

Space, speed, and cost: Key power priorities and solutions for data centers.



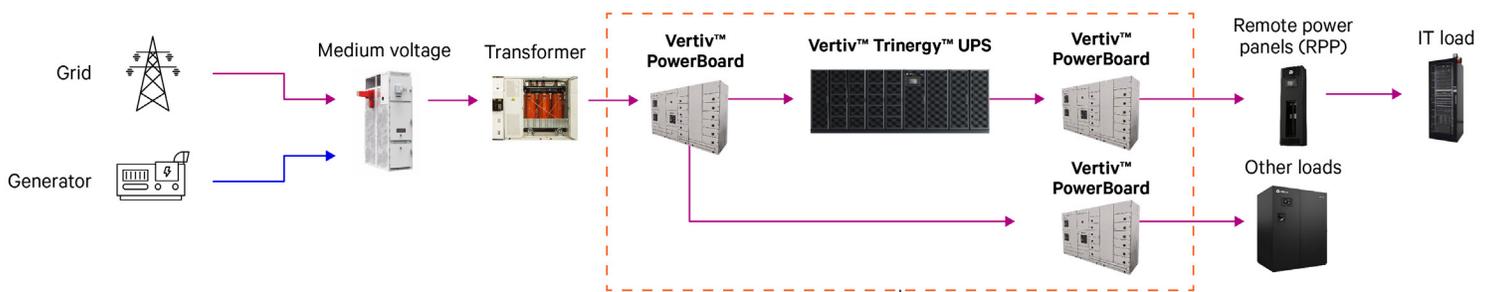
Vertiv™ PowerNexus with Vertiv™ Trinerigy™ UPS system at a glance

Hyperscalers, colocation, and other data center operators strive to find cost, time, and space efficiencies. While at the same time, the growing use of AI and high-performance computing (HPC) services and applications is [increasing the demand](#) for more power in systems, making this goal more complex. As data centers grow, the need for better and more efficient power distribution is rising to address facility emergencies and accommodate IT and equipment loads — especially at peak times.

Meeting the power demands of modern data centers requires innovative approaches to power distribution and management. The integration of UPS and switchgear components has emerged as a critical solution for optimizing space utilization and operational efficiency.

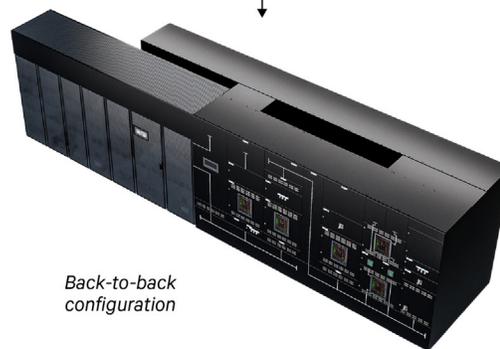
Integrated UPS and switchgear

Integrated systems save space as well as commissioning and installation times. From an operations perspective, the power loss due to distance is reduced as the switchgear directly connects to the bypass cabinet, thereby maximizing the capability of the power harnessed and distributed to the equipment. This integrated approach delivers the reliability and scalability needed to support growing computational demands while reducing deployment complexity and installation time.



Closed-coupled Vertiv™ PowerBoard Switchboard and Vertiv™ Trinerigy™ UPS (1.5Mw-2.5Mw)

- **Space efficiency:** 10-15% space savings and an additional 30% with prefabricated Vertiv™ PowerNexus.
- **Cost savings:** Up to 15-20% lower cost due to reduced installation.
- **Speed of deployment:** Deploys 60% faster than traditional build.
- **Reduced installation complexity:** Simplifies the installation process and less human error.
- **Enhanced monitoring and control:** Centralized monitoring and control.



Back-to-back configuration

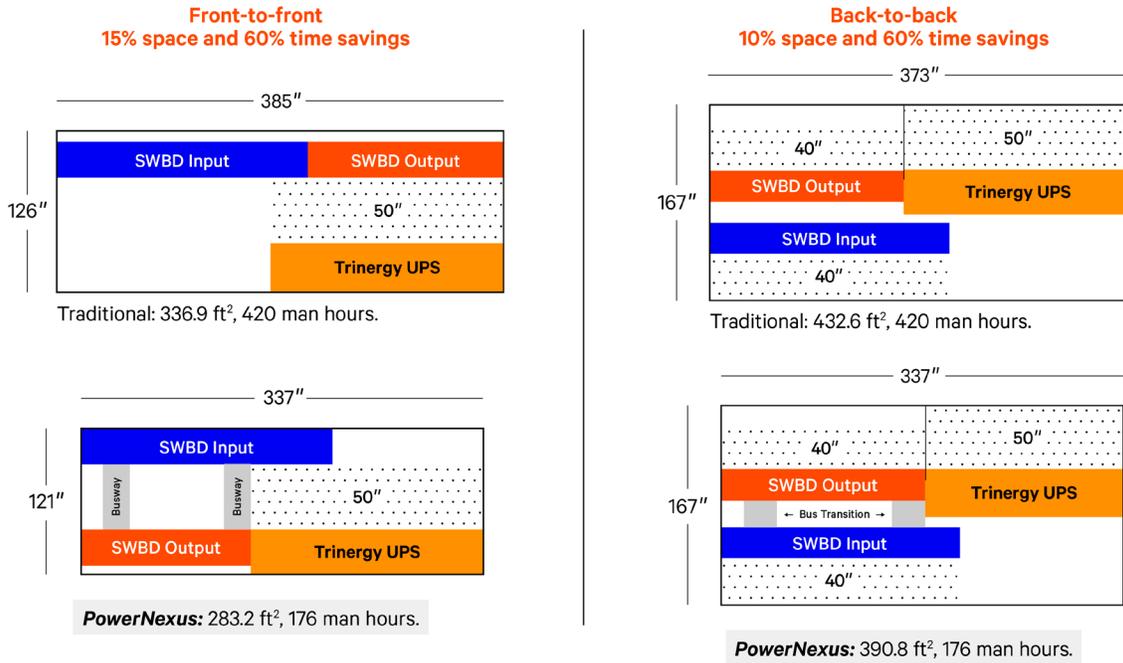
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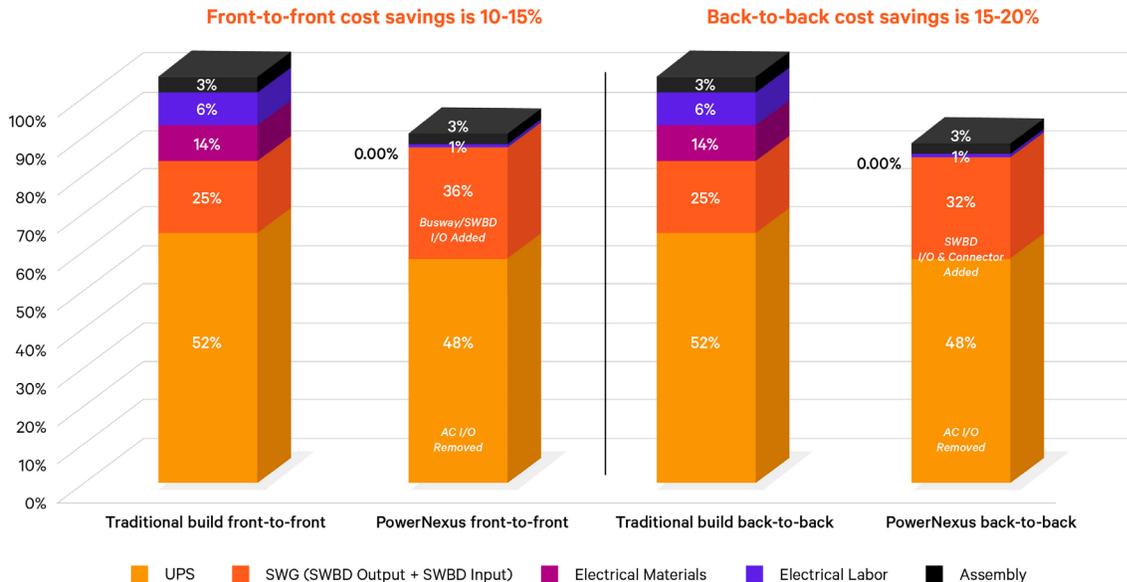
Comparing the space and time savings of traditional builds and Vertiv™ PowerNexus, Vertiv PowerNexus with Vertiv™ Trinerigy™ UPS allowed for up to 15% space reduction, up to 20% cost savings, and up to 60% faster deployment.

Comparison on space and time savings: Traditional builds vs Vertiv PowerNexus



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Comparing the installation cost savings of traditional builds vs. two configurations of Vertiv™ PowerNexus with Vertiv Trinerigy UPS



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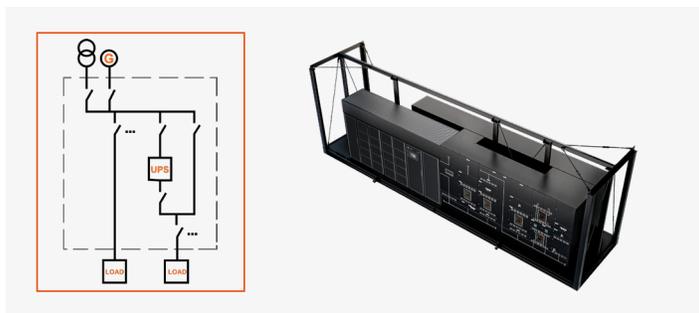
*Percentage estimates and comparisons used with Vertiv™ PowerNexus in the studies are based on average equipment and labor costs in the market as of publishing this technical brief. Actual costs and savings may vary.

Prefabricated Vertiv™ PowerNexus

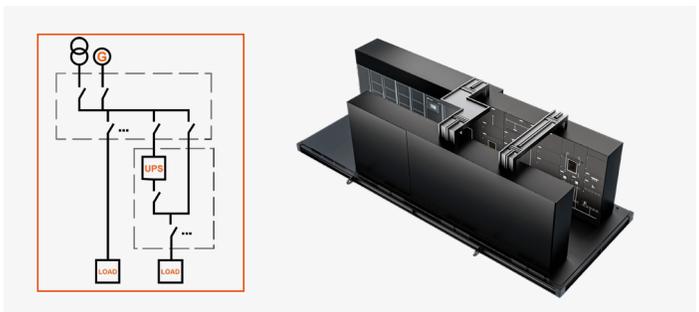
Vertiv™ PowerNexus offers flexible delivery configurations to suit various installation needs:

- **On-Site assembly:** Assembled directly inside the power room: Available in front-to-front or back-to-back arrangements.
- **Prefabricated and assembled:**
 - In enclosure: Delivered in a front-to-front arrangement.
 - On skid: Available in either front-to-front or back-to-back arrangements.

Prefabricated solution centers on delivering a flexible and efficient power infrastructure solution ready for rapid deployment.



Back-to-back arrangement: This is the most efficient arrangement. There is no need for any external connection. This is suitable for on work site integration and on skid integration.



Front-to-front: In this arrangement switchgear input section is connected to UPS and switchgear output section by busbars. This is suitable for on work site integration, on skid integration and in enclosure integration.

Key benefits include:

- **Accelerated deployment:** The prefabricated Vertiv PowerNexus is tested and validated off-site, significantly reducing on-site setup time and ensuring a faster path to operational readiness.
- **Plug-and-play integration:** Pre-engineered for seamless connection to existing infrastructure, the platform offers a proper plug-and-play solution that simplifies installation and minimizes the need for complex on-site engineering adjustments.
- **Enhanced reliability and quality control:** Prefabricated Vertiv PowerNexus is assembled and tested in a controlled environment, ensuring high quality, reliability, and consistency upon arrival.
- **Cost efficiency:** With minimal on-site labor requirements and a streamlined installation process, organizations can benefit from significant cost savings on labor and materials.
- **Effortless outdoor deployment:** The prefabricated Vertiv PowerNexus enclosure configuration enables installation outside of the building and is already equipped with air conditioning and other systems, like access control and fire suppression.
- **Optimized space utilization:** Skid-mounted configurations save valuable floor space by compactly housing the entire system, an advantage for facilities with limited expansion space.

In essence, a prefabricated Vertiv PowerNexus provides a fast and efficient power infrastructure solution, allowing end users to meet their power needs with minimal downtime, optimal resource allocation, and a strong focus on long-term operational efficiency.

Vertiv expertise drives **innovative technologies and design techniques** to **optimize** facility space, decrease deployment time, and **realize up to 25% TCO savings***.

With decades of industry experience, our **end-to-end line of sight of the power infrastructure offers an additional space savings of up to 30%*** on top of the initial space reduction achieved with Vertiv PowerNexus. Our reliable, compact design maximizes efficiency while further minimizing the overall footprint.

Through our adaptable building block approach and unmatched global footprint, **customers can deploy up to 50% faster.** Site works and commissioning costs **are up to 50% lower than traditional build methods***.

*Comparison between module vs. traditional stick built. Percentages based upon management estimates, case studies and publicly available data.

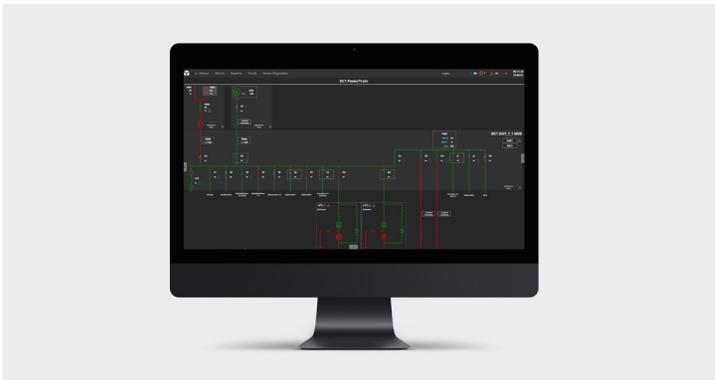
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Vertiv™ PowerNexus with Vertiv™ Trinerergy™ UPS system at a glance

Intelligent onboard monitoring & control

Vertiv™ PowerNexus comes standard with an advanced onboard monitoring and control platform designed to streamline deployment and reduce complexity through full factory configuration. This platform includes all the essential features of an intelligent monitoring and control application, such as dynamic visualization, alarm and event handling, comprehensive reporting, third-party integration, and health diagnostics.

The platform is customizable with three scalable options to suit various operational needs:



	Essential	Advanced	Premium
Monitoring	X	X	X
Control		X	X
Redundancy			X
Service Cloud Integration			X

When paired with Vertiv's Data Center Management System, Vertiv PowerNexus achieves seamless integration with minimal testing enabled by our plug-and-play technology, further accelerating deployment and simplifying site installation.



Achieve peak power efficiency and performance

UPS systems employing advanced and elevated performance for data centers' power needs present a transformative opportunity and approach to efficient power management, addressing the pressing needs of evolving and modern data centers. By offering significant space and labor savings, along with enhanced reliability, Vertiv PowerNexus with Vertiv™ Trinerergy™ UPS system improves operational efficiency and positions agile organizations to respond quickly to market demands. Its potential for integration with advanced technologies, such as monitoring systems and higher voltage capacities, further solidifies its role as a leader in the sector.

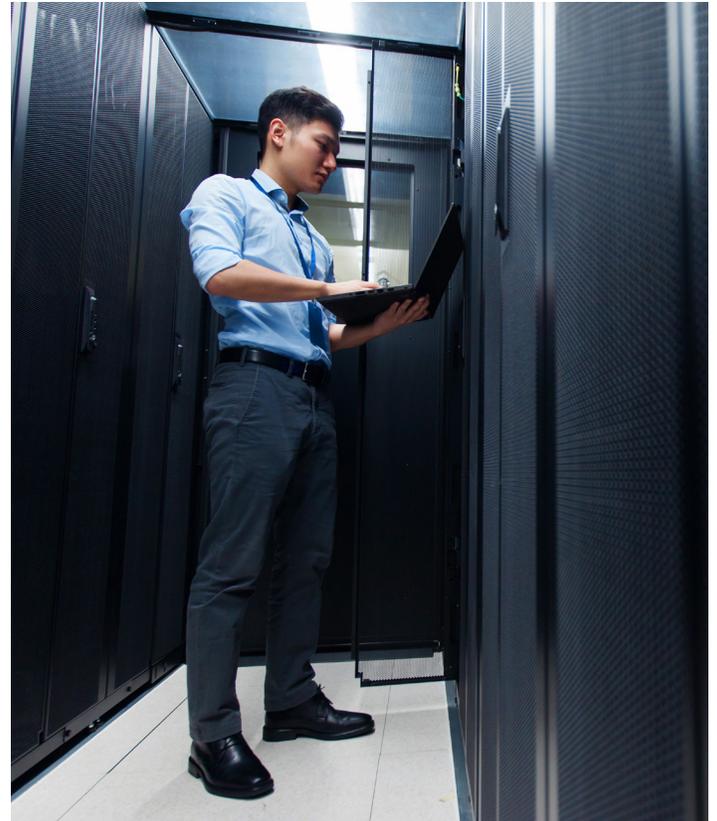
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Key considerations and insights

The significance of efficient whitespace use and reliable power loads and management is more crucial than ever. Deploying tailored solutions quickly and ensuring uptime in high-density settings at reduced capital and operational expenses (CapEx and OpEx) allows data centers to meet regular customer needs while preparing for future growth and expansion.

Considerations for choosing Power Distribution Systems

- Space and cost efficiency: Choose systems with significant space savings in customizable configurations, reducing operational costs.
- Reliability enhancements: Opt for systems that minimize potential human error in installations and maintenance, enabling overall consistency in power delivery and improving reliability.
- Labor savings: Ease in deployments can reduce man hours for electrical installation, greatly accelerating project timelines. Streamlined installation processes also minimize the environmental impact associated with extensive installation practices.



Business insights and future market demand

- Competitive market advantage: By integrating Power Distribution Systems with advanced monitoring systems like a data center management system (DCMS), data centers can position themselves as leaders in having consistent operations and uptime. In addition, as future AI infrastructure demand for power increases, systems will have to be geared and available for expansion to higher voltage systems while considering more efficient energy consumption.



- Adaptation to trends: The shift towards AI and HPC underscores the need for innovative solutions that maximize savings in physical infrastructure to invest in increasing and improving critical computing resources. As hyperscalers and colos prioritize reducing physical footprints, solutions like Vertiv™ PowerNexus will remain in high demand.
- Integration capabilities: Future developments in UPS systems that accommodate higher voltages and enhanced integration will cater to market demands, particularly in hyperscale and colocation sectors. As the market and regulations evolve further, incorporating potentially sustainable technologies will be crucial for compliance and meeting stakeholder expectations.
- Holistic power management needs: The growing complexity in data center operations will drive the need for integrated solutions that can efficiently monitor and optimize various equipment and maintenance strategies. A single monitoring system gives operators a heightened advantage as they integrate all equipment for improved overall visibility and tracking.

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Vertiv™ PowerNexus with Vertiv™ Trinergy™ UPS system at a glance

Technical Specifications

Vertiv™ PowerNexus			
Rating [kVA]	1500	2000	2500
Inputs	2 (grid and generator)		
Operating temperature	Up to 35°C @ 100% load		
Relative humidity @ 20 °C (non condensing)	Up to 95%		
Frame color (RAL scale)	RAL7021		
IP protection	IP20 for UPS, IP31 for SWB		
Integration	Assembly on site or preassembled on skid or inclosure in factory		
Grounding	TN-C or TN-S		
Certification	CE and UL	CE and UL	UL
Nominal voltage [V]	400/480		
Input breaker @480V [A]	2500	3000	4000
Input breaker @400 [A]	3000	4000	5000
Short circuit rating	100 kA/1s		
UPS			
Core rating [kVA]	500		
Inverter overload capacity	110% continuous, 125% for 10 mins, 150% for 1 min		
Input factor	≥0.99		
UPS modes	Online (VFI), Dynamic Online (VI), ECO Mode (VFD)		
UPS efficiency @ VFI mode	≥97%		
UPS efficiency @ VFD mode	≥99%		
Frequency range [Hz]	40 - 70		
UPS serviceability	Complete UPS isolation by using external bypass		
Battery voltage range [V]	397 - 700		

Technical Data Vertiv™ Trinergy™

1500 kW 400V

2000 kW 400V

Primary Input

Nominal mains input voltage / voltage range ⁽⁶⁾	(V)	400 (340 to 460), 3Ph+PE or 3Ph+N+PE	
Nominal frequency / frequency tolerance	(Hz)	Selectable 50 or 60	
Input Power Factor		≥ 0.99	
Input current distortion (THDI)	(%)	≤3	
Walk in/soft start	(seconds)	15 (1 to 90 selectable)	
Rectifier Hold-Off	(seconds)	0 (0 to 240 selectable)	
Inrush current / I _{max} input		≤1	

Inverter Output

Nominal apparent power	(kVA)	1500	2000
Nominal active power	(kW)	1500	2000
Nominal output current @ nominal voltage 480V	(A)	2165	2887
Maximum output active power @ 35°C	(kW)	1500	2000
Inverter Overload Capacity ⁽⁵⁾		110% continuous, 125% for 10mins, 150% for 1min	
Nominal output voltage	(V)	400 (380 to 415 selectable) 3Ph+PE or 3Ph+N+PE	
Nominal output frequency	(Hz)	Selectable 50 or 60	
Output load Power Factor without derating		0,7 leading - 0,4 lagging	
Voltage stability in steady state condition for input (AC & DC) variations and step load (0 to Nominal load)	(%)	±1	
Voltage stability in dynamic condition for input variation (AC & DC) and step load	(%)	Complies with IEC/EN 62040-3, Class 1	
Voltage stability in steady state for 100% load imbalance (0, 0, 100)	(%)	±3	
Frequency slew rate	(Hz/sec)	<1 default (selectable up to 5 Hz)	
Output voltage distortion at nominal linear load	(%)	<1.5	
Output voltage distortion @ reference non linear load as for IEC/EN 62040-3	(%)	<5	
Load crest factor handled without derating the UPS	(I _{pk} /I _{rms})	3:1	
Phase angle precision with balanced loads	(degrees)	±1	
Phase angle precision with 100% unbalanced loads	(degrees)	±2	

DC Source

Battery types		VRLA, Li-Ion, Ni-Zn	
Permissible battery voltage range	(V)	397 to 700	
Recommended n° of VRLA cells:		240-300	
Float voltage for VRLA @ 20 °C	(V/cell)	2.27	
End cell voltage for VRLA	(V/cell)	1.65	
Float voltage stability in steady state condition	(%)	±1	
DC ripple voltage without battery	(%)	±1	
Optimum battery temperature	(°C)	15 to 25	
Battery recharge current setting range for 240cells @ 400V input voltage & maximum output load (PF=1) ⁽⁶⁾	(A)	437	583

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Vertiv™ PowerNexus with Vertiv™ Trinerger™ UPS system at a glance

Static Bypass

Nominal bypass input voltage ⁽⁶⁾	(V)	400 (380 to 415 selectable), 3Ph+PE or 3Ph+N+PE	
Nominal bypass input voltage range ⁽⁶⁾	(%)	±10 (5 to 15 selectable)	
Nominal output frequency	(Hz)	Selectable 50 or 60	
Frequency range	(%)	±1 (2, 3, 4 selectable)	
Maximum static bypass overload capacity:			
	For 10 minutes	(%)	125
	For 1 minute	(%)	150
Transfer time whit inverter synchronous to bypass:			
	Inverter to Bypass	(ms)	No break
	Bypass to Inverter	(ms)	<2ms

General System Data

AC/AC efficiency VFI without charging current @ nominal input conditions ⁽³⁾⁽⁴⁾ with resistive load:		≥ 97%	
AC/AC efficiency with dynamic online (VI) without charging current @ nominal input conditions ⁽³⁾⁽⁴⁾ with maximum resistive load:		≥ 99%	
AC/AC efficiency in Intelligent ECO mode without charging current @ nominal input conditions ⁽³⁾⁽⁴⁾ with maximum resistive load:		≥ 99%	
Prospective short circuit current I _{cp} with bypass fuses	(kAIC)	Up to 200	
Heat dissipation @ nominal input conditions and nominal output load:			
	Float Mode VFI	(BTU/h)	207702
		(kW)	60.9
	Float Mode VFD	(BTU/h)	67410
		(kW)	19.8
Mechanical dimensions:			
	Height	(mm)	2013
	Width	(mm)	5111 ⁽⁷⁾
	Depth	(mm)	1048
Net Weight		(kg)	4854 ⁽⁷⁾
Noise @ 1 meter ⁽³⁾⁽⁴⁾ as per ISO 7779/3746 at full load		(dBA ± 2dBA)	68
Protection degree with open doors		IP20	
Fame colour (RAL scale)		7021	
Cable entry		Top/Bottom	
Service Access		Front and Top	
Access		Front and Top (no rear access required)	
Cooling		Forced Ventilation, front air intake, top air outlet	

Environmental

Location		Indoor (free from corrosive gases and conductive dust)
Operating Temperature	(°C)	0 to 50 with automatic derating from 40°C
Maximum relative humidity @ 20 °C (non condensing)	(%)	Up to 95 with humidity control and correction
Max altitude above sea level without derating	(m)	1000 (for higher altitudes complies with IEC/EN 62040-3)
Immunity to electrical interference		IEC / EN / BS 62040-2
EMC Class		IEN / EN 62040-2 Class C3
Environmental Aspects		IEC/ EN/ 62040-4
Classification according to IEC/EN 62040-3		VFI-SS-111
Options		Dynamic Grid Support
		Integrated Backfeed Protection Device
		DC Ground Fault Detection
		EPO Push Button
		Flange connections
		Vertiv™ Life™ Services Remote Diagnostic and Preventive Monitoring
Network Protocols with Monitoring Card		Battery Trip Option
		Modbus TCP
		BACnet/WS
		BACnet/IP
		SNMP v1, v3, IPv6

Note:

(1) Short circuit values depend on UPS rating, please contact Vertiv Technical Support for more information

(2) Values specified for single unit. Units in parallel may have different values due to contribution of the parallel connections. Please contact Vertiv Technical Support for more information

(3) For tolerance see IEC/EN 60146-1-1 or DIN VDE 0558. The data refer to 25°C ambient temperature

(4) At nominal voltage, nominal frequency

(5) Value obtained at 25°C

(6) In case of a split configuration, the primary input and the bypass input must have a common neutral reference

(7) 1500kW UL version will be available starting from June 2025 with optimized width 4000 mm and weight 3950 kg. 2000kW UL version will be available starting from February 2025 with optimized width 5000 mm and weight 4800 kg