

# Lenovo P330 SFF G2

Version: 1 | 02/02/2021

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## SECTION I: Platform Overview

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Description	POWER OF A WORKSTATION PRICE OF A DESKTOP Mission-critical tasks require superior reliability and powerful performance; the ThinkStation® P330 leads on both counts and does it with exceptional all-around value.
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## CPU

Processor Support	Intel Coffee Lake Xeon E3-1200 Series/Core/Pentium
Socket Type	Socket-H4 (LGA 1151)

## Operating Systems

Preloaded	Windows 10 Pro 64-bit for Workstations Windows 10 Pro 64-bit Ubuntu 18.04 LTS (configuration specific)
Supported	Windows 10 Home 64-bit Ubuntu 18.04 LTS

## Memory

Slots	Up to 4 DIMMs
Channels	Supports up to 4 DIMM Sockets, 2 Channels
Type	288-Pin, 1866/2133/2400/2666MHz ECC and non-ECC UDIMM
ECC Support	Yes, CPU Dependent
Speed	Up to 2666MHz
Max DIMM Size	32GB DDR4 UDIMM
Max System Memory	128GB

## Storage

Total Bays/Size	1 x 3.5" 1 x 2.5"
SATA	4 x SATA Connectors, Gen 3
PCIe	1 x M.2 PCIe Connector Onboard Additional M.2 NVMe Drives Supported by Single Adapters
eSATA	1 x eSATA Connector, Gen 3
Disclaimers	Additional parts/enclosures may be required for some configurations

## Video

Integrated Graphics	Intel Integrated UHD Graphics 630
Discrete Graphics	PCIe Add-In-Card, Details in Section Below
Multi-GPU Support	Yes
Type	PCIe Add-In-Card
Bus Interface	PCIe x16

## Slots

Slot 1	PCIe 3.0 x16, Full Height, Full Length, 45W, With Latch
Slot 2	PCIe 2.0 x1, Full Height, Full Length, 25W
Slot 3	PCIe 3.0 x4, Full Height, Full Length, 75W, With Latch

## Front I/O

USB	2 x USB 3.1 Gen 2 Type-A 2 x USB 3.1 Gen 1 Type-A 1 x USB 3.1 Gen 1 Type-C
Audio	1 x Combo Audio/Microphone Jack (3.5mm)
Media Card Reader	Optional: Front 7-in-1 Media Card Reader (USB 2.0)
Flex Module	One 5.25" Flex Bays, Supports the Following: <ul style="list-style-type: none"> <li>• Up to one 5.25" to 3.5" HDD Kit</li> <li>• Up to one 5.25" Front Access Storage Enclosure</li> <li>• Up to one 5.25" Flex module for one or more of the following options: 9.0mm optical/front eSATA/front Thunderbolt/front USB 3.1 Gen 1 Type-C</li> </ul> Note: 1. Only one can be supported from the following: dual Thunderbolt ports 2. Up to two ports are supported from 1394, eSATA, and USB Type-C
Disclaimers	Not all components above available concurrently in a single Flex Module.

## Rear I/O

USB	2 x USB 2.0 Type-A 2 x USB 3.1 Gen 1 Type-A
Audio	1 x Rear (Line Out); Retaskable to 5.1
DisplayPort	2 x Standard (CPU dependent) Optional 1 x Rear Port (CPU dependent)
HDMI	Optional 1 x Rear Port (CPU dependent)
Serial Port	1 x Standard Optional 1 x Rear Port
Ethernet	1 x 1GbE - RJ45
PS/2	Optional 2 x PS/2
Parallel Port	Optional 1 x Rear Bracket
Optional USB Adapter	Dual Type-C ports USB 3.1 Dual Type-A ports USB 2.0
Optional Network Adapter	Bitland BN8E88 Single Port Gigabit Ethernet Adapter Intel I210-T1 Single Port Gigabit Ethernet Adapter Intel I350-T2 Dual Port Gigabit Ethernet Adapter Aquantia Single Port 10G Ethernet Adapter Aquantia Single Port 5G Ethernet Adapter PCIe WiFi Card With BT HP External Antenna Kit (9560 AC)

## Ethernet

Vendor	Intel Jacksonville I219LM
Speeds	10/100/1000Mbps
Functions	PXE, ASF, WOL, Jumbo Frames, Teaming
Connectors	1 x RJ45

## Audio

Vendor	Realtek
Type	HD (5.1)
Internal Speaker	Yes
Connectors	1 x Rear 3.5mm Jacks (Line Out)
Chipset	ALC233
Number of Channels	2 Channels
Number of Bits/Audio Resolution	6 Channel DAC supports 16/20/24 bit PCM 2 Stereo ADC supports 16/20 bit PCM

## Thermal

Temp Sensors	Ambient Sensor VR1 Sensor PCIe Sensor MB Sensor
Fans	1 x CPU Fans 1 x Rear Fan 1 x Front Fans 1 x Power Supply Fan (internal) 1 x ODD Bay Fans (optional)

## Power Specifications

Power Supply	210W	260W
Power Efficiency	85% Efficient @ 50% Load	92% Efficient @ 50% Load
Main	C14	C14
Operating Voltage Range	100 - 240V	100 - 240V
Rated Voltage Range	90-264VAC	90-264VAC
Rated Line Frequency	47Hz / 63Hz	47Hz / 63Hz
Operating Line Frequency Range	50Hz / 60Hz	50Hz / 60Hz
Rated Input Current	3A	4A
Power Supply Fan	Yes	Yes
ENERGY STAR® Qualified (config dependent)	Yes	Yes
80 PLUS Compliant	Yes	Yes
Built-in Self Test (BIST) LED	Yes	Yes
Aux Power Drop	No	No

# BIOS

Vendor	AMI
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## Chassis Information

Color	Raven Black
PSU	260W and 210W Available, Autosensing, 92% PSU, 80 PLUS Platinum Qualified
Thermal Solutions	Two System Fans Standard (1 front, 1 rear), One Fan per CPU, One PSU Fans
Dimensions	339.725mm/13.375" H x 292.1mm/11.5" D x 88.9mm/3.5" W
Weight	7.6kg / 16.76lbs

## Packaging Dimensions

Height (mm/in)	530mm / 20.87"
Width (mm/in)	195mm / 7.68"
Depth (mm)	395mm / 15.55"

## Security & Serviceability

TPM	Infineon SLB9670VQ2.0FW7.63 TPM 2.0
Asset ID	Yes, 1024 x 8bit
vPro	Intel vPro for WS (AMT 12.X)
Cable Lock Support	Yes, Optional Kensington Cable Lock
Serial, Parallel, USB, Audio, Network, Enable/Disable Port Control	Yes
Power-On Password	Yes
Setup Password	Yes
NIC LEDs (integrated)	Yes
Access Panel Key Lock	No
Boot Sequence Control	Yes
Padlock Support	No
Boot without keyboard and/or mouse	Yes
Access Panel	Tool-less Side Cover Removal
Optical Drive	Tool-less

Hard Drives	Tool-less
Expansion Cards	Tool-less
Processor Socket	Tool-less
Color coded User Touch Points	Yes
Color-coordinated Cables and Connectors	Yes
Memory	Tool-less
System Board	Retained With Screws
Restore CD/DVD/USB Set	Not Included, Restore Media Available via Lenovo Customer Support Center

## Operating Environment

Air Temperature	Operating: 10°C to 35°C (50°F to 95°F)
Storage	Storage: -40°C to 60°C (-40°F to 140°F) in Original Shipping Carton Storage: -10°C to 60°C (14°F to 140°F) Without Carton
Humidity	Relative Humidity Operating: 10% to 80% (non-condensing) Relative Humidity Storage/Transit: 10% to 90% (non-condensing) Wet Bulb Temperature Operating: 25°C (77°F) max Wet Bulb Temperature Non-operating: 40°C (104°F) max
Altitude	Operating: -15.2m to 3048m (-50ft to 10000ft) Storage: -15.2m to 10668m (-50ft to 35000ft)
Vibration	Package Vibration: Random,1.04G at 2-200 Hz, 15 Minutes XYZ 6 faces Operating Vibration: Random,0.27G at 5-500 Hz, 30 Minutes Per Surface (X,Y,Z) Non-Operating Vibration: Random,1.04G at 2-200 Hz, 15 Minutes Per Surface (±X,±Y,±Z)
Shock	Operation Shock: 3ms (15G) for 4 Axis (+X, -X, +Y,-Y) 3ms (30G) for 2 Axis (+Z, -Z), Half-sine Wave, Each Side Will do One Time Rack Operation Shock: 5ms (15G) for 6 Axis (+X, -X, +Y,-Y,+Z, -Z), Half-sine Wave, Each Side Will do One Time Non-operating Shock: Trapezoidal Wave, 50G, 9ms, 6 Sides (+X, -X, +Y,-Y, +Z, -Z), Filter 300Hz, Each Side Shock One Time

## SECTION II: Platform Detail

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Board Size	10.51" x 9.65" (267mm x 245mm)
Layout	Custom ATX

## Motherboard Core

Processor Support	Intel Coffee Lake Xeon E3-1200 Series/Core/Pentium
Socket Type	Socket-H4 (LGA 1151)
Memory Support	DDR4 up to 2666MHz UDIMM Memory (ECC and non-ECC)
Voltage Regulator	95W TDP Capable
Chipset (PCH)	Intel C246 Chipset
Flash	16MB
Super I/O	Nuvoton NCT6686D-L
Clock	Intel Native isCLK
Audio	Realtek ALC233 Codec
Ethernet	Intel Jacksonville I219LM

## Supported Components

Processor Level	Intel Coffee Lake - Xeon	Intel Coffee Lake - Core
Processor	E-2288G E-2286G E-2278G E-2276G E-2274G E-2246G E-2244G E-2226G E-2224G E-2236 E-2234 E-2224 E-2174G	i9-9900 i7-9700 i5-9600 i5-9500 i5-9400F i5-9400 i3-9300 i3-9100 i7-8700 i5-8600 i5-8500 i5-8400 i3-8300 i3-8100
Memory Type	ECC UDIMMs - 2666MHz	non-ECC UDIMMs - 2666MHz
Memory	8GB PC4-2666MHz DDR4 ECC UDIMM 16GB PC4-2666MHz DDR4 ECC UDIMM	4GB PC4-2666MHz DDR4 non-ECC UDIMM 8GB PC4-2666MHz DDR4 non-ECC UDIMM 16GB PC4-2666MHz DDR4 non-ECC UDIMM 32GB PC4-2666MHz DDR4 non-ECC UDIMM

## Storage

3.5" SATA Hard Disk Drive (HDD)	1TB SATA HDD 7200rpm, 6Gb/s, 3.5" 2TB SATA HDD 7200rpm, 6Gb/s, 3.5" 4TB SATA HDD 7200rpm, 6Gb/s, 3.5" (enterprise class)
2.5" SATA Hard Disk Drive (HDD)	500GB 2.5" SATA HDD 7200rpm (FIPS certified)
2.5" SATA Solid State Drive (SSD)	256GB SATA SSD, 6Gb/s, TLC, 2.5", OPAL 512GB SATA SSD, 6Gb/s, TLC, 2.5" OPAL 512GB SATA SSD, 6Gb/s, TLC, 2.5", Non-OPAL 1024GB SATA SSD, 6Gb/s, TLC, 2.5" OPAL
M.2 PCIe Solid State Drive (SSD)	256GB M.2 PCIe SSD, Gen 3 x4, NVMe, OPAL 512GB M.2 PCIe SSD, Gen 3 x4, NVMe, OPAL

	1024GB M.2 PCIe SSD, Gen 3 x4, NVMe, OPAL
Intel Optane Storage Technology	32GB M.2 Optane Memory

## RAID

RAID Levels and Requirements	Supported RAID 0/1
Notes	Supported RAID levels for a system will vary from the stated capabilities of the RAID controller due to dependencies on the number and capacity of physical disks in the system and on customer requirements for performance, fault tolerance, or data redundancy. Max supported RAID 0/1.

## Optical Drive/Removable Media

DVD-ROM Drive	Slim DVD-ROM Drive
DVD Burner/CD-RW Drive	Slim DVD Burner/CD-RW Drive
Blu-Ray Burner Drive	Slim Blu-Ray ODD DVD Burner
Media Card Reader Specifications	Optional Front 7-in-1 USB 2.0 Media Card Reader

## Keyboard and Pointing Devices

Keyboard	Calliope USB Keyboard Traditional USB Keyboard Traditional PS/2 Keyboard Calliope USB Wireless Keyboard
Pointing Devices	Calliope USB Mouse Calliope Wireless Mouse PS/2 Optical Mouse Fingerprint USB Mouse

## PCIe Adapters

Network	Intel I210-T1 Single Port Gigabit Ethernet Adapter Intel I350-T2 Dual Port Gigabit Ethernet Adapter Bitland BN8E88 1000M PCIe ASF FH Aquantia 5G Ethernet Adapter (single port) Aquantia 10G Ethernet Adapter (single port)
Thunderbolt	Rear Thunderbolt PCIe Adapter
USB	2 Port USB Expansion Card (USB3.0) PCIe x1 Rear Dual Port USB 3.1 Type-C PCIe Adapter
WiFi Cards	Intel PCIe WiFi Card With BT External Antenna Kit (9560 AC)
PCIe to M.2 Adapter Card	PCIe x4 to M.2 Adapter (for NVMe SSD)



## SECTION III: Supported Component Detail

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### CPU Specifications

CPU	Intel Xeon E-2276G	Intel Xeon E-2274G	Intel Xeon E-2246G	Intel Xeon E-2244G	Intel Xeon E-2226G
# of Cores	6	4	6	4	6
# of Threads	12	8	12	8	6
Processor Base Frequency	3.8GHz	4GHz	3.6GHz	3.8GHz	3.4GHz
Max Turbo Frequency	4.9GHz	4.9GHz	4.8GHz	4.8GHz	4.7GHz
Cache	12MB	8MB	12MB	8MB	12MB
TDP	80W	83W	80W	71W	80W
Intel ARK Spec Link	<a href="#">Intel Xeon E-2276G</a>	<a href="#">Intel Xeon E-2274G</a>	<a href="#">Intel Xeon E-2246G</a>	<a href="#">Intel Xeon E-2244G</a>	<a href="#">Intel Xeon E-2226G</a>

### CPU Specifications

CPU	Intel Xeon E-2224G	Intel Xeon E-2236	Intel Xeon E-2234	Intel Xeon E-2224	Intel i7-9700
# of Cores	4	6	4	4	8
# of Threads	4	12	8	4	8
Processor Base Frequency	3.5GHz	3.4GHz	3.6GHz	3.4GHz	3GHz
Max Turbo Frequency	4.7GHz	4.8GHz	4.8GHz	4.6GHz	4.7GHz
Cache	8MB	12MB	8MB	8MB	12MB
TDP	71W	80W	71W	71W	65W
Intel ARK Spec Link	<a href="#">Intel Xeon E-2224G</a>	<a href="#">Intel Xeon E-2236</a>	<a href="#">Intel Xeon E-2234</a>	<a href="#">Intel Xeon E-2224</a>	<a href="#">Intel i7-9700</a>

### CPU Specifications

CPU	Intel i5-9500	Intel i5-8500	Intel i5-9400	Intel i3-9300	Intel i3-8300
# of Cores	6	6	6	4	4
# of Threads	6	6	6	4	4
Processor Base Frequency	3GHz	3GHz	2.9GHz	3.7GHz	3.7GHz
Max Turbo Frequency	4.4GHz	4.1GHz	4.1GHz	4.3GHz	Not Available
Cache	9MB	9MB	9MB	8MB	8MB

TDP	65W	65W	65W	62W	62W
Intel ARK Spec Link	<a href="#">Intel i5-9500</a>	<a href="#">Intel i5-8500</a>	<a href="#">Intel i5-9400</a>	<a href="#">Intel i3-9300</a>	<a href="#">Intel i3-8300</a>

## CPU Specifications

CPU	Intel i3-9100
# of Cores	4
# of Threads	4
Processor Base Frequency	3.6GHz
Max Turbo Frequency	4.2GHz
Cache	6MB
TDP	65W
Intel ARK Spec Link	<a href="#">Intel i3-9100</a>

## HDD Specifications

Drive	500GB SATA - 7200rpm, 6Gb/s, 2.5"	1TB SATA - 7200rpm, 6Gb/s, 3.5"	2TB SATA - 7200rpm, 6Gb/s, 3.5"
3.5" SATA Hard Disk Drive (HDD)	Not Available	Yes	Yes
2.5" SATA Hard Disk Drive (HDD)	Yes	Not Available	Not Available
Connector	SATA	SATA	SATA
Transfer Rate (Gb/sec)	160MB/s OD Read	Average Data Rate, Read/Write 156MB/s	Average Data Rate, Read/Write 156MB/s
Spindle Speed (RPM)	7,200	7,200	7,200
Power Off to Spindle Stop (sec)	NA	NA	NA
DC Power to Drive Ready (sec)	3.5	<10.0	<17.0
Average Latency (msec)	4.2	4.16	4.16
Input (VDC)	5	5	5
Typical (Watts)	1.9	6.19	6.7
Idle (Watts)	0.7	4.6	4.5
Physical Dimensions	69.85mm x 100.34mm x 7mm	101.6mm x 146.99mm x 19.88mm	101.6mm x 146.99mm x 26.1mm
Weight (grams)	90	420	535
Operating (C) Ambient	0 to 60	0 to 60	0 to 60
Operating (C) Base Casting	60	60	60
Non-Operating (C) Ambient	(-40 to 70)	(-40 to 70)	(-40 to 70)
Gradient (C per Hour)	20	20	20

Operating (Gs @ 2ms)	400	70	80
Non-Operating (Gs @ 2ms)	1000	350	300

## Solid State Storage Specifications

Drive	256GB SATA3 - SSD, 6Gb/s, 2.5" OPAL	512 GB SATA3 - SSD, 6Gb/s, 2.5" OPAL	1024 GB SATA3 - SSD, 6Gb/s, 2.5" OPAL	512GB SATA3 - SSD, 6Gb/s, 2.5" Non-OPAL	M.2 256GB PCIe SSD (OPAL)
Dimensions Millimeters (W x D x H)	70 x 100 x 7.0	70 x 100 x 7.0	70 x 100 x 7.0	70 x 100 x 7.0	22 x 80 x 3
Interface Type	SATA-III	SATA-III	SATA-III	SATA-III	PCIe Gen 3x4
Power Active (AVG)	1.8W	1.9W	2.2W	1.9W	5.0W
Power Idle	50 mW	50 mW	50 mW	50 mW	50 mW
Typical Sequential Read	540 MB/s	540 MB/s	540 MB/s	540 MB/s	3000 MB/s
Typical Sequential Write	500 MB/s	500 MB/s	500 MB/s	500 MB/s	1500 MB/s
Typical Random Read (4GB Span)	74K IOPS	75K IOPS	75K IOPS	75K IOPS	240,000 IOPS
Typical Random Write (4GB Span)	81K IOPS.	84K IOPS.	84K IOPS.	84K IOPS.	230,000 IOPS
Operating Temperature Range	0 to 55°C	0 to 55°C	0 to 55°C	0 to 55°C	0 to 55°C
Endurance Rating (Lifetime Writes)	85TB	150TB	300TB	150 TB	85 TB
Mean Time Between Failures (MTBF)	2.0M POH	2.0M POH	2.0M POH	2.0M POH	2.0M POH
Hardware Encryption	AES 256 bit	AES 256 bit	AES 256 bit	Not Available	AES 256 bit
Disclaimers	SSD performance measured with Crystal Disk Mark version 6.0.2 with the default 1000 MB data set. Sequential measurements are with 1 Thread, Queue-Depth 32. Random measurements are with 4 threads and queue-depth 32.				

## Solid State Storage Specifications

Drive	M.2 512GB PCIe SSD (OPAL)	M.2 1TB PCIe SSD (OPAL)	M.2 2TB PCIe SSD (OPAL)
Dimensions Millimeters (W x D x H)	22 x 80 x 3	22 x 80 x 3	22 x 80 x 3
Interface Type	PCIe Gen 3x4	PCIe Gen 3x4	PCIe Gen 3x4
Power Active (AVG)	5.0W	5.0W	5.0W
Power Idle	50 mW	50 mW	50 mW
Typical Sequential Read	3000 MB/s	3000 MB/s	3000 MB/s
Typical Sequential Write	2400 mB/s	2700 MB/s	3000 MB/s

Typical Random Read (4GB Span)	400,000 IOPS	550,000 IOPS	600,000 IOPS
Typical Random Write (4GB Span)	350,000 IOPS	500,000 IOPS	500,000 IOPS
Operating Temperature Range	0 to 55°C	0 to 55°C	0 to 55°C
Endurance Rating (Lifetime Writes)	150 TB	300 TB	600 TB
Mean Time Between Failures (MTBF)	2.0M POH	2.0M POH	2.0M POH
Hardware Encryption	AES 256 bit	AES 256 bit	AES 256 bit
Disclaimers	SSD performance measured with Crystal Disk Mark version 6.0.2 with the default 1000 MB data set. Sequential measurements are with 1 Thread, Queue-Depth 32. Random measurements are with 4 threads and queue-depth 32.		

## Optical Drive Specifications

Description	9.0mm Slim DVD ROM	9.0mm Slim DVD Writer	9.0mm Slim UHD BD
Interface Type	SATA 1.5 Gb/s	SATA 1.5 Gb/s	SATA 1.5 Gb/s
Dimensions	128±0.4×9.0 ±0.4×127±0.4(Max) Unit:mm (Without Bezel-W x H x D)	128±0.4×9.0 ±0.4×127±0.4(Max) Unit:mm (Without Bezel-W x H x D)	128±0.4×9.0 ±0.4×127±0.4(Max) Unit:mm (Without Bezel-W x H x D)
Disc Capacity	NA	NA	NA
Type	DVDROM	DVDWriter	BD Rambo
External Dimensions	NA	NA	NA
Speed	NA	NA	NA
Bay Type	9.0mm Tray	9.0mm Tray	9.0mm Tray
Color	Business Black or without bezel	Business Black or without bezel	Business Black or without bezel
Removable	No	No	No
Internal Buffer Size	0.5MB Min	0.5MB Min	4MB
Writes	NA	8XDVD+R / 8XDVD+RW / 6XDVD+R DL 8XDVD-R / 6XDVD- RW / 6XDVD-R DL 24XCD-R / 16XCD-RW	6x BD-R / 2x BD-RE 8XDVD+R / 8XDVD+RW / 6XDVD+R DL 8XDVD-R / 6XDVD- RW / 6XDVD-R DL 5XDVD-RAM 24XCD-R / 16XCD-RW
Reads	8XDVD-ROM / 24XCD-ROM	8XDVD-ROM / 24XCD-ROM	6x BD-ROM /8x DVD- ROM / 5x DVD-RAM / 24x CD-ROM
Source	DC Power 5V	DC Power 5V	DC Power 5V
DC Power Requirements	+5V±5%	+5V±5%	+5V±5% Ripple less than 100mVp-p
DC Current	Max 2.5A@5v	Max 2.5A@5v	Max 2A@5v

Operating Systems Supported	All Windows OS	All Windows OS	All Windows OS
Temperature	Operating: 5°C to 45 °C Non-Operating:-30°C to 60°C	Operating: 5°C to 45 °C Non-Operating:-30°C to 60°C	Operating: 5°C to 45 °C Non-Operating:-30°C to 60°C
Relative Humidity	Operating > Read: 15 % to 85 % (Non-Condensing) Write 15 % to 80 % (Depend on the Temperature) Storage/Transportation> 10 % to 80 % (Non-Condensing)	Operating > Read: 15 % to 85 % (Non-Condensing) Write 15 % to 80 % (Depend on the Temperature) Storage/Transportation> 10 % to 80 % (Non-Condensing)	Operating > Read: 15 % to 85 % (Non-Condensing) Write 15 % to 80 % (Depend on the Temperature) Storage/Transportation> 10 % to 80 % (Non-Condensing)

## Integrated Graphics Adapter

Type	Intel UHD Graphics 630
Display Interface	1x DP, 1x HDMI 1.4
Video Resolution (max)	4096x2304 @ 60Hz (DP), 4096x2304 @ 24Hz (HDMI)

## Discrete Graphics Adapter

Adapter	Quadro P400	Quadro P600	Quadro P620	Quadro P1000
Bus Interface	PCIe 3.0 x16	PCIe 3.0 x16	PCIe 3.0 x16	PCIe 3.0 x16
Display Interface	3 x mDP 1.4	4 x mDP 1.4	4 x mDP 1.4	4 x mDP 1.4
Graphics Chipset	Pascal	Pascal	Pascal	Pascal
Memory Clock Frequency (MHz)	1003MHz	1002MHz	1252MHz	1253MHz
Memory Size	2GB GDDR5	2GB GDDR5	2GB GDDR5	4GB GDDR5
Memory Interface	64-bit	128-bit	128-bit	128-bit
Memory Bandwidth	Up to 32GB/s	Up to 64GB/s	Up to 80GB/s	Up to 82GB/s
GPU Cores	CUDA Cores: 256	CUDA Cores: 384	CUDA Cores: 512	CUDA Cores: 640
GPU Core Frequency (MHz)	1228MHz	1329MHz	1266MHz	1266MHz
Maximum Power Consumption	30W	40W	40W	47W
Supported Resolutions and Max Refresh Rates (Hz) (Note: Analog and/or Digital)	3 x 4096x2160 @ 60Hz 1 x 5120x2880 @ 60Hz	4 x 4096x2160 @ 60Hz 4 x 5120x2880 @ 60Hz	4 x 4096x2160 @ 60Hz 4 x 5120x2880 @ 60Hz	4 x 4096x2160 @ 60Hz 4 x 5120x2880 @ 60Hz
Thermal Solution	Ultra-quiet Active Fansink	Ultra-quiet Active Fansink	Ultra-quiet Active Fansink	Ultra-quiet Active Fansink
Dimension	2.713" H x 5.7" L Single Slot, Low Profile	2.713" H x 5.7" L Single Slot, Low Profile	2.713" H x 5.7" L Single Slot, Low Profile	2.713" H x 5.7" L Single Slot, Low Profile

# SECTION IV: BIOS / Certifications / Standards /

## Environmental

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### BIOS Specifications

WMI Support	Compliant With Microsoft WBEM and the DMTF Common Information Model
ROM-Based Setup Utility (F1)	System Configuration Setup Program (text only interface) Available at Power-on With F1 Key
Bootblock Recovery	Recovers System BIOS if the Flash ROM Becomes Corrupted
Replicated Setup	Saves System Configuration Settings to a File That Can Then be Used to Replicate the Settings to Other Systems
Boot Control	Boot Control Available Through ROM-based Setup Utility or With F12 Key at Power-on
Memory Change Alert	Power-on Error Message in the Event of a Decrease in System Memory
Thermal Alert	Power-on Error message in the Event of a Fan Failure
Asset Tag	Supports Ability to Set SMBIOS Type 2 Baseboard Asset Tag Field
System/Emergency ROM Flash Recovery with Video	Supports Process to Recover the System BIOS if the Flash ROM Becomes Corrupted
Remote Wakeup/Remote Shutdown	System Admin Can Power On/Off a Client Computer from a Remote Location to Provide Maintenance
Quick Resume Time	Supports Low Power S3 (suspend to RAM) and Prompt Resume Times
ROM Revision Level	System UEFI (BIOS) Version Reported in SMBIOS Type 0 Structure and in BIOS Setup
Keyboard-less Operation	System Can be Booted Without a Keyboard
Per-port Control	Allows I/O Ports to be Individually Enabled/Disabled Through ROM-based Setup or WMI Interface
Adaptive Cooling	Offers Multiple Settings for Fan Control Ranging Between Better Performance and Better Acoustics
Security	User and Administrator Passwords Can Protect Boot and ROM-based Setup <ul style="list-style-type: none"><li>- Support Electronic Lock</li><li>- Chassis Intrusion Detection</li><li>- UEFI Secure Boot Support</li><li>- HDD Password Can Protect HDD Data</li><li>- Windows UEFI Firmware Update Support</li><li>- Device Guard Support</li><li>- Optional Access Panel Lock, Kensington Lock, and Pad Lock</li></ul>
Intel(R) AMT (includes ASF 2.0)	Allows System to be Supported from a Remote Location
Intel(R) TXT	Intel(R) Trusted Execution Technology Provides a Security Foundation to Build Protections Against Software Based Attacks
Memory Modes	Supports Mirroring, Lock Step, and Sparing Memory Modes
Windows 10 Ready	Supports Windows 10 Requirements for Secure Flash, UEFI v 2.6 Device Guard Support Spec

## Industry Standard Specification Support

UEFI	Unified Extensible Firmware Interface v2.7
ACPI (Advanced Configuration and power Management Interface)	Advanced Configuration and Power Interface v6.1
ASF 2.0	DMTF Alert Standard Format Specification v2.0
ATA (IDE)	AT Attachment 6 with Packet Interface (ATA/ATAPI-6)
CD Boot	EI Torito Bootable CD-Rom Format Specification, v1.0
EHCI	Enhanced Host Controller Interface for Universal Serial Bus, Revision v1.0
PCI	NA (No PCI slot)
PCI Express	PCI Express Base Specification v3.0
SATA	Serial ATA Revision 3.0 Specification
TPM	Trusted Computing Group TPM Specification v2.0
UHCI	Universal Host Controller Interface Design Guide, Revision v1.1
USB	Universal Serial Bus Revision v1.1 Universal Serial Bus v2.0 Universal Serial Bus v3.0
SMBIOS	DMTF System Management Spec v3.2.1
XHCI	XHCI SPEC Revision v1.2

## Social and Environmental Responsibility

Quality Control	Lenovo is a member of an eco declaration system that enforces regular independent quality control
Hazardous Substances and Preparation	<ul style="list-style-type: none"> <li>• Products do not contain more than; 0.1% lead, 0.01% cadmium, 0.1% mercury, 0.1% hexavalent chromium, 0.1% polybrominated biphenyls (PBB) or 0.1% polybrominated diphenyl ethers (PBDE). (See legal reference and Note B1)</li> <li>• Products do not contain Asbestos</li> <li>• Products do not contain Ozone Depleting Substances: Chlorofluorocarbons (CFC), hydrobromofluorocarbons (HBFC), hydrochlorofluorocarbons (HCFC), Halons, carbontetrachloride, 1,1,1-trichloroethane, methyl bromide</li> <li>• Products do not contain more than; 0.005% polychlorinated biphenyl (PCB), 0.005% polychlorinated terphenyl (PCT) in preparation</li> <li>• Products do not contain more than 0.1% short chain chloroparaffins (SCCP) with 10-13 carbon atoms in the chain containing at least 48% per mass of chlorine in the SCCP</li> <li>• Parts with direct and prolonged skin contact do not release nickel in concentrations above 0.5 microgram/cm<sup>2</sup>/week</li> </ul> <p>REACH Article 33 information about substances in articles is available at: <a href="http://www.lenovo.com/social_responsibility/us/en/ThinkGreen_products.html#environment">http://www.lenovo.com/social_responsibility/us/en/ThinkGreen_products.html#environment</a></p>
Batteries	Not Available
Safety, EMC Connection to the Telephone Network and Labeling	Not Applicable, no Connection to a Telephone Network

# Safety, EMC Connection to the Telephone Network and Labeling

System Software Manager	Lenovo ThinkStation Supports Software Management Tools by Lenovo Vantage
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## Regulations & Standards

EMC & Safety	<p>FCC DoC for North America  VCCI Certification for Japan  BSMI Certification for Taiwan  EU/EFTA CE Mark &amp; DoC  UL/CUL(P920,P720,P520,P520c), cTUVus(P330)  UL-GS(P920,P720,P520,P520c), TUV-GS(P330)  IEC60950-1 CB Report/Certificate  Saudi Arabia SASO  Kuwait KUCAS  China CCC Mark  Hong Kong SAR (CB report)  Singapore PSB  South Africa SABS  Russia-EAC  Morocco-CM  Mexico-NOM  Kazakhstan-EAC  Belarus-EAC  Serbia KVALITET  Ukraine UKrCEPRO  India-BIS  USA Chemical Emission Test</p>
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## Environmentals

Energy Star	ENERGY STAR® v7.0
EPEAT	EPEAT Certification Available on Select Models
ErP Lot-3 2013	Yes
Hazardous Substances	<ul style="list-style-type: none"> <li>• Products do not contain more than; 0.1% lead, 0.01% cadmium, 0.1% mercury, 0.1% hexavalent chromium, 0.1% polybrominated biphenyls (PBB) or 0.1% polybrominated diphenol ethers (PBDE)</li> <li>• Products do not contain Asbestos</li> <li>• Products do not contain Ozone Depleting Substances: Chlorofluorocarbons (CFC), hydrobromofluorocarbons (HBFC), hydrochlorofluorocarbons (HCFC), Halons, carbontetrachloride, 1,1,1-trichloroethane, methyl bromide</li> <li>• Products do not contain more than; 0.005% polychlorinated biphenyl (PCB), 0.005% polychlorinated terphenyl (PCT) in preparation</li> <li>• Products do not contain more than 0.1% short chain chloroparaffins (SCCP) with 10-13 carbon atoms in the chain containing at least 48% per mass of chlorine in the SCCP</li> <li>• Parts with direct and prolonged skin contact do not release nickel in concentrations above 0.5 microgram/cm<sub>2</sub>/week</li> </ul>