

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 E3-1246v3, 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 E3-1226v3, 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™ i7-4770 processor, Quad-Core, 8 MB cache, 3.4 GHz, up to 3.9 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™ i3-4330 processor, Dual-Core, 4 MB cache, 3.5 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, 4 MB cache, 3.5 GHz
Intel® Core™ i3-4130 processor, Dual-Core, 4 MB cache, 3.4 GHz

Intel® Pentium® G3240 processor, Dual-Core, 3 MB cache, 3.1 GHz
Intel® Pentium® G3220 processor, Dual-Core, 3 MB cache, 3.0 GHz

Technical Specifications - Hard Drives

SATA Hard Drives for HP Workstations	**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)	
	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 512GB SATA 6Gb/s SSD	**Capacity**	512GB	
		Height	0.28 in; 0.7 cm	

Technical Specifications - Hard Drives

		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)	
	HP 256GB SATA 6Gb/s SED SSD	**Capacity**	256GB	
		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 550MB/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
		Interface	6Gb/s SATA	
		Synchronous Transfer Rate (Maximum)	600 Mb/s	
	Samsung Enterprise 240GB SATA SSD	**Capacity**	240GB	
		Width	**Physical Size**	2.5 in; 6.36 cm
		Interface	SATA 6Gb/s	
		Synchronous Transfer Rate (Maximum)	Up to 600MB/s	
	Samsung Enterprise 480GB SATA SSD	**Capacity**	480GB	
		Width	**Physical Size**	2.5 in; 6.36 cm
		Interface	SATA 6Gb/s	
		Synchronous Transfer Rate (Maximum)	Up to 600MB/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)	

Technical Specifications - Hard Drives

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

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 x DisplayPort 1.2
	Maximum Resolution	Up to 2560 x 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 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: - 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) 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	The thermal solution used on this card is an active fan heatsink.
NVIDIA NVS 510 2GB Graphics	**Form Factor**	Low Profile, 2.713 inches × 6.3 inches, single slot
	Graphics Controller	NVS 510 GPU Core Clock: 797 Mhz Memory Clock: 891 Mhz

Technical Specifications - Graphics

	CUDA Cores: 192
Bus Type	PCI Express x16, Generation 2.0
Memory	2GB DDR3
Connectors	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 x 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) 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

Technical Specifications - Graphics

		Web site: http://welcome.hp.com/country/us/en/support.html
	Power Consumption	33.4 Watts
	Note	Heatsink cooler design is active.
AMD FirePro W2100 2GB Graphics	**Form Factor**	Low Profile, half length (full-height bracket included)
	Graphics Controller	AMD FirePro™ W2100 professional graphics based on Oland GPU. GPU: 320 Stream Processors organized into 5 Compute Units GPU Frequency: 630Mhz Power: 26W Cooling: Active
	Bus Type	PCI Express® x8, Generation 3.0
	Memory	2GB DDR3 memory Memory Bandwidth: up to 28.8 GB/s Memory Width: 128 bit
	Connectors	2x Display Port 1.2 connectors 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 1.2: - up to 4096x2160 x 24 bpp @ 60Hz Dual Link DVI(I) (requires adapter cable): - up to 2560 x 1600 x 32 bpp @ 60Hz Single Link-DVI(I)(requires adapter cable): - up to 1920 x 1200 x 32 bpp @ 60Hz VGA (requires adapter cable): - up to 1920 x 1200 x 32 bpp @ 60Hz
	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	2 x DisplayPort® 1.2a Maximum number of displays: 2
	Shading Architecture	Shader Model 5.0
	Supported Graphics APIs	OpenCL™ 1.2, DirectX® 11.2/12, OpenGL 4.4 OpenGL 4.4 support with driver release 14.301.xxx OpenCL 1.2 conformance expected with drive release 14.301.xxx

Technical Specifications - Graphics

Available Graphics Drivers	Windows 8.1 (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	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 www.amd.com/firepro for details.

Technical Specifications - Graphics

NVIDIA Quadro K420 1GB Graphics	**Form Factor**	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
	Bus Type	PCI Express x16, 2.0 compliant
	Memory	Size: 1GB DDR3 Clock: 891MHz Memory Bandwidth: 29GB/s Memory Width: 128 bit
	Connectors	One dual-link DVI-I connector One DisplayPort connector 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
	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 3840x2160 Maximum number of monitors across all available Quadro K420 outputs is

Technical Specifications - Graphics

		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 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 × 1536 × 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 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. Additonal cables must be ordered separately. 3. Full Height Profile bracket installed. Low Profile bracket included in after market kit.

Technical Specifications - Graphics

NVIDIA Quadro K1200 4GB Graphics	**Form Factor**	Dimensions: 2.71" H x 6.875" L Single Slot, Low Profile Cooling: Active Weight: ~175 grams
	Graphics Controller	NVIDIA Quadro K1200 Graphics Card GPU: GM107 with 512 CUDA cores Power: 46 Watts
	Bus Type	PCI Express 2.0 x16
	Memory	Size: 4GB GDDR5 Memory Bandwidth: 80 GB/s Memory Width: 128-bit
	Connectors	4 mini-DisplayPort 1.2a Factory Configured Option: 4 mini-DP-to-DP adapters included with card Option Kit: 4 mini-DP-to-DP adapters included with card Additional 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 × 1536 × 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)
	Display Output	Maximum number of displays - 4 direct attached monitors Maximum number of DisplayPort displays possible: - 4 1920x1200 - 4 2560x1600 - 4 4096x2160 Maximum number of monitors across all available Quadro K1200 outputs is 4.
	Shading Architecture	Shader Model 5.0

Technical Specifications - Graphics

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 K1200 offered as Factory Configured Option includes 4 miniDP to DP video cable adapters. Other video cable adapters must be ordered separately. 2. Quadro K1200 offered as an Option Kit includes 4 mini-DP to DP adapters. 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).

Technical Specifications - Multimedia and Audio Devices

HP Thin USB Powered Speakers	**Frequency Response** (-3dB, 24-bit/96kHz input)	FO to 20kHz
	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 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 ± 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-condensing)	**Temperature**	41° to 122° F (5° to 50° C)
		Relative Humidity	10% to 90%
		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)

Technical Specifications - Optical and Removable Storage

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-condensing)	**Temperature**	41° to 122° F (5° to 50° C)	
	Relative Humidity	10% to 90%	
	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 No driver is required for this device. Native support is provided by the operating system.	
	Kit Contents	HP SATA SuperMulti DVD Writer Drive, Roxio Easy Media Creator software, Intervideo WinDVD Software, installation guide, and DVD+R media.	

HP Blu-Ray Writer	**Description**	5.25-inch, half-height, tray-load
	Mounting Orientation	Either horizontal or vertical
	Interface Type	SATA
	Dimensions (WxHxD)	15.0 x 4.4 x 20.3 cm (5.9 x 1.7 x 8.0 in)
	Disc Formats	BD-ROM BD-R BD-RE DVD-RAM DVD+R DVD+RW DVD+R DL DVD-R DL DVD-R DVD-RW

Technical Specifications - Optical and Removable Storage

	CD-R CD-RW		
Disc Capacity	**DVD-ROM**	8.5 GB DL or 4.7 GB standard	
	Blu-ray	50 GB DL or 25 GB standard	
	Full Stroke DVD	< 250 ms (seek)	
	Full Stroke CD	< 210 ms (seek)	
	Blu-ray	Blu-ray	
	Startup Time (Time to drive ready from tray loading)	BD-ROM (SL/DL)	25S / 28S
		BD-R (SL/DL)	25S / 28S
		BD-RE (SL/DL)	25S / 28S
		DVD-ROM (SL/DL)	18S / 18S
		DVD-R (SL/DL)	25S / 25S
		DVD-RW	25S
		DVD+R (SL/DL)	25S / 25S
		DVD+RW	25S
		DVD-RAM	45S
		CD-ROM	45S
Maximum Data Transfer Rates	**CD ROM Read**	CD-ROM	Up to 40X
		CD-R	Up to 40X
		CD-RW	Up to 40X
	DVD ROM Read	DVD-RAM	Up to 5X
		DVD+RW	Up to 10X
		DVD-RW	Up to 10X
		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 12X
		DVD-R	Up to 12X
	Blu-Ray	BD-ROM	Up to 6X
		BD-ROM DL	Up to 4.8X
		BD-R	Up to 6X
		BD-R DL	Up to 4.8X
		BD-R	Up to 6X
		BD-RE SL/DL	Up to 4.8X
Power	**Source**	SATA DC power receptacle	
	DC Power Requirements	5 VDC ± 5%-100 mV ripple p-p 12 VDC ± 10%-100 mV ripple p-p	
	DC Current	5 VDC -900 mA typical, 1200 mA maximum 12 VDC -1000 mA typical, 1600 mA maximum	
Operating Environmental (all conditions non-condensing)	**Temperature**	41° to 122° F (5° to 50° C)	
	Relative Humidity	15% to 80%	
	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	

Technical Specifications - Optical and Removable Storage

		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 * No driver is required for this device. Native support is provided by the operating system. ** RHEL WS4 not supported on Z200/Z200SFF
	Kit Contents	HP Blue Laser RW Drive, Roxio Easy Media Creator software, Intervideo WinDVD Software, installation guide.
	Disclaimer	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 15-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) Fits conveniently in the 5.25" drive bay.
	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) SD Ultra High Speed II(SD UHSII) 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 These additional media types are supported with a card adapter. Memory Stick Micro (M2) miniSD miniSD High Capacity Micro SD Memory Card (MicroSD)

Technical Specifications - Optical and Removable Storage

	Micro SD High Capacity Memory Card (MicroSDHC) Test Parameters/Conditions - Power applied, unit operating on system ±5%
Operating Systems Supported	Windows 8 Pro (64-bit)* Windows 8.1 (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. 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. 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. Seehttp://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 Transport Specification Rev. 1.0, Compliant Intel Front Panel I/O Connectivity Design Guide V. 1.3, FCC, CE, BSMI, C-Tick, VCCI, MIC, cUL, TUVT
Weight	0.35 lbs (0.16 kg)

Technical Specifications - Controller Cards

HP IEEE 1394b FireWire PCIe Card	**Data Transfer Rate**	Supports up to 800 Mbps
	Devices Supported	IEEE-1394 compliant devices
	Bus Type	PCIe card full height PCIe slots
	Ports	Two IEEE-1394b bilingual 9-Pin Connector (Rear)
	Internal Connectors	One 10-Pin header Custom Connector
	System Requirements	Windows 7 Professional 32-bit and 64-bit, Microsoft® Windows® XP Professional, Windows XP Home, Windows Vista, SLED 11 and RHEL 6. Intel Pentium® G series or higher processor, 128-MB RAM, 1-GB 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
	Operating Systems Supported	Windows 7 Professional 32-bit and 64-bit, Windows Vista® Business 32-bit and 64-bit, Windows® XP Professional, XP Professional 64-bit, RHEL 6 and SLED 11.
HP Thunderbolt-2 PCIe 1-port I/O 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)
	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, 128-MB RAM, 1-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 bracket, DisplayPort to DisplayPort cable, internal header cables (2), user documentation and warranty card.
	Warranty	The HP Thunderbolt™ 2 PCIe 1-port I/O Card has a one-year Limited Warranty or the remainder of the warranty of the HP supported product in which it is installed. Technical support is available seven days a week, 24 hours a day, by phone, as well as online support forums. Certain restrictions and exclusions apply.

Summary of Changes

Date of change:	Version History:		Description of change:
June 1, 2014	From v15 to v16	Added	IdNumber
September 4. 2014	From v16 to v17	Changed	Added HP Client Security and the Intel Core i3-4160, OS section updated.
November 1, 2014	From v17 to v18	Added	HP 15-in-1 Media Card Reader
		Removed	Intel® Xeon® processor E3-1270v3, Intel® Xeon® processor E3-1230v3, Intel® Core™ i3-4330, Intel® Pentium® G3220, NVIDIA Quadro 410 512MB Graphics, Genuine Windows® 7 Ultimate 64-bit, Genuine Windows® 7 Home Premium 32/64-bit, HP 14-in-1 Media Card Reader
December 1, 2014	From v18 to v19	Added	Ubuntu Desktop Linux 14.04, NVIDIA Quadro K620
		Changed	OS, entry 3D and processors section
		Removed	Windows 7 Ultimate 64-bit,Intel Pentium® G3220 processor 3.00 -- 3 MB 1333 MHz 2 N N HDGraphics, Intel Core™ i3-4330 processor 3.50 -- 4 MB 1600 MHz 2 Y N 4600, Intel Xeon processor E3-1230v3 3.30 3.70 8 MB 1600 MHz 4 Y Y No, Intel Xeon processor E3-1270v3 3.50 3.90 8 MB 1600 MHz 4 Y Y No
January 1, 2014	From v19 to v20	Removed	Core i7, i5 and Intel Pentium Processors, 250, 500 and 1TB SATA 10k rpm HDDs
February 1, 2015	From v20 to v21	Added	OS, Windows 8.1 64-bit
April 1, 2015	From v21 to v22	Changed	Memory nomenclature
May 1, 2015	From v22 to v23	Added	Windows 8.1, and Linux in OS, NVIDIA Quadro K1200 and Memory note in Overview and Supported Components section.
		Changed	OS and Memory order and support from Overview and Supported Components
		Removed	256 SED SSD
June 1, 2015	From v23to v24	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