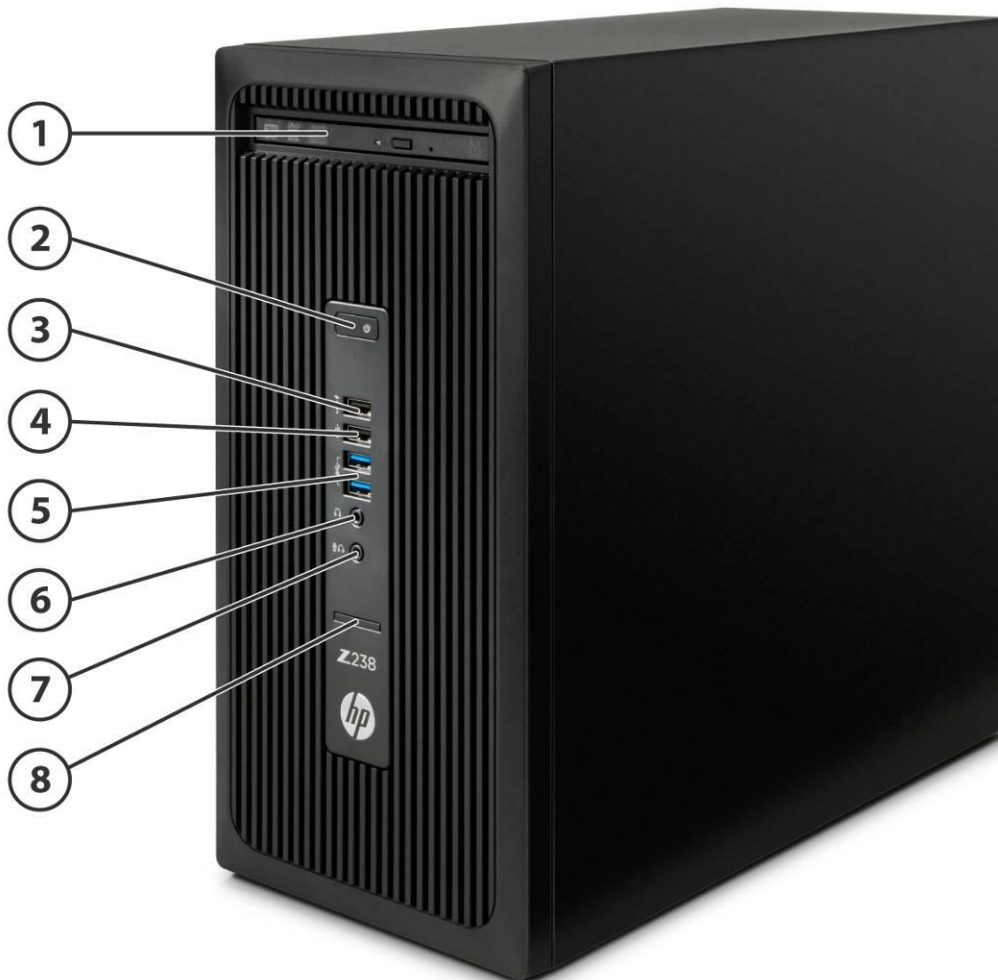


Overview

HP Z238 Microtower Workstation

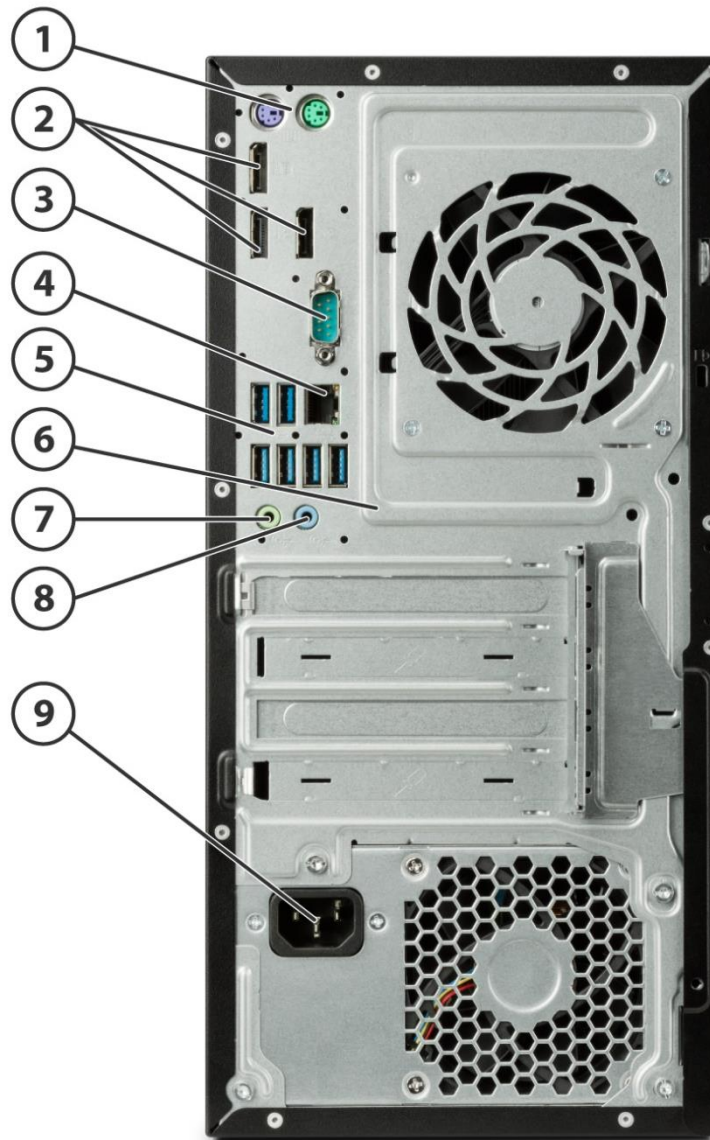


Front View

1. Optical Drive (shown with: HP 9.5mm Slim SuperMulti DVD Writer)
2. Power button
3. USB 3.0 (charging)
4. USB 3.0

5. (2) USB 2.0
6. Headphone Jack
7. Headphone/Microphone Combo Jack
8. Optional: SD Media Card Reader

Overview



Back View

- | | |
|-----------------------------|-----------------------------------|
| 1. (2) PS/2 | 6. (2) internal 3.5" storage bays |
| 2. (3) DisplayPort (DP 1.2) | 7. 1 Audio Line-out |
| 3. 1 Serial port (standard) | 8. 1 Audio Line-in |
| 4. RJ-45 (LoM) | 9. Power connector |
| 5. (6) USB 3.0 ports | |

Form Factor	Minitower
Operating Systems	Preinstalled: <ul style="list-style-type: none">• Windows 10 Pro 64¹

Overview

- Windows 10 Home 64 High End¹
- Windows 10 Home 64 Chinese Market CPPP¹
- Windows 7 Professional 64 (available through downgrade rights from Windows 10 Pro 64)²
- HP Linux-ready

Supported:

- Windows 10 Enterprise 64
- Windows 7 Enterprise 32/64
- Windows 7 Professional 32
- Red Hat Enterprise Linux Desktop 6, 7
- SUSE Linux Enterprise Desktop 11 SP3, 12

NOTES: For detailed OS/hardware support information for Linux, see:
http://www.hp.com/support/linux_hardware_matrix

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

² This system is preinstalled with Windows 7 Professional software and also comes with a license and media for Windows 10 Pro software. You may only use one version of the Windows software at a time. Switching between versions will require you to uninstall one version and install the other version. You must back up all data (files, photos, etc.) before uninstalling and installing operating systems to avoid loss of your data.

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

Overview

Processors									
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® E3-1240v6 processor	4	3.7	4.1	8	2400	Y	N/A	Y	80W
Intel® Xeon® E3-1230v6 processor	4	3.5	3.9	8	2400	Y	N/A	Y	80W
Intel® Xeon® E3-1225v6 processor	4	3.3	3.7	8	2400	N	Intel® HD Graphics P630	Y	80W
Intel® Xeon® E3-1205v6 processor	4	3.0	N/A	8	2400	N	Intel® HD Graphics P630	Y	65W
Intel® Xeon® E3-1240v5 processor	4	3.5	3.9	8	2133	Y	N/A	Y	80W
Intel® Xeon® E3-1230v5 processor	4	3.4	3.8	8	2133	Y	N/A	Y	80W
Intel® Xeon® E3-1225v5 processor	4	3.3	3.7	8	2133	N	Intel® HD Graphics P530	Y	80W
Intel® Core™ i7-7700 processor	4	3.6	4.2	8	2400	Y	Intel® HD Graphics 630	Y	65W
Intel® Core™ i5-7500 processor	4	3.4	3.8	6	2400	N	Intel® HD Graphics 630	Y	65W
Intel® Core™ i3-7100 processor	2	3.9	N/A	3	2400	N	Intel® HD Graphics 630	N	51W
Intel® Pentium® G4560 processor	2	3.5	N/A	3	2400	N	Intel® HD Graphics 630	N	54W
Intel® Core™ i7-6700 processor	4	3.4	4.0	8	2133	Y	Intel® HD Graphics 530	Y	65W
Intel® Core™ i5-6600 processor	4	3.3	3.9	6	2133	N	Intel® HD Graphics 530	Y	65W
Intel® Core™ i3-6100 processor	2	3.7	N/A	3	2133	N	Intel® HD Graphics 530	N	51W
Intel® Pentium® G4400 processor	2	3.3	N/A	3	2133	N	Intel® HD Graphics 510	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.

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

NOTES: Integrated Intel® HD graphics is not supported on the Intel® Xeon® Processor E3-1230v5, E3-1240v5 Intel® Xeon E3, Intel® Core i3 processors can support either ECC or non-ECC memory; Intel® Core i5/i7 processors only support non-ECC memory.

Processor numbers differentiate features within each processor family, not across different processor families. See: http://www.intel.com/products/processor_number/ for details.

Overview

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

Color	Black
Expansion Slots (see system board section for more details)	<p>1 PCIe Gen3 x16 slot 1 PCIe Gen3 x1 slot /x1 connector 1 PCIe Gen3 x1 slot /x1 connector 1 PCIe Gen3 x4 slot /x16 connector</p> <p>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.</p>
Expansion Bays (see storage section for more details)	2 internal 3.5" bays
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: 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); 6 USB 3.0 ports, 1 serial port (standard), 2 PS/2, RJ-45 (LoM), 1 Audio Line-in, and 1 Audio Line-out.
Interfaces Supported	SD Media Card Reader (optional)
Chassis Dimensions (H x W x D)	Standard desktop orientation: 355 x 165 x 356 mm (14.0 x 6.5 x 14.1 in)
Weight	<p>Exact weights depend upon configuration;</p> <p>Minimum Weight: 6.42 kg (14.12 lb) Typical Weight*: 6.99 kg (15.38 lb) Maximum Weight: 7.9 kg (17.42 lb)</p> <p>Max Supported Weight (desktop orientation): 35 kg (77 lb)</p> <p>NOTE: Configured with 2 3.5" hard drives, 1 optical drive, 2 DIMMs and 1 NVIDIA Quadro K620 graphics card</p>
Temperature	<p>Operating: 40° to 95°F (5° to 35°C) Non-operating: -40° to 140°F (-40° to 60°C)</p> <p>NOTE: 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).</p>
Humidity	<p>Operating: 8% to 85% Non-operating: 8% to 90%</p>
Maximum Altitude (non-pressurized)	<p>Operating: 3,000 m (10,000 ft) Non-operating: 9,100 m (30,000 ft).</p>

Overview

Power Supply	280W 85% Efficiency wide-ranging, active Power Factor Correction (PFC) The Power Supply Efficiency Report for the 280W, 85% efficiency power supply may be found at this link: TBD
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® C236 chipset
Memory	4 DIMM slots, supporting up to 64GB ECC/non-ECC, DDR4 2133 and 2400 MT/s
Memory disclaimers	The CPUs determine the speed at which the memory is clocked. If a 2133 MT/s capable CPU is used in the system, the maximum speed the memory will run at is 2133 MT/s regardless of the specified speed of the memory. NOTE: Transfer rates up to 2133 and 2400 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 v6 family			
Intel® Xeon E3-1240 v6 3.7 2400 4C TWR CPU	Y	N	Note 1,3
Intel® Xeon E3-1230 v6 3.5 2400 4C TWR CPU	Y	N	Note 1,3
Intel® Xeon E3-1225 v6 3.3 2400 4C TWR CPU	Y	N	Note 1,3
Intel® Xeon E3-1205 v6 3.0 2400 4C TWR CPU	Y	N	Note 1,3
Intel® Xeon® processor E3-1200 v5 family			
Intel® Xeon E3-1240 v5 3.5 2133 4C CPU	Y	N	Note 3
Intel® Xeon E3-1230 v5 3.4 2133 4C CPU	Y	N	Note 3
Intel® Xeon E3-1225 v5 3.3 2133 4C CPU	Y	N	Note 2
7th generation Intel® Core™ processor family			
Intel® Core™ i7-7700 processor 3.6 2400 4C TWR CPU	Y	N	Note 4
Intel® Core™ i5-7500 processor 3.4 2400 4C TWR CPU	Y	N	Note 4
7th generation Intel® Core™ i3 processor family			
Intel® Core™ i3-7100 processor 3.9 2400 2C TWR CPU	Y	N	Note 4
6th generation Intel® Core™ processor family			
Intel® Core i7-6700 3.4 2133 4C CPU	Y	N	Note 4
Intel® Core i5-6600 3.3 2133 4C CPU	Y	N	Note 4
6th generation Intel® Core™ i3/Pentium processor family			
Intel® Core i3-6100 3.7 2133 2C CPU	Y	N	Note 3
Intel® Pentium G4400 3.3 2133 2C CPU	Y	N	

NOTE 1: Intel® HD Graphics P630 supports workstation-specific graphics drivers for improved compatibility and performance on select professional applications, compared to Intel® HD Graphics 630.

NOTE 2: Intel® HD Graphics P530 supports workstation-specific graphics drivers for improved compatibility and performance on select professional applications, compared to Intel® HD Graphics 530.

NOTE 3: These processors support either ECC or non-ECC memory

NOTE 4: These processors support only non-ECC memory

Monitors / Displays

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP Z Display Z27n 27-inch IPS LED Backlit Monitor		Y	K7C09A8#ABA	
HP Z Display Z25n 25-inch IPS LED Backlit Monitor		Y	K7C01A8#ABA	
HP Z Display Z24n 24-inch IPS LED Backlit Monitor		Y	K7B99A8#ABA	
HP Z Display Z24nq 23.8-inch IPS Backlit Monitor		Y	L1K59A8#ABA	
HP Z Display Z24nf 23.8-inch IPS Backlit Monitor		Y	K7C00A8#ABA	
HP Z Display Z23n 23-inch IPS LED Backlit Monitor		Y	M2J79A8#ABA	
HP Z Display Z22n 21.5-inch IPS LED Backlit Monitor		Y	M2J71A8#ABA	

Supported Components

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	
2TB SATA 7200 rpm 6Gb/s 3.5" HDD	Y	Y	QB576AA	
3TB SATA 7200 rpm 6Gb/s 3.5" HDD	Y	Y	QF298AA	
4TB SATA 7200 rpm 6Gb/s 3.5" HDD (Enterprise Class) For storage drives, GB = a billion bytes. TB = a trillion bytes. Actual formatted capacity is less. Up to 36GB (for Windows 10) of system disk is reserved for system recovery software.	Y	Y	K4T76AA	

SATA Solid State Drives*

HP Solid State Drives (SSDs) for Workstations

HP 256GB SATA 6Gb/s SSD

*For storage drives, GB = a billion bytes. TB = a trillion bytes. Actual formatted capacity is less. Up to 36GB (for Windows 10) of system disk is reserved for system recovery software.

Y	Y	A3D26AA	
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PCIe SSDs

PCIe SSDs for HP Workstations

HP Z Turbo Drive G2 256GB SSD	Y	Y	M1F73AA
HP Z Turbo Drive G2 512GB SSD	Y	Y	M1F74AA

Hard Drive Controllers

Integrated SATA Controller (Z230)

Integrated SATA Controller, RAID 0,1 supported: 4x 6 Gb/s ports

	Factory Configured	Option Kit	Support Notes
Integrated SATA Controller (Z230) Integrated SATA Controller, RAID 0,1 supported: 4x 6 Gb/s ports	Y	Y	
Factory integrated RAID on motherboard for SATA drives			
RAID 0 Configuration – Striped Array	Y	N	See Note 1
RAID 1 Configuration – Mirrored Array	Y	N	See Note 1
Integrated RAID for PCIe SSDs			
RAID 0 Data Configuration	Y	N	See Note 1
RAID 1 Data Configuration	Y	Y	See Note 1

Supported Components

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

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

Graphics	Factory Configuration		Option Kit Part Number	Support Notes	Supported	
	Factory Configuration	Option Kit			# of cards	Mixed?
Integrated Intel® HD Graphics Media Accelerators (Z230)						
Intel® HD Graphics P630	Y	N			1	
Intel® HD Graphics 630	Y	N			1	
Intel® HD Graphics 610	Y	N			1	
Intel® HD Graphics P530	Y	N			1	
Intel® HD Graphics 530	Y	N			1	
Intel® HD Graphics 510	Y	N			1	
Professional 2D						
NVIDIA® NVS™ 310 512MB Graphics*	Y	Y	A7U59AA		1	
* Can be mixed with one NVS 510						
NVIDIA® NVS™ 315 1GB Graphics	Y	Y	E1U66AA		1	
NVIDIA® NVS™ 510 2GB Graphics**	Y	Y	C2J98AA		1	
** Can be mixed with NVS 310						
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	
HP DisplayPort to Dual Link DVI Adapter	Y	Y	NR078AA		1	
Entry 3D						
AMD FirePro™ W2100 2GB Graphics	Y	Y	J3G91AA		1	
NVIDIA® Quadro® K420 2GB Graphics	Y	Y	N1T07AA		1	
NVIDIA® Quadro® K620 2GB Graphics	Y	Y	J3G87AA		1	
Mid-range 3D						
NVIDIA® Quadro® K1200 4GB Graphics	Y	Y	L4D16AA		1	

Supported Components

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.

Supported Components

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

DDR4-2400 ECC Unbuffered DIMMs - CTO

4GB DDR4-2400 ECC (1x4GB) RAM
 8GB DDR4-2400 ECC (2x4GB) RAM
 8GB DDR4-2400 ECC (1x8GB) RAM
 16GB DDR4-2400 ECC (2x8GB) RAM
 32GB DDR4-2400 ECC (4x8GB) RAM
 32GB DDR4-2400 ECC (2x16GB) RAM
 64GB DDR4-2400 ECC (4x16GB) RAM

DDR4-2400 nECC Unbuffered DIMMs - CTO

4GB DDR4-2400 nECC (1x4GB) RAM
 8GB DDR4-2400 nECC (2x4GB) RAM
 16GB DDR4-2400 nECC (2x8GB) RAM
 32GB DDR4-2400 nECC (4x8GB) RAM
 64GB DDR4-2400 nECC (4x16GB) RAM

DDR4-2133 ECC Unbuffered DIMMs - CTO

HP 4GB (1x4GB) DDR4-2133 ECC RAM
 HP 8GB (2x4GB) DDR4-2133 ECC RAM
 HP 8GB (1x8GB) DDR4-2133 ECC RAM
 HP 16GB (2x8GB) DDR4-2133 ECC RAM
 HP 32GB (4x8GB) DDR4-2133 ECC RAM
 HP 64GB (4x16GB) DDR4-2133 ECC RAM

DDR4-2133 nECC Unbuffered DIMMs CTO

HP 4GB (1x4GB) DDR4-2133 nECC RAM
 HP 8GB (2x4GB) DDR4-2133 nECC RAM
 HP 16GB (2x8GB) DDR4-2133 nECC RAM
 HP 32GB (4x8GB) DDR4-2133 nECC RAM
 HP 64GB (4x16GB) DDR4-2133 nECC 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

DDR4-2400 ECC Unbuffered DIMMs - AMO

Option Kit Part Number	Support Notes
HP 4GB (1x4GB) DDR4-2400 ECC Unbuffered RAM	1CA77AA
HP 8GB (1x8GB) DDR4-2400 ECC Unbuffered RAM	1CA79AA
HP 16GB (1x16GB) DDR4-2400 ECC Unbuffered RAM	1CA75AA

DDR4-2400 non-ECC Unbuffered DIMMs - AMO

Supported Components

HP 8GB (1x8GB) DDR4-2400 nECC Unbuffered RAM	1CA80AA
PROMO 4GB (1x4GB) DDR4-2400 nECC Unbuffered RAM	1CA78AT

DDR4-2133 ECC Unbuffered DIMMs - AMO

HP 4GB (1x4GB) DDR4-2133 ECC RAM	NOH86AA
HP 8GB (1x8GB) DDR4-2133 ECC RAM	NOH87AA
HP 16GB (1x16GB) DDR4-2133 ECC RAM	NOH88AA

DDR4-2133 non-ECC Unbuffered DIMMs - AMO

HP 4GB (1x4GB) DDR4-2133 non-ECC RAM	TOE50AA
HP 8GB (1x8GB) DDR4-2133 non-ECC RAM	TOE51AA
HP 16GB (1x16GB) DDR4-2133 non-ECC RAM	TOE52AA

NOTE: Only unbuffered DDR3 DIMMs are supported.

Two channels of DDR4 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 2133 MT/s capable CPU is used in the system, the maximum speed the memory will run at is 2133 MT/s regardless of the specified speed of the memory.

NOTE: Transfer rates up to 2133 MT/s

NOTE: Factory-configured CTO (xxxxxAV) and aftermarket AMO (xxxxxAA, xxxxxAT) HP memory part numbers designated as “2133” or “2400” will be transitioned to using 2666MHz speed memory components. This does not affect HP part number availability nor does it affect system performance or operation. All hardware configurations currently supporting HP memory part numbers designated as “2133” or “2400” have been tested to work with 2666MHz memory and are fully-supported by HP under standard support terms.

Multimedia and Audio Devices

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
Integrated Realtek HD ALC221 Audio	Y	N		

Optical and Removable Storage

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP 9.5mm Slim DVD-ROM Drive	Y	Y	K3R63AA	
HP 9.5mm Slim SuperMulti DVD Writer	Y	Y	K3R64AA	
HP 15-in-1 Media Card Reader	Y	Y		

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.

With Blu-ray 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.

Supported Components

Networking and Communications

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
Integrated Intel® I219LM PCIe GbE Controller (Intel® vPro™1 with Intel® AMT 11.0)	Y	Y		
Intel® Ethernet I210-T1 PCIe NIC	Y	Y	E0X95AA	See Notes 3, 4

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.

Input Devices

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
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 USB Business Slim Keyboard	Y	Y	N3R87AA	
HP PS/2 Business Slim Keyboard	Y	Y	N3R86AA	

Other Hardware

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP Power Cord Kit	N	Y	DM293A	
HP Serial Port Adapter	Y	Y	PA716A	

Software

	Factory Configured	Option Kit	Support Notes
HP Performance Advisor	Y	N	See Note 1
HP Remote Graphics Software (RGS) 7.1	Y	Y	
PDF Complete - Corporate Edition	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:

Supported Components

- [Windows 7 Professional](#)
- [Windows 10 Pro](#)

Operating Systems

Windows® 7 Professional 64-bit

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

Windows 10 Pro 64

Windows 10 Pro downgrade to Windows 7
Professional 64

Windows 10 Home 64

Support Notes

See <http://www.microsoft.com/windows/windows-7/>
for support details.

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

Environmental

System Board									
System Board Form Factor	ATX 24.38 x 24.38 mm (9.6 x 9.6 inches)								
Processor Socket	Single LGA 1151								
CPU Bus Speed	DMI								
Chipset	Intel® PCH C236								
Memory Expansion Slots	4 DDR4 memory slots								
Memory Type Supported	DDR4, UDIMM (Unbuffered), ECC & non-ECC								
Memory Modes	Non-Interleaved for single channel. Interleaved when both channels are populated.								
Memory Speed Supported	2133 and 2400 MHz DDR4								
Memory Protection	ECC available on data								
Maximum Memory	64GB								
Memory Configuration (Supported)	4GB, 8GB and 16GB non-ECC/ 4GB, 8GB and 16GB ECC unbuffered DIMMs are supported. ECC and non-ECC memory DIMMs cannot be mixed on the same system. NOTES: 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.								
Supported Drive Interfaces	<table border="1"> <tbody> <tr> <td>SATA</td> <td>Integrated (4) 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.</td> </tr> <tr> <td>Serial Attached SCSI</td> <td>None</td> </tr> <tr> <td>Integrated RAID</td> <td>NOTE: Requires identical hard drives (speeds, capacity, interface)</td> </tr> <tr> <td>Integrated Graphics</td> <td>Intel® HD Graphics 530 (on Core i3/i5/i7-6xxx processors); Intel® HD Graphics P530 (on Intel® Xeon E3-12x5v5 processors). Based on Unified Memory Architecture (UMA)- A region of system memory is reserved and dedicated to the graphics display.</td> </tr> </tbody> </table>	SATA	Integrated (4) 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	Intel® HD Graphics 530 (on Core i3/i5/i7-6xxx processors); Intel® HD Graphics P530 (on Intel® Xeon E3-12x5v5 processors). Based on Unified Memory Architecture (UMA)- A region of system memory is reserved and dedicated to the graphics display.
SATA	Integrated (4) 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	Intel® HD Graphics 530 (on Core i3/i5/i7-6xxx processors); Intel® HD Graphics P530 (on Intel® Xeon E3-12x5v5 processors). Based on Unified Memory Architecture (UMA)- A region of system memory is reserved and dedicated to the graphics display.								

Environmental

		Support for Microsoft DirectX 11, OpenGL 4.0 and OpenCL 1.2 on Intel® HD Graphics P530; 3 DP 1.2 graphics ports integrated on 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 11.0
	Serial	1 rear port
	2nd Serial	Yes- requires optional Serial Port Adapter Kit
IEEE 1394 Connector(s)		
USB Connector(s)	Front	2 USB 3.0, 2 USB 2.0
	Rear	6 USB 3.0
	Internal	1 USB 3.0, 1 USB 2.0
HD Integrated Audio	Yes	
Flash ROM	Yes	
Chassis Fan Header	1 Rear System Chassis Fan	
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	
	280W, 85% efficiency, wide-ranging, active PFC Power Supply The Z238 85% PSU Efficiency Report can be found at this link: TBD	
Operating Voltage Range	90-264 VAC	

Environmental

Rated Voltage Range	100–240 VAC
Rated Line Frequency	50–60 Hz
Operating Line Frequency Range	47–63 Hz
Rated Input Current	4A @ 100-240V
Heat Dissipation	Heat Dissipation
Power Supply Fan	Power Supply Fan
FEMP Standby Power Compliant	FEMP Standby Power Compliant
Surge Tolerant Full Ranging Power Supply (withstands power surges up to 2000V)	Surge Tolerant Full Ranging Power Supply (withstands power surges up to 2000V)
ErP Lot 6- Tier 2 Compliance @ 230V (<0.5W in S5- Power Off)	ErP Lot 6- Tier 2 Compliance @ 230V (<0.5W in S5- Power Off)
Declared Noise Emissions (Entry-level and High-end configurations)	Declared Noise Emissions (Entry-level and High-end configurations)
System Configuration (Entry level)	System Configuration (Entry level)
	Memory Info
System Configuration (High-end)	
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)

Environmental

Dynamic(new)	<p>Shock</p> <p>Operating: ½-sine: 40g, 2-3ms</p> <p>Non-operating:</p> <p> ½-sine: 160 cm/s, 2-3ms (~100g)</p> <p> square: 422 cm/s, 20g</p> <p>Vibration</p> <p>Operating random: 0.5g (rms), 5-300 Hz</p> <p>Non-operating random: 2.0g (rms), 10-500 Hz</p> <p>NOTES: Values represent individual shock events and do not indicate repetitive shock events. Values do not indicate continuous vibration.</p>
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.
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

Environmental

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
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, parallel, 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
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)

Environmental

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	80mm x 80mm x 25mm 4-wire PWM (non-serviceable)
CPU Heatsink Fan	Mainstream (<=65W): 92mm x 92mm 52.5mm Performance (<=95W): 94mm x 100.2mm x 110mm
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). <ul style="list-style-type: none"> • 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	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

Environmental

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. 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: <ul style="list-style-type: none"> • 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.

Environmental

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	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.

Environmental

Intel® Active Management Technology (AMT)	AMT 11.0; 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 2.4.0
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 ATA II: Extensions to Serial ATA 1.0, Revision 1.0a - Serial ATA II Cables and Connectors Volume 2 Gold - SATA-IO SATA Revision 3.0 Specification
SPD	PC SDRAM Serial Presence Detect (SPD) Specification, Revision 1.2B

Environmental

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

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

Environmental

Social and Environmental Responsibility	
Eco-Label Certifications & Declarations	<p>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:</p> <ul style="list-style-type: none"> 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	<p>The battery in this product complies with EU Directive 2006/66/EC Battery size: CR2032 (coin cell) Battery type: Lithium Metal</p> <p>The battery in this product does not contain:</p> <ul style="list-style-type: none"> Mercury greater than 5ppm by weight Cadmium greater than 10ppm by weight Lead greater than 40ppm by weight
Restricted Material Usage	<p>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 HP Inc. 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.</p>
Low Halogen Statement	<p>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.</p>
End-of-Life Management and Recycling	<p>HP Inc. 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.</p>
HP Inc. Corporate Environmental Information	<p>For more information about HP's commitment to the environment: Global Citizenship Report http://www.hp.com/hpinfo/globalcitizenship/gcreport/index.html</p> <p>Eco-label certifications http://www.hp.com/hpinfo/globalcitizenship/environment/productdesign/ecolabels.html</p> <p>ISO 14001 certificates: http://www.hp.com/hpinfo/globalcitizenship/environment/operations/envmanagement.html</p>
Additional Information	<ul style="list-style-type: none"> 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	<p>HP Workstation product packaging meets the HP General Specification for the Environment at http://www.hp.com/hpinfo/globalcitizenship/society/gen_specifications.html</p> <ul style="list-style-type: none"> Does not contain restricted substances listed in HP Standard 011-1 General Specification for the Environment

Environmental

	<ul style="list-style-type: none"> • 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.

Technical Specifications – Storage / Hard Drives

Manageability	
Intel® Active Management Technology (AMT)	<p>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:</p> <ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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 <p>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, 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.</p>

Technical Specifications – Storage / 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)	Single Track	1.0 ms	
			Average	11 ms	
			Full Stroke	18 ms	

Technical Specifications – Storage / Hard Drives

overhead, including settling)

Rotational Speed	7,200 rpm
Logical Blocks	3,907,029,168
Operating Temperature	41° to 131° F (5° to 55° C)

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)

Technical Specifications – Storage / Hard Drives

HP Solid State Drives (SSDs) for Workstations	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)
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)
	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 (Z240)	Form Factor	<p>Integrated in select Intel® Xeon E3, Intel® Core i7, and Intel® Core i5 processors.</p> <p>Check specific platform specifications for selections.</p>
	Graphics Controller	Intel® HD Graphics
	Memory	<p>Unified Memory Architecture (UMA) frame buffer. Graphics memory is shared with system memory. Size selectable between 32 MB to 1024 MB via BIOS setting. Default size is 128 MB. Additional memory is allocated for graphics as needed using Intel's Dynamic Video Memory Technology (Intel® DVM 5.0), to provide an optimal balance between graphics and system memory use.</p>
	Connectors	Check system platform specifications where Intel® HD Graphics are available.
	Maximum Resolution	<p>Display Port: 2560 x 1600 DVI: 1920x1200 VGA: 2048x1536</p> <p>Note: For DVI and VGA outputs, separate adapters may be required.</p>
	Shading Architecture	Shader Model 5.0
	Supported Graphics APIs	<p>OpenGL 4.0 DirectX 11.1</p>
	Available Graphics Drivers	<p>Windows 10 Windows 7</p>
	Form Factor	<p>Integrated in select Intel® Xeon E3, Intel® Core i7, and Intel® Core i5 processors.</p> <p>Check specific platform specifications for selections.</p>
	Graphics Controller	Intel® HD Graphics
	Memory	<p>Unified Memory Architecture (UMA) frame buffer. Graphics memory is shared with system memory. Size selectable between 32 MB to 1024 MB via BIOS setting. Default size is 128 MB. Additional memory is allocated for graphics as needed using Intel's Dynamic Video Memory Technology (Intel® DVM 5.0), to provide an optimal balance between graphics and system memory use.</p>
	Connectors	Check system platform specifications where Intel® HD Graphics are available.
	Maximum Resolution	<p>Display Port: 2560 x 1600 DVI: 1920x1200 VGA: 2048x1536</p>

Technical Specifications - Graphics

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 10 Windows 7

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:

Technical Specifications - Graphics

- 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	Windows 8.1 Windows 8 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 Note

19.5 Watts

1. The thermal solution used on this card is an active fan heatsink.
2. Factory configured NVS 310 graphics card have no cable adapters included. Adapters must be ordered separately.
3. Option kit NVS 310 includes 2 DP to DVI-D cable adapters.
4. Configurations of three NVS 310 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 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

Technical Specifications - Graphics

Memory	Size: 1GB DDR3 Clock: 875Mhz Memory Bandwidth: 14GB/s
Connectors	DMS-59 output
Maximum Resolution	Cables included: - For CTO: DMS-59 to DVI cable - For AMO: DMS-59 to DVI cable and DMS-59 to VGA cable Maximum number of displays supported: 2 Maximum Resolution Support: - DMS-59 to VGA: 2048 x 1536 @ 85Hz - DMS-59 to DVI: 1920 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: <ul style="list-style-type: none">• 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: <ul style="list-style-type: none">• 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: <ul style="list-style-type: none">• 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

Technical Specifications - Graphics

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

1. The thermal solution used on this card is an active fan heatsink. Factory configured graphics card includes DMS-59 to DVI cable.
2. Option kit graphics card includes DMS-59 to DVI and DMS-59 to VGA cables (one each).
3. Configurations of three NVS 315 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 NVS 510 2GB Graphics

Form Factor Graphics Controller

Low Profile, 2.713 inches × 6.3 inches, single slot

NVS 510 GPU
 Core Clock: 797 Mhz
 Memory Clock: 891 Mhz
 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

Technical Specifications - Graphics

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 Web site:

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

Power Consumption

33.4 Watts

Note

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, Qaudro 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.

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

Technical Specifications - Graphics

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
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 2GB 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: 2GB 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 4.

Technical Specifications - Graphics

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	<ol style="list-style-type: none"> 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

Technical Specifications - Graphics

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. Additional cables must be ordered separately.
 3. Full Height Profile bracket installed. Low Profile bracket included in aftermarket kit.

**NVIDIA Quadro K1200
 4GB Graphics**

Form Factor

Dimensions: 2.71" H x 6.875" L
 Single Slot, Low Profile

Technical Specifications - Graphics

	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 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)
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
Supported Graphics APIs	OpenGL 4.4 DirectX 11.1

Technical Specifications - Graphics

Available Graphics Drivers

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

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 - Optical and Removable Storage

Description	9.5mm height, tray-load	
Mounting Orientation	Either horizontal or vertical	
Interface Type	SATA / ATAPI	
Dimensions (WxHxD)	128 x 9.5 x 127mm	
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 (typical)
	Full Stroke CD	< 220 ms (typical)
	DVD-ROM	Single layer: Up to 4.7 GB Double layer: Up to 8.5 GB
Power	DVD-ROM Single Layer	< 110 ms (typical)
	Source	SATA DC power receptacle
	DC Power Requirements	5 VDC ± 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	Operating Systems Supported	Windows 8.1, 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
		No driver is required for this device. Native support is provided by the operating system.
Kit Contents	Kit Contents	9.5mm Slim DVD-ROM Drive, 5.25" ODD Bay adapter/carrier, slim SATA data/power cable, installation guide

HP 9.5mm Slim SuperMulti DVD Writer

Description	9.5mm height, tray-load
Mounting Orientation	Either horizontal or vertical
Interface Type	SATA/ATAPI
Dimensions (WxHxD)	128 x 9.5 x 127mm
Supported Media Types	DVD-RAM DVD+R DVD+RW DVD+R DL DVD-R DL DVD-R

Technical Specifications - Optical and Removable Storage

	DVD-RW CD-R CD-RW	
Disc Capacity	DVD-ROM	8.5 GB DL or 4.7 GB standard
	Full Stroke DVD	< 200 ms (seek)
	Full Stroke CD	< 200 ms (seek)
Maximum Data Transfer Rates	CD ROM Read	CD-ROM, CD-R Up to 24X CD-RW Up to 24X
	DVD ROM Read	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 ± 5%-100 mV ripple p-p
	DC Current	5 VDC -< 800 mA 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 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, Cyberlink Power2Go Software, Cyberlink PowerDVD Software, installation guide, and DVD+R media.	

HP SD 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)

Dedicated slot in front bezel (orderable option)

Technical Specifications - Optical and Removable Storage

Supported Media Types	<p>Secure Digital Card (SD) Secure Digital High Capacity (SDHC) SD Extended Capacity Memory Card (SDXC) SD Ultra High Speed II(SD UHSII) 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)</p>
Operating Systems Supported	<p>Test Parameters/Conditions - Power applied, unit operating on system ±5%</p> <p>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.</p> <p>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.</p> <p>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.</p>
Kit Contents	<p>SD card reader, Install Guide, IO & Security Software and Documentation CD 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</p> <p>0.35 lbs (0.16 kg)</p>

Technical Specifications - Networking and Communications

Integrated Intel® I219LM PCIe GbE Controller (Intel® vPro with Intel® AMT 11.0)	Connector	RJ-45
	Controller	Intel® I2179LM 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)
	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, Muti-port teaming, RSS, ACPI, Advanced cable diagnostic, loopback modes, AMT 9.0 support, Circuit Breaker, VLAN, Multicast Listener Discovery (MLD)

Summary of Changes

Date of change:	Version History:		Description of change:
March 1, 2017	From v1 to v2	Added	7 th Gen Intel Processors, CTO & AMO memory, Intel HD Graphics 630, HP Corporate info.
April 1, 2017	From v2 to v3	Added	Intel Xeon processors E3 v6 Family, CTO & AMO memory, Intel HD Graphics 610 & P630.
September 22, 2017	From v3 to v4	Added	Memory footnotes
		Changed	Displays section
		Removed	iSCSI Boot as Management Capabilities for the Integrated Intel I219LM PCIe GbE Networking Controller and removed the integrated Intel HD Graphics P630 for the E3-1240, 1230 v6 Intel Xeon processors.
November 30, 2017	From v4 to v5	Added	Disclaimer added to processors section
August 9, 2018	From v5 to v6	Changed	Memory support

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