

## Overview

## NVIDIA Graphics



## SUPPORTED SOLUTIONS

### Category

### Part number

#### QUADRO

NVIDIA® QUADRO® K420	N1T07AA
NVIDIA® QUADRO® K620	J3G87AA
NVIDIA® QUADRO® K1200	L4D16AA
NVIDIA® QUADRO® K2200	J3G88AA
NVIDIA® QUADRO® M2000	T7T60AA
NVIDIA® QUADRO® M4000	M6V52AA
NVIDIA® QUADRO® M5000	M6V53AA
NVIDIA® QUADRO® M6000 (12GB)	L2K02AA
NVIDIA® QUADRO® M6000 (24GB)	T7T61AA
NVIDIA® QUADRO® M1000M	T8W13AA

## Overview

NVIDIA® QUADRO® M2000M

**Available factory integrated only.**

### **NVIDIA NVS**

NVIDIA NVS 310

M6V51AA

NVIDIA NVS 315

E1U66AA

NVIDIA NVS 510

C2J98AA

### **NVIDIA TESLA**

NVIDIA Tesla K40

F4A88AA

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Overview

## COMPATIBILITY MATRIX

	Category	HP Z1 G3	HP Z240 SFF	HP Z240 Tower	HP Z440	HP Z640	HP Z840
<b>NVIDIA® QUADRO® K420</b>	Sub Entry 3D		X	X	X	X	X
<b>NVIDIA® QUADRO® K620</b>	Entry 3D		X	X	X	X	X
<b>NVIDIA® QUADRO® K1200</b>	Mid-range 3D		X	X	X	X	X
<b>NVIDIA® QUADRO® K2200</b>	Mid-range 3D			X	X	X	X
<b>NVIDIA® QUADRO® M2000</b>	Mid-range 3D			X	X	X	X
<b>NVIDIA® QUADRO® M4000</b>	High End 3D			X	X	X	X
<b>NVIDIA® QUADRO® M5000</b>	High End 3D			X	X	X	X
<b>NVIDIA® QUADRO® M6000 (12GB)</b>	Ultra 3D					X	X
<b>NVIDIA® QUADRO® M6000 (24GB)</b>	Ultra 3D					X	X
<b>NVIDIA® QUADRO® M1000M</b>	Entry 3D	X					
<b>NVIDIA® QUADRO® M2000M*</b>	Mid-range 3D	X					
<b>NVIDIA® Tesla® K40</b>	Ultra 3D				X	X	X
<b>NVIDIA® NVS™ 310</b>	Pro 2D		X	X	X	X	X
<b>NVIDIA® NVS™ 315</b>	Pro 2D		X	X	X	X	X
<b>NVIDIA® NVS™ 510</b>	Pro 2D		X	X	X	X	X

## Overview

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\* Available factory integrated only

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## Desktop Workstation Graphics

### **NVIDIA® QUADRO® K420 2GB Graphics**

<b>Part number</b>	N1T07AA
<b>Compatibility</b>	Z440, Z640, Z840
<b>Form Factor</b>	Low Profile, single slot Dimensions: 2.713 inches × 6.3 inches Cooling: Active
<b>Graphics Controller</b>	NVIDIA Quadro K420 GPU: GK107 with 192 CUDA cores Power: 41W
<b>Bus Type</b>	PCI Express x16, 2.0 compliant
<b>Memory</b>	Size: 2GB DDR3 Clock: 891MHz Memory Bandwidth: 29GB/s Memory Width: 128 bit
<b>Connectors</b>	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.
<b>Maximum Resolution</b>	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
<b>Image Quality Features</b>	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

## Desktop Workstation Graphics

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**Display Output**

Maximum number of displays:

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

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

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

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

**Shading Architecture**

Shader Model 5.0

**Supported Graphics APIs**

DX11, OpenGL 4.4

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

**Available Graphics Drivers**

Microsoft Windows 8.1

Microsoft Windows 8

Microsoft Windows 7

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

**Notes**

1. Factory configured Quadro K420 does not include any video adapters. Adapters must be ordered separately.
  2. Option kit Quadro K420 includes one DP to DVI-D adapter.
  3. Full Height Profile bracket installed. Low Profile bracket included in aftermarket kit.
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## Desktop Workstation Graphics

### NVIDIA Quadro K620 2GB Graphics

<b>Part number</b>	J3G87AA
<b>Compatibility</b>	Z240 SFF/CMT, Z440, Z640, Z840
<b>Form Factor</b>	Dimensions: 2.713" H x 6.3" L Single Slot, Low Profile Cooling: Active Weight: 133 grams
<b>Graphics Controller</b>	NVIDIA Quadro K620 GPU: GM107 GPU with 384 CUDA cores Power: 45 Watts
<b>Bus Type</b>	PCI Express 2.0 x16
<b>Memory</b>	Size: 2GB GDDR3 Memory Bandwidth: 29 GB/s Memory Width: 128-bit
<b>Connectors</b>	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.
<b>Maximum Resolution</b>	DisplayPort 1.2: - up to 4096x2160 x 30 bpp @ 60Hz - supports High Bit Rate 2 (HBR2) and Multi-Stream Transport (MST)  Dual Link DVI(I) output: - up to 2560 x 1600 x 32 bpp @ 60Hz  Single Link-DVI(I) output: - up to 1920 x 1200 x 32 bpp @ 60Hz  VGA (via adapter cable): - 2048 x 1536 x 32 bpp at 85 Hz
<b>Image Quality Features</b>	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,

## Desktop Workstation Graphics

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.



## Desktop Workstation Graphics

### NVIDIA Quadro K1200 4GB Graphics

<b>Part number</b>	L4D16AA
<b>Compatibility</b>	HP Z240 SFF/Tower, Z440, Z640, Z840
<b>Form Factor</b>	Dimensions: 2.71" H x 6.875" L Single Slot, Low Profile Cooling: Active Weight: ~175 grams Includes Full Height and Low Profile chassis brackets
<b>Graphics Controller</b>	NVIDIA® QUADRO® K1200 Graphics Card GPU: GM107 with 512 CUDA cores Power: 46 Watts
<b>Bus Type</b>	PCI Express 2.0 x16
<b>Memory</b>	Size: 4GB GDDR5 Memory Bandwidth: 80 GB/s Memory Width: 128-bit
<b>Connectors</b>	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
<b>Maximum Resolution</b>	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
<b>Image Quality Features</b>	12-bit internal display pipeline (hardware support for 12-bit scanout on supported panels, applications and connection)
<b>Display Output</b>	Maximum number of displays

## Desktop Workstation Graphics

- 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

API support includes:

CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran

### Available Graphics Drivers

Windows 10

Windows 8.1

Windows 8

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).

## Desktop Workstation Graphics

### NVIDIA Quadro K2200 Graphics Card

<b>Part number</b>	J3G88AA
<b>Compatibility</b>	Z240 CMT, Z440, Z640, Z840
<b>Form Factor</b>	Dimensions: 4.376" H x 7.97" L Single Slot, Full Height Cooling: Active Weight: 240 grams
<b>Graphics Controller</b>	NVIDIA Quadro K2200 Graphics Card GPU: GM107 with 640 CUDA cores Power: 68 Watts
<b>Bus Type</b>	PCI Express 2.0 x16
<b>Memory</b>	Size: 4GB GDDR5 Memory Bandwidth: 80 GB/s Memory Width: 128-bit
<b>Connectors</b>	1 DL-DVI(I) 2 DisplayPort 1.2a  Factory Configured Option: No video cable adapter included Option Kit: One DP-to-DVI adapter included with card  Additional DVI-to-VGA, DisplayPort-to-VGA or DisplayPort-to-DVI adapters are available as accessories
<b>Maximum Resolution</b>	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
<b>Image Quality Features</b>	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,

## Desktop Workstation Graphics

Interleaved, and passive stereo

### Display Output

Maximum number of displays

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

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

- 4 1920x1200
- 4 2560x1600
- 2 4096x2160

Maximum number of monitors across all available Quadro K2200 outputs is 4.

### Shading Architecture

Shader Model 5.0

### Supported Graphics APIs

OpenGL 4.4  
DirectX 11.1

API support includes:

CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran

### Available Graphics Drivers

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

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

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

### Notes

1. Quadro K2200 offered as Factory Configured Option does not include a video cable adapter. Video cable adapters must be ordered separately.
2. Quadro K2200 offered as an Option Kit includes one DP-to-DVI video cable adapter. Additional cables must be ordered separately.
3. A total maximum of 4 active monitors are supported across all display output types. This may be accomplished by using daisy chained DisplayPort 1.2 displays (displays must support MST and HBR2).

## Desktop Workstation Graphics

### **NVIDIA® QUADRO® M2000 4GB Graphics**

<b>Part number</b>	T7T60AA
<b>Compatibility</b>	HP Z240 Tower, Z440, Z640, Z840
<b>Form Factor</b>	Dimensions: 4.376" H x 6.6" L Single Slot, Full Height Cooling: Active Weight: 239 grams
<b>Graphics Controller</b>	NVIDIA Quadro M2000 Graphics Card GPU: GM206 with 768 CUDA cores Power: 75 Watts
<b>Bus Type</b>	PCI Express 3.0 x16
<b>Memory</b>	Size: 4GB GDDR5 Memory Bandwidth: 105.7 GB/s Memory Width: 128-bit
<b>Connectors</b>	4x DisplayPort 1.2a  Factory Configured Option: No video cable adapter included After Market Option: No video cable adapter included  Additional DisplayPort-to-VGA, DisplayPort-to-HDMI, or DisplayPort-to-DVI adapters are available as accessories
<b>Maximum Resolution</b>	DisplayPort: - up to 4096 x 2160 x 30 bpp @ 60Hz - up to 2560 x 1600 x 30 bpp @ 120 Hz - supports High Bit Rate 2 (HBR2) and Multi-Stream Transport (MST)  Using two DP outputs, the M2000 can drive one dual DP input display with 5120 x 2880 x 30 bpp @ 60Hz resolution.
<b>RAMDAC</b>	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
<b>Image Quality Features</b>	Maximum number of displays - 4 direct attached monitors

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## Desktop Workstation Graphics

Maximum number of monitors across all available Quadro M2000 outputs is 4.

**Shading Architecture** Shader Model 5.0

**Supported Graphics APIs** OpenGL 4.5  
DirectX 12

API support includes:  
CUDA C, CUDA C++, DirectCompute 5.0, and OpenCL software

**Available Graphics Drivers** Microsoft Windows 10  
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 M2000 offered as Factory Configured Option does not include a video cable adapter. Video cable adapters must be ordered separately.
2. Quadro M2000 offered as an After Market Option does not include video cables. Video cable adapters must be ordered separately.
3. See [www.hp.com/go/support](http://www.hp.com/go/support) for HP supported NVIDIA graphics drivers

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## Desktop Workstation Graphics

### **NVIDIA® QUADRO® M4000 8GB Graphics**

<b>Part number</b>	M6V52AA
<b>Compatibility</b>	HP Z240 Tower, Z440, Z640, Z840
<b>Form Factor</b>	Dimensions: 4.4" H x 9.5" L Single Slot, Full Height Cooling: Active Weight: 475 grams (without extender)
<b>Graphics Controller</b>	NVIDIA® QUADRO® M4000 GPU: GM204 with 1664 CUDA cores Power: 120 Watts
<b>Bus Type</b>	PCI Express 3.0 x16
<b>Memory</b>	Size: 8GB GDDR5 Memory Bandwidth: 192 GB/s Memory Width: 256-bit
<b>Connectors</b>	4 DisplayPort™ 1.2a Factory configured Option: 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 accessories
<b>Maximum Resolution</b>	DisplayPort™: - single 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
<b>Image Quality Features</b>	12-bit internal display pipeline (hardware support for 12-bit scanout on supported panels, applications and connection)  NVIDIA® 3D Vision™ technology, 3D DLP, Interleaved, and other 3D stereo format support  Full OpenGL quad buffered stereo support

## Desktop Workstation Graphics

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

### Display Output

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

Maximum number of DisplayPort™ displays possible:  
- 4 1920x1200  
- 4 2560x1600  
- 4 4096x2160  
- 2 5120x2880 (requires dual DP input capable 5k displays)

Maximum number of monitors across all available QUADRO® M4000 outputs is 4.

### Shading Architecture

Shader Model 5.0

### Supported Graphics APIs

OpenGL 4.5  
DirectX 12

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

### Available Graphics Drivers

Windows 10  
Windows 8.1  
Windows 8  
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. Configurations using the QUADRO® M4000 graphics card 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).



## Desktop Workstation Graphics

### **NVIDIA® QUADRO® M5000 8GB Graphics**

<b>Part number</b>	M6V53AA
<b>Compatibility</b>	HP Z240, Z440, Z640, Z840
<b>Form Factor</b>	Dimensions: 4.4" H x 10.5" L Dual Slot, Full Height Cooling: Active Weight: 525 grams (without extender)
<b>Graphics Controller</b>	NVIDIA® QUADRO® M5000 GPU: GM204 with 2048 CUDA cores Power: 150 Watts
<b>Bus Type</b>	PCI Express 3.0 x16
<b>Memory</b>	Size: 8GB GDDR5 ECC capable Memory bandwidth: 211GB/s Memory Width: 256-bit
<b>Connectors</b>	1 Dual Link DVI-I 4 DisplayPort™ 1.2a  Factory configured option: No adapter included with card. After market option kit: No adaptor included with card.  Additional DVI to VGA, DisplayPort™ to VGA, DisplayPort™ to DVI, and DisplayPort™ to Dual-Link DVI adapters available as accessories
<b>Maximum Resolution</b>	DisplayPort™: - up to four 4096 x 2160 x 30 bpp @ 60Hz displays - up to two 5120 x 2880 @ 60Hz displays - 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
<b>Image Quality Features</b>	12-bit internal display pipeline (hardware support for 12-bit scanout on supported panels, applications and connection)

## Desktop Workstation Graphics

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

Full OpenGL quad buffered stereo support.

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

### Display Output

Maximum number of displays

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

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

- 4 1920x1200
- 4 2560x1600
- 4 4096x2160
- 2 5120x2880 (requires dual DP input 5k displays)

Maximum number of monitors across all available QUADRO® M5000 outputs is 4.

### Shading Architecture

Shader Model 5.0

### Supported Graphics APIs

OpenGL 4.5

DirectX 12

API support for NVIDIA®'s CUDA™ C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, Fortran

### Available Graphics Drivers

Windows 10

Windows 8.1

Windows 8

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® M5000 does not include a video cable adapter. Video cable adapters must be ordered separately.
2. 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).
3. Configurations of a single QUADRO® M5000 graphics card 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).

## Desktop Workstation Graphics

### **NVIDIA® QUADRO® M6000 12GB Graphics**

<b>Part number</b>	L2K02AA
<b>Compatibility</b>	HP Z840, Z640
<b>Form Factor</b>	4.42" H x 10.5" L Dual Slot Power: 250 Watts Weight: 1030 grams
<b>Graphics Controller</b>	NVIDIA® QUADRO® M6000 Graphics Card based on the GM200 GPU Core Count: 3072 Base Clock: 1026 MHz Boost Clock: 1152 MHz Idle Clock: 324 MHz
<b>Bus Type</b>	PCI Express 3.0 x16
<b>Memory</b>	12GB GDDR5 384-bit memory I/O path 317 GB/s memory bandwidth ECC Memory (disabled by default)
<b>Connectors</b>	DP (x4) Dual-Link DVI-I 3-pin mini-DIN connector SLI connector QUADRO® Sync connector One 8-pin auxiliary power connector  Factory configured option: No adapter included with card. Option Kit: No adaptor included with card.  DVI to VGA, DisplayPort™ to VGA, DisplayPort™ to DVI, and DisplayPort™ to Dual-Link DVI adapters available as accessories.
<b>Image Quality Features</b>	<ul style="list-style-type: none"><li>• DisplayPort™ with Multi-Stream Technology (MST) and High Bit Rate 2 (HBR2), HDMI 1.4, and HDCP 1.3 support</li><li>• NVIDIA® 3D Vision™ technology</li><li>• NVIDIA® Premium Mosaic and nView</li></ul>
<b>Display Output</b>	400 MHz integrated RAMDAC <ul style="list-style-type: none"><li>• Maximum resolution over VGA (requires DVI to VGA cable or DP to VGA adapter): 2048 × 1536 × 32 bpp at 85 Hz</li></ul> Dual-link internal TMDS (DVI 1.0)

## Desktop Workstation Graphics

- Maximum resolution over digital port (single GPU and SLI mode): 2560 × 1600 × 32 bpp at 60 Hz (reduced blanking)

Single-link internal TMDS (DVI 1.0)

- Maximum resolution over digital port (single GPU and SLI mode): 1920 × 1200 × 32 bpp at 60 Hz (reduced blanking)

DisplayPort™ 1.2a with MST and HBR2. Each DisplayPort™ connector has the following capabilities:

- Maximum pixel clock: 592 MPixel/s
- Maximum bandwidth: 17.2 Gbps
- Example maximum resolution: 4096 × 2160 × 30 bpp at 60Hz

HDMI

- Maximum resolution (requires DP to HDMI adapter): 4096 × 2160 × 8 bpp at 60Hz

### Shading Architecture

Shader Model 5.0

### Supported Graphics APIs

Full OpenGL 4.4

Full DirectX 12

API support includes:

CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran

### Available Graphics Drivers

Windows 10

Windows 8.1

Windows 8

Windows 7 Professional

Linux®

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

<http://www8.hp.com/us/en/drivers.html>

### Notes

1. NVIDIA® GRID VGX Pass Through feature supported on NVIDIA® QUADRO® M6000 to enable direct mapping of GPU to Virtual Machine.

2. No display output adapter included.

3. For HP Z840 Workstation configurations, the 1125W power supply option must be used.

## Desktop Workstation Graphics

### **NVIDIA® QUADRO® M6000 24GB Graphics**

<b>Part number</b>	T7T61AA
<b>Compatibility</b>	HP Z840, Z640
<b>Form Factor</b>	4.4" H x 10.5" L Dual Slot Power: 250 Watts Weight: 1023 grams
<b>Graphics Controller</b>	NVIDIA® QUADRO® M6000 Graphics Card based on the GM200 GPU Core Count: 3072 Base Clock: 1026 MHz Boost Clock: 1152 MHz Idle Clock: 324 MHz
<b>Bus Type</b>	PCI Express 3.0 x16
<b>Memory</b>	24GB GDDR5 384-bit memory I/O path 317 GB/s memory bandwidth ECC Memory (disabled by default)
<b>Connectors</b>	DP (x4) Dual-Link DVI-I Optional Stereo SLI connector QUADRO® Sync connector One 8-pin auxiliary power connector  Factory configured option: No adapter included with card. Option Kit: No adaptor included with card.  Dual-Link DVI to VGA, DisplayPort™ to VGA, DisplayPort™ to DVI, and DisplayPort™ to Dual-Link DVI adapters available as accessories.
<b>Image Quality Features</b>	<ul style="list-style-type: none"><li>● DisplayPort™ with Multi-Stream Technology (MST) and High Bit Rate 2 (HBR2), HDMI 1.4, and HDCP 1.3 support</li><li>● NVIDIA® 3D Vision™ technology</li><li>● NVIDIA® Premium Mosaic and nView</li></ul>
<b>Display Output</b>	400 MHz integrated RAMDAC <ul style="list-style-type: none"><li>● Maximum resolution over VGA (requires DVI to VGA cable or DP to VGA adapter): 2048 × 1536 × 32 bpp at 85 Hz</li></ul> Dual-link internal TMDS (DVI 1.0)

## Desktop Workstation Graphics

- Maximum resolution over digital port (single GPU and SLI mode): 2560 × 1600 × 32 bpp at 60 Hz (reduced blanking)

Single-link internal TMDS (DVI 1.0)

- Maximum resolution over digital port (single GPU and SLI mode): 1920 × 1200 × 32 bpp at 60 Hz (reduced blanking)

DisplayPort™ 1.2a with MST and HBR2. Each DisplayPort™ connector has the following capabilities:

- Maximum pixel clock: 592 MPixel/s
- Maximum bandwidth: 17.2 Gbps
- Example maximum resolution: 4096 × 2160 × 30 bpp at 60Hz

HDMI

- Maximum resolution (requires DP to HDMI adapter): 4096 × 2160 × 8 bpp at 60Hz

### Shading Architecture

Shader Model 5.0

### Supported Graphics APIs

Full OpenGL 4.4

Full DirectX 12

API support includes:

CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran

### Available Graphics Drivers

Windows 10

Windows 8.1

Windows 8

Windows 7 Professional

Linux®

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

<http://www8.hp.com/us/en/drivers.html>

### Notes

1. NVIDIA® GRID VGX Pass Through feature supported on NVIDIA® QUADRO® M6000 to enable direct mapping of GPU to Virtual Machine.

2. No display output adapter included.

3. For HP Z840 Workstation configurations, the 1125W power supply option must be used.

## Desktop Workstation Graphics

### **NVIDIA® QUADRO® M1000M 2GB Graphics**

<b>Part number</b>	T8W13AA
<b>Compatibility</b>	HP Z1 G3
<b>Form Factor</b>	MXM v3.1 Type A (82mm x 70mm)
<b>Graphics Controller</b>	N16P-Q1, 993MHz core clock 512 CUDA cores
<b>Bus Type</b>	PCI Express Gen 3 x16 (part of MXM v3.1 connector)
<b>Memory</b>	2GB GDDR5 128bit wide interface 2500MHz, 80 GB/s
<b>Connectors</b>	One MXM v3.1 connector (285-pin)
<b>Maximum Resolution</b>	2 x 4096x2160 @ 60Hz digital displays + 1 x 3840x2160 @ 60Hz internal digital display In Z1 G3 application: - Internal Display: 3840x2160 - External Display via DP 1.2 connector: 4096x2160 - External Display via TBT 3 connector: 4096x2160
<b>RAMDAC</b>	Not Applicable
<b>Image Quality Features</b>	Each color component can be processed at up to 32-bit floating point precision and displayed at up to 12-bit precision. Advanced FXAA and TXAA antialiasing. 16K Texture and Render Processing. MPEG-2 HD and WMV HD video playback (1920x1080p). H.264 hardware decode acceleration. NVIDIA® Scalable Geometry Engine.
<b>Shading Architecture</b>	Shader Model 5.0 support
<b>Supported Graphics APIs</b>	Full IEEE 764-2008 32-bit DirectX 12 OpenGL 4.5 Compute API support for NVIDIA® CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python and Fortran
<b>Available Graphics Drivers</b>	Windows 7 64-bit Windows 10 64-bit

## Desktop Workstation Graphics

SUSE Linux® Enterprise Desktop 11 64-bit  
Red Hat Enterprise Linux® 6 Workstation 64-bit

### Notes

See [www.hp.com/go/support](http://www.hp.com/go/support) for HP supported NVIDIA® graphics drivers

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## Desktop Workstation Graphics

### **NVIDIA® QUADRO® M2000M 4GB Graphics**

<b>Part number</b>	Factory integrated offering only
<b>Compatibility</b>	HP Z1G3
<b>Form Factor</b>	MXM v3.1 Type A (82mm x 70mm)
<b>Graphics Controller</b>	N16P-Q3, 1084MHz core clock 640 CUDA cores
<b>Bus Type</b>	PCI Express Gen 3 x16 (part of MXM v3.1 connector)
<b>Memory</b>	4GB GDDR5 128 bit wide interface 2500MHz, 80 GB/s
<b>Connectors</b>	One MXM v3.1 connector (285-pin)
<b>Maximum Resolution</b>	2 x 4096x2160 @ 60Hz digital displays + 1 x 3840x2160 @ 60Hz internal digital display In Z1 G3 application: - Internal Display: 3840x2160 - External Display via DP 1.2 connector: 4096x2160 - External Display via TBT 3 connector: 4096x2160
<b>RAMDAC</b>	Not Applicable
<b>Image Quality Features</b>	Each color component can be processed at up to 32-bit floating point precision and displayed at up to 12-bit precision. Advanced FXAA and TXAA antialiasing. 16K Texture and Render Processing. MPEG-2 HD and WMV HD video playback (1920x1080p). H.264 hardware decode acceleration. NVIDIA® Scalable Geometry Engine. AES-128 CTR/CBC/ECB decryption modes supported. NVIDIA® 3D Vision Pro
<b>Shading Architecture</b>	Shader Model 5.0 support
<b>Supported Graphics APIs</b>	Full IEEE 764-2008 32-bit DirectX 12 OpenGL 4.5 Compute API support for NVIDIA® CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python and Fortran
<b>Available Graphics Drivers</b>	Windows 7 64-bit Windows 10 64-bit SUSE Linux® Enterprise Desktop 11 64-bit Red Hat Enterprise Linux® 6 Workstation 64-bit

## Desktop Workstation Graphics

**Notes** See [www.hp.com/go/support](http://www.hp.com/go/support) for HP supported NVIDIA® graphics drivers

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### **NVIDIA® NVS 310 1GB Graphics**

<b>Part number</b>	M6V51AA
<b>Compatibility</b>	HP Z240 SFF/Tower, Z440, Z640, Z840
<b>Form Factor</b>	Low Profile: 2.713 inches in height × 6.150 inches in length Weight: ~142 grams
<b>Graphics Controller</b>	NVIDIA® NVS 310 GPU: GF119-825
<b>Bus Type</b>	PCI Express x16, 2.0 compliant
<b>Memory</b>	Size: 1GBB DDR3 Clock: 875Mhz Memory Bandwidth: 14GB/s
<b>Connectors</b>	2x DisplayPort™ 1.2
<b>Maximum Resolution</b>	Up to 2560 x 1600 (digital display) per display.
<b>Image Quality Features</b>	<p>The following video formats are supported:</p> <ul style="list-style-type: none"><li>- MPEG2</li><li>- MPEG4 Part 2 Advanced Simple Profile</li><li>- H.264 SVC codec support</li><li>- Support for 3D Blu Ray</li><li>- VC1</li><li>- DivX version 3.11 and later</li><li>- MVC</li></ul> <p>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.</p>
<b>Display Output</b>	<p>Up to 2 displays in the following configurations:</p> <p>DisplayPort™ output:</p> <ul style="list-style-type: none"><li>• 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</li><li>• Supports 2 monitors up to resolution of 1920 × 1200 at 60 Hz with reduced blanking using DisplayPort™ 1.2 multi stream topology technology.</li></ul>

## Desktop Workstation Graphics

### 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**

Windows 10  
Windows 8.1  
Windows 8  
Genuine Windows 7 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.
2. Factory configured NVS 310 graphics card have no cable adaptors 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).

## Desktop Workstation Graphics

### **NVIDIA® NVS 315 1GB Graphics**

<b>Part number</b>	E1U66AA
<b>Compatibility</b>	HP Z240, Z440, Z640, Z840
<b>Form Factor</b>	Low Profile: 2.713 inches in height × 5.7 inches in length Weight: ~142 grams
<b>Graphics Controller</b>	NVIDIA® NVS 315 (using GF119-825 GPU) Number of Cores: 48 CUDA cores Max. Power: 19.3W Cooling Solution: Active fan heatsink
<b>Bus Type</b>	PCI Express x16, 2.0 compliant
<b>Memory</b>	Size: 1GB DDR3 Clock: 875Mhz Memory Bandwidth: 14GB/s
<b>Connectors</b>	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
<b>Maximum Resolution</b>	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
<b>Image Quality Features</b>	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.

## Desktop Workstation Graphics

### Display Output

Up to 2 displays using one of the following DMS-59 cables:

- DMS-59 to DVI
- DMS-59 to VGA
- DMS-59 to DP

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

Windows 10  
Windows 8.1  
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.
2. Factory configured graphics card includes DMS-59 to DVI cable.
3. Option kit graphics card includes DMS-59 to DVI and DMS-59 to VGA cables (one each).
4. 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).

## Desktop Workstation Graphics

### **NVIDIA® NVS 510 2GB Graphics**

<b>Part number</b>	C2J98AA
<b>Compatibility</b>	HP Z240 SFF/Tower, Z440, Z640, Z840
<b>Form Factor</b>	Low Profile, 2.713 inches × 6.3 inches, single slot
<b>Graphics Controller</b>	NVS 510 GPU Core Clock: 797 Mhz Memory Clock: 891 Mhz CUDA Cores: 192
<b>Bus Type</b>	PCI Express x16, Generation 2.0
<b>Memory</b>	2GB DDR3
<b>Connectors</b>	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)
<b>Maximum Resolution</b>	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.
<b>Image Quality Features</b>	10-bit internal display processing, including hardware support for 10-bit scan-out
<b>Display Output</b>	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.

## Desktop Workstation Graphics

- 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

Windows 10  
Windows 8.1  
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>

### Notes

Heatsink cooler design is active.

## Desktop Workstation Graphics

### NVIDIA® Tesla K40 Compute Processor

<b>Part number</b>	F4A88AA
<b>Compatibility</b>	HP Z440,Z640, Z840
<b>Form Factor</b>	Size: 4.376 inches by 10.5 inches Slots: Dual Slot Power Connectors: One 6-pin and one 8-pin Weight: ~826 grams
<b>System Interface</b>	PCI Express Gen3 ×16
<b>Video Outputs</b>	None.
<b>Memory</b>	12GB GDDR5, memory path: 384-bit memory clock: 3Ghz
<b>Peak Memory Bandwidth</b>	288 GB/s
<b>Supported APIs</b>	CUDA, OpenACC, OpenCL 1.2 API support includes: C, C++, Java, Python, and Fortran
<b>Supported Operating Systems</b>	Windows 10 Windows 8 (64-bit) Genuine Windows 7 Professional (64-bit) Red Hat Enterprise Linux® (RHEL) 5, 6 Desktop/Workstation (64-bit) SUSE Linux® Enterprise Desktop 11 (64-bit)  HP qualified drivers may be preloaded or available from the HP support Web site: <a href="http://welcome.hp.com/country/us/en/support.html">http://welcome.hp.com/country/us/en/support.html</a>  Novell SUSE Linux® Enterprise drivers may also be obtained from: <a href="ftp://download.NVIDIA.com/novell">ftp://download.NVIDIA.com/novell</a> or <a href="http://www.NVIDIA.com">http://www.NVIDIA.com</a>
<b>Processor Cores</b>	GK110B GPU Base Clock: 745 MHz Boost Clock: up to 875 Mhz 2888 CUDA cores
<b>Power Consumption</b>	~235 Watts <b>Note 1:</b> A 1125W PSU is required for any K40 configuration on the Z820 <b>Note 2:</b> A 1125W PSU is required for any K40 configuration on the Z840 <b>Note 3:</b> For HP Z440 Workstation configurations, the 700W PSU option is needed. <b>Note 4:</b> Configurations of a single Tesla K40 compute card 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



## Desktop Workstation Graphics

Option (AMO PN: J9P80AA).

### **Tesla K40 GPU Boost**

By default the Tesla K40 active ships with the core clock set to the base clock. HPC workloads can have one or more characteristics as described. When selecting one of the supported boost clocks a good strategy is to characterize the workload with the available boost clocks. For example, DGEMM/Linpack are extremely demanding on power. Therefore, the "base clock" may be the correct choice when running Linpack. Some workloads in life sciences, manufacturing, CFD, CAD, etc., may have power headroom and can take advantage of one of the boost clocks.

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## Summary of Changes

Date of change:	Version History:		Description of change:
June 1, 2016	From v1 to v2		Created new

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