



TECHNICAL WHITEPAPER

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HP ZCENTRAL 4R: POWER AND COOLING REQUIREMENTS

HP ZCENTRAL 4R WORKSTATION POWER REQUIREMENTS

Each HP ZCentral 4R system can be configured with up to two (2) 675W Power Supplies. When two Power Supplies are installed the system can be configured in either Redundant or Aggregate Mode. In Redundant Mode, the system should not be configured to pull more than a combined power load of 675W. In Aggregate Mode, the system should not pull more than two times 675W (1350W). When planning for redundancy, each circuit should be sized to handle the total load of both PSUs in case one fails.

Power usage is highly dependent on configuration and software utilization (workload). Included below are 4 configurations that include idle, busy, and max usage for reference at 25C. Any deviations, such as alternate CPU, Memory, Graphics, Hard Drive, USB, PCIe cards and elevated input temperature, should be scaled in power based on datasheets. It is recommended to use a power meter to determine actual utilization of the system with customer specific software if more accurate data is needed.



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When running multiple units in a racked environment, customers should ensure their infrastructure can safely supply enough power to meet their needs.

For reference, the configurations below note the input power consumption at 25C, not the PSU Load. The input Power Consumption (Pin) is related to the Load on the PSU (Pout) by Efficiency.

Pin = Pout/Efficiency.

Max Input Power at 115V not to exceed ~780W

Max Input Power at 230V not to exceed ~760W

Max Input Current at 100V not to exceed 9A.

Max Input Current at 240V not to exceed 4.5A

		Processor	Intel® Xeon® W-2223 4C 3.6GHz		
		Memory	1x 8GB DDR4 2933 (Registered DIMM)		
		Graphics	1x NVIDIA® Quadro® P400		
		Disks / Optical	1x HP Zturbo M.2 512GB TLC SSD		
		Power Supply	1x 675W		
		Other	N/A		
			115 VAC	230 VAC	100 VAC
Energy Consumption (Watts)	Windows Idle (S0)	45.2	45.3	45.1	
	Windows Busy Typ(S0)	144.8	142.3	140.9	
	Windows Busy Max (S0)	150.7	149.58	148.9	

		Processor	1x Intel® Xeon® W-2245 8C 3.9GHz		
		Memory	2x16GB DDR4-2933 (Registered DIMM)		
		Graphics	1x NVIDIA® Quadro® P2200		
		Disks / Optical	1x ZTurbo 256 GB M.2 SSD; 1x 2 TB 7200 SATA Enterprise 3.5in HDD		
		Power Supply	1x 675W		
		Other	N/A		
			115 VAC	230 VAC	100 VAC
Energy Consumption (Watts)	Windows Idle (S0)	53.1	53.3	52.98	
	Windows Busy Typ(S0)	272.9	270.6	267.3	
	Windows Busy Max (S0)	279.4	280.3	279.3	

		Processor	1x Intel® Xeon® W-2255 10C 3.7GHz		
		Memory	4x 16GB DDR4-2933 (Registered DIMM)		
		Graphics	1x NVIDIA® Quadro RTX™ 4000		
		Disks / Optical	1x Zturbo 512 GB M.2 SSD; 1x 4 TB 7200 Enterprise SATA HDD		
		Power Supply	1x 675W		
		Other	N/A		
			115 VAC	230 VAC	100 VAC
Energy Consumption (Watts)	Windows Idle (S0)	56.7	57.0	56.7	
	Windows Busy Typ(S0)	335.2	333.2	330.9	
	Windows Busy Max (S0)	345.3	344.8	344.6	

		Processor	1x Intel® Xeon® W-2295 18C 3.0GHz		
		Memory	4x 32GB DDR4-2933 (Registered DIMM)		
		Graphics	1x NVIDIA® Quadro RTX™ 8000		
		Disks / Optical	2x ZTurbo 2 TB M.2 SSD; 2x ZTurbo 2 TB Z Dual Pro PCIe SSD; 4x 1 TB 2.5in SATA SSD		
		Power Supply	2x 675W PSU		
		Other	N/A		
			115 VAC	230 VAC	100 VAC
Energy Consumption (Watts)	Windows Idle (S0)	60.4	60.8	60.4	
	Windows Busy Typ(S0)	464.2	458.5	461.4	
	Windows Busy Max (S0)	495.7	487.2	491.2	



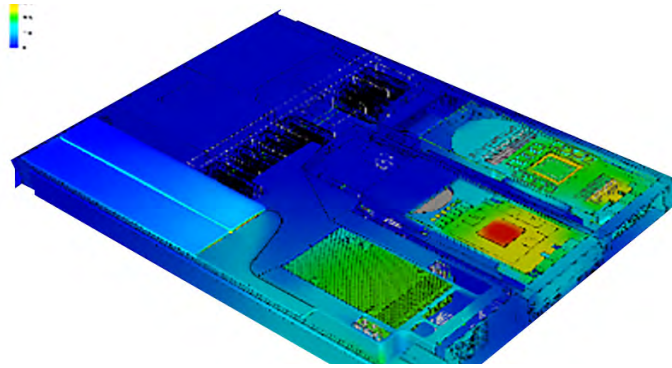
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HP ZCENTRAL 4R WORKSTATION COOLING REQUIREMENTS

The HP ZCentral 4R Workstation has a unique form factor compared to our traditional desktop workstations. These differences may lead to unique cooling considerations when implementing the HP ZCentral 4R Workstation in the customer environment. The typical workstation requirements still apply such as:

- 1) Keeping obstructions clear from the inlets and outlets of the product.
- 2) Having an environment with ambient inlet air temperature no higher than 35 °C (95 °F).
- 3) Derating the ambient air temperature by 1 °C (1.8 °F) for altitudes higher than 1524 m (5000 ft) for each 305 m (1,000 feet) increase in elevation.
- 4) See the HP ZCentral 4R Workstation QuickSpecs for other environmental requirements such as humidity, sun load, maximum altitude, etc.

The HP ZCentral 4R Workstation contains six system fans and up to two power supply fans. These fans have airflow, maximum rotational speeds, and maximum noise levels that are much higher than fans in our other HP workstations. Each system fan is rated to rotate up to 23,000 RPM (383 Hz) and will supply approximately 20 CFM (cubic feet per minute) or (approximately 34 cubic meters per hour) each at maximum speed installed in the unit. The power supply fan(s) run at lower maximum speeds and adjust speed(s) based on load, inlet air temperature, and altitude. The maximum expected airflow requirement for a single HP ZCentral 4R Workstation unit is approximately 135 CFM (approximately 230 cubic meter per hour). This is the expected airflow required if the system fans are running at full speed (overridden by the customer) and the power supply fans are at maximum speeds. It is very likely that the unit will require less airflow but this is highly dependent on the configuration, applications that are running, inlet air temperature, altitude, etc. Sizing the environmental airflow for the HP ZCentral 4R Workstation(s) is/ are in using this estimate will ensure adequate inlet air is provided (i.e. multiply the maximum airflow requirement above by number of units deployed). A customer may find that a lower airflow supply is sufficient based on their configuration(s), environment, and operating conditions. We recommend measuring your average power output over time to adjust your CRAC or other air conditioning as required to reduce the energy footprint of the room the units are deployed in (or use other automatic control system to adjust to keep inlet air in acceptable range).

Note that the maximum inlet air temperature is acceptable for these units and will yield our typical workstation-class reliability, but lower inlet air temperatures will increase the long term reliability of your system(s) and yield lower system generated noise.



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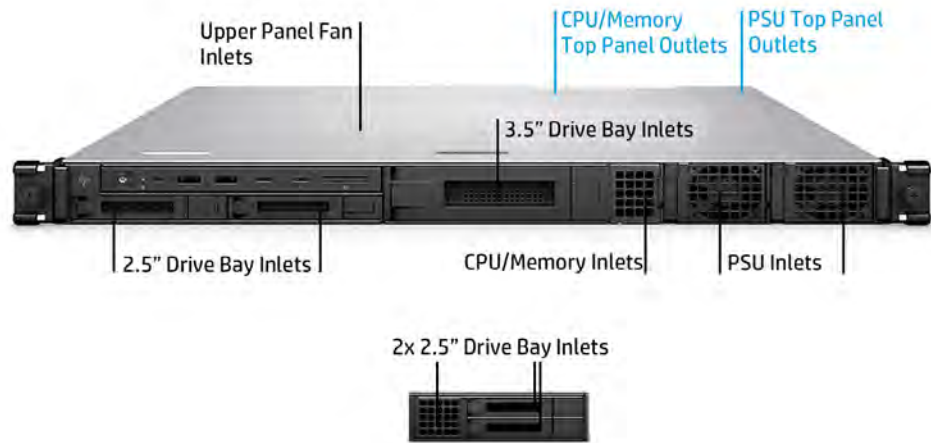
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There are several inlet areas on the HP ZCentral 4R as shown below. There are also additional inlet vents on the bottom of the chassis under the dual slot riser (possible double wide graphics card) area (not shown).



The following are some cooling recommendations that should be considered for HP ZCentral 4R Workstations that are placed in a rack enclosure.

- 1) Ensure that any spaces (gaps) that allow hot air from the outlet area(s) of the units in the rack to circulate to the inlets are filled such that hot air exiting the HP ZCentral 4R Workstation or any other unit does not have a pathway to enter the HP ZCentral 4R Workstation inlets. These include the areas shown in the above pictures identified as inlets (front, top panel, side panel, and bottom panel inlets).
- 2) Ensure that any adjacent unit, if not another HP ZCentral 4R Workstation, does not radiate so much heat as to increase the inlet air temperature above the 35 °C (95 °F) upper limit (or the de-rated temperature if at altitude above 1524 m (5000 ft).
- 3) Ensure that the hot exit air is extracted at a sufficient rate such that it does not increase the environmental temperature above the requirements listed above and in the [QuickSpecs](#).
- 4) Please avoid placing any feature in front of the HP ZCentral 4R Workstation(s) that will impede airflow such as rack doors, etc. The cooling design of the HP ZCentral 4R Workstation assumes there will be no airflow resistance due to upstream components (such as cables, doors, screens, etc.).

The heat dissipation of the product is dependent on configuration, loading, inlet temperature, and altitude and may vary greatly. The [QuickSpecs](#) describes four power supply configuration power dissipation estimates. The temperature rise from the inlet(s) of the product to the outlet(s) of the product will depend on airflow and power dissipation. Note that at lower air flows (lower system fan speeds) at the same power dissipation level will result in higher outlet air temperatures.

The noise generated by the HP ZCentral 4R Workstation is much higher than our other workstation products. This is due to the difficulty in supplying sufficient air to cool the components in this 1U workstation form factor. The Idle, room temperature, noise level will be ~34 dB(A) bystander sound pressure and 4.9 Bel sound power. This is approximately twice as loud as any of our other workstation desktop products. The noise level with a highly configured HP ZCentral 4R under high load can exceed 50 dB(A) at room temperatures. This is approximately 3-4 times as loud as our other current desktop workstation products. A customer can override the internal fan control to set the minimum system fan speeds higher than set automatically. The highest speed setting will set the system fans spinning at full speed and will yield bystander sound pressures at approximately 74 dB(A) with maximum power supply fan speeds.

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