

Lenovo ThinkSystem DE6000H Hybrid Storage Array Product Guide

Lenovo ThinkSystem DE6000H is a scalable, hybrid mid-range storage system that is designed to provide high performance, simplicity, capacity, security, and high availability for medium to large businesses. The ThinkSystem DE6000H delivers enterprise-class storage management capabilities in a performance-optimized system with a wide choice of host connectivity options, flexible drive configurations, and enhanced data management features. The ThinkSystem DE6000H is a perfect fit for a wide range of enterprise workloads, including big data and analytics, video surveillance, technical computing, backup and recovery, and other storage I/O-intensive applications.

ThinkSystem DE6000H models are available in a 2U rack form-factor with 24 small form-factor (2.5-inch SFF) drives (2U24 SFF) or a 4U rack form-factor with 60 LFF drives (4U60 LFF) and include two controllers, each with 16 GB or 64 GB cache for a system total of 32 GB or 128 GB. Base ports provide universal 10 Gb iSCSI or 4/8/16 Gb Fibre Channel (FC) host connectivity, and the host interface cards provide 12 Gb SAS, 10/25 Gb iSCSI, 8/16/32 Gb FC or NVMe/FC, or 25/40/100 Gb NVMe/RoCE connections.

The Lenovo ThinkSystem DE6000H 2U24 SFF and 4U60 LFF enclosures are shown in the following figure.

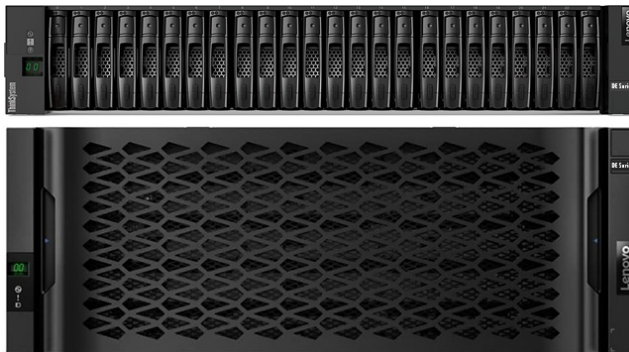


Figure 1. Lenovo ThinkSystem DE6000H 2U24 SFF (top) and 4U60 LFF (bottom) enclosures

Did you know?

The ThinkSystem DE6000H offers end-to-end NVMe storage connectivity with NVMe over Fabrics (NVMeOF).

The ThinkSystem DE6000H scales up to 3.84 PB of raw storage capacity in the base configuration or up to 7.68 PB with the optional Features on Demand upgrade.

The ThinkSystem DE6000H supports multiple storage connectivity protocols with a choice of SAS, iSCSI, Fibre Channel, NVMe over Fibre Channel, or NVMe over RoCE.

For the ThinkSystem DE6000H, customers can change the host port protocol from FC to iSCSI or from iSCSI to FC for the SFP+ host ports built into the controller (base host ports).

Key features

The ThinkSystem DE6000H Storage Array scales up to 240 (base configuration) or 480 (optional upgrade) drives with the attachment of Lenovo ThinkSystem DE240S 2U24 SFF, DE120S 2U12 LFF, and DE600S 4U60 LFF Expansion Enclosures. It also offers flexible drive configurations with the choice of 2.5-inch (SFF) and 3.5-inch (LFF) form factors, 10 K rpm SAS and 7.2 K rpm NL SAS hard disk drives (HDDs), and SAS solid-state drives (SSDs).

The ThinkSystem DE6000H offers the following key features and benefits:

- Scalable, high performance mid-range hybrid storage with dual active/active controller configurations with 16 GB or 64 GB cache per controller for high availability and performance.
- Faster application response times with support for NVMe over Fabrics.
- Improved performance and data protection with Dynamic Disk Pools (DDP) technology, as well as support for traditional RAID 0, 1, 3, 5, 6, and 10.
- Flexible storage protocols to match diverse client needs with support for 10 Gb iSCSI or 4/8/16 Gb FC and 12 Gb SAS, 10/25 Gb iSCSI, or 8/16/32 Gb FC host connectivity, or 8/16/32 Gb NVMe/FC host connectivity, or 25/40/100 Gb NVMe/RoCE host connectivity.
- 12 Gb SAS drive-side connectivity with support for up to 24x 2.5-inch small form factor (SFF) drives in the 2U24 SFF enclosures, up to 12x 3.5-inch large form factor (LFF) drives in the 2U12 LFF enclosures, or up to 60x 3.5-inch LFF drives in the 4U60 LFF enclosures.
- Base scalability to up to 192 SFF or 240 LFF drives with the optional upgrade to increase the number of LFF drives to 480 by attaching ThinkSystem DE240S 2U24 SFF, DE120S 2U12 LFF, and DE600S 4U60 LFF expansion enclosures to satisfy growing needs for storage capacity and performance.
- Rich set of standard storage management functions available at no extra cost, including Dynamic Disk Pools, SSD read cache, snapshots, volume copy, thin provisioning, and encryption (requires optional FIPS drives).
- Optional licensed functions, including higher number of drives and snapshots for greater scalability and synchronous or asynchronous mirroring for continuous data availability.
- Intuitive, web-based GUI for easy system setup and management.
- Designed for 99.9999% availability with redundant hot-swap components, including controllers and I/O modules, power supplies, cooling modules (4U60 LFF enclosures only), proactive maintenance, and non-disruptive firmware upgrades.

The ThinkSystem DE6000H supports the complete range of data storage requirements, from highly used applications to high-capacity, low usage applications.

The following drives are supported in the 2U24 SFF enclosures:

- Capacity-optimized SSDs (1 drive write per day [DWD]): 3.84 TB, 7.68 TB, and 15.36 TB
- High performance SSDs (3 DWD): 800 GB, 1.6 TB
- Performance-optimized, enterprise class HDDs: 1.2 TB and 1.8 TB 10K rpm
- Performance-optimized, enterprise class self-encrypting FIPS HDDs: 1.8 TB 10K rpm
- High performance self-encrypting FIPS SSDs (3 DWD): 1.6 TB

The following drives are supported in the 2U12 LFF enclosures:

- High-performance SSDs (3 DWD; 2.5" drive in a 3.5" drive tray): 800 GB
- High performance self-encrypting FIPS SSDs (3 DWD; 2.5" drive in a 3.5" drive tray): 1.6 TB
- High-capacity, archival-class nearline HDDs: 4 TB, 8 TB, 10 TB, 12 TB, and 16 TB 7.2K rpm
- High-capacity, archival-class nearline self-encrypting FIPS HDDs: 6 TB and 10 TB 7.2K rpm

The following drives are supported in the 4U60 LFF enclosures:

- High-performance SSDs (3 DWD; 2.5" drive in a 3.5" drive tray): 800 GB, 1.6 TB
- High-capacity, archival-class nearline HDDs: 4 TB, 8 TB, 10 TB, 12 TB, and 16 TB 7.2K rpm
- High-capacity, archival-class nearline self-encrypting FIPS HDDs: 10 TB 7.2K rpm
- High performance self-encrypting FIPS SSDs (3 DWD): 1.6 TB

All drives are dual-port and hot-swappable. Drives of the same form factor can be intermixed within the appropriate enclosure, which provides the flexibility to address performance and capacity needs within a single enclosure.

Up to seven ThinkSystem DE240S 2U24 SFF or ThinkSystem DE120S 2U12 LFF, or up to three ThinkSystem DE600S 4U60 LFF, or a combination of the ThinkSystem DE240S 2U24 SFF, DE120S 2U12 LFF, and DE600S 4U60 LFF expansion enclosures for a maximum of 240 drives per system (including a controller enclosure) are supported by a single ThinkSystem DE6000H storage array in the base configuration.

With the optional Features on Demand (FoD) upgrade, the DH6000H supports attachment of up to seven ThinkSystem DE600S 4U60 LFF, or a combination of the DE240S 2U24 SFF, DE120S 2U12 LFF, and DE600S 4U60 LFF expansion enclosures for a total of eight enclosures (one controller enclosure and up to seven expansion enclosures) and up to 480 drives per system.

Customers can intermix 2U24 SFF, 2U12 LFF, and 4U60 LFF expansion enclosures behind a 2U24 SFF or 4U60 LFF controller enclosure. This configuration delivers the added flexibility to mix 3.5-inch and 2.5-inch drives within a single system.

More drives and expansion enclosures are designed to be dynamically added with virtually no downtime, which helps to quickly and seamlessly respond to ever-growing capacity demands.

The ThinkSystem DE6000H offers high levels of system and data availability with the following technologies:

- Dual-active controller modules with automatic load balancing and failover
- Mirrored data cache with flash backup (battery-backed destaging to flash)
- Dual-port SAS HDDs and SSDs with automatic drive failure detection and rebuild with global hot spares
- Redundant, hot-swappable and customer replaceable hardware components, including SFP/SFP+ transceivers, controller and I/O modules, power supplies, cooling modules (4U60 LFF only), and drives
- Automated path failover support for the data path between the host and the drives with multipathing software
- Non-disruptive controller and drive firmware upgrades

Components and connectors

The following figure shows the front of the ThinkSystem DE6000H and DE240S 2U SFF enclosures.

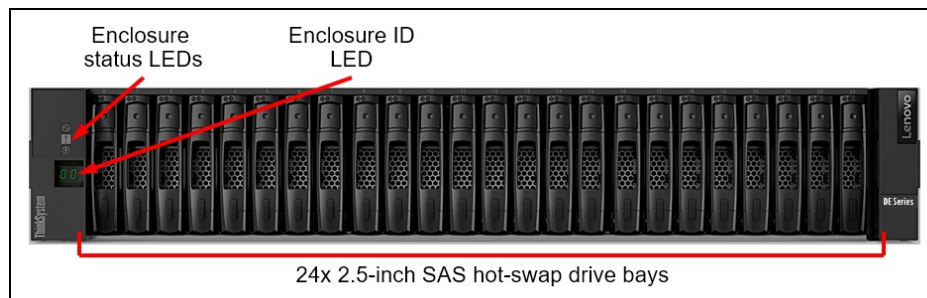


Figure 2. ThinkSystem DE6000H and DE240S 2U SFF enclosures front view

The front of the ThinkSystem DE6000H and DE240S 2U SFF enclosures includes the following components:

- 24 SFF hot-swap drive bays
- Enclosure status LEDs
- Enclosure ID LED

The following figure shows the front of the ThinkSystem DE120S 2U LFF enclosure.

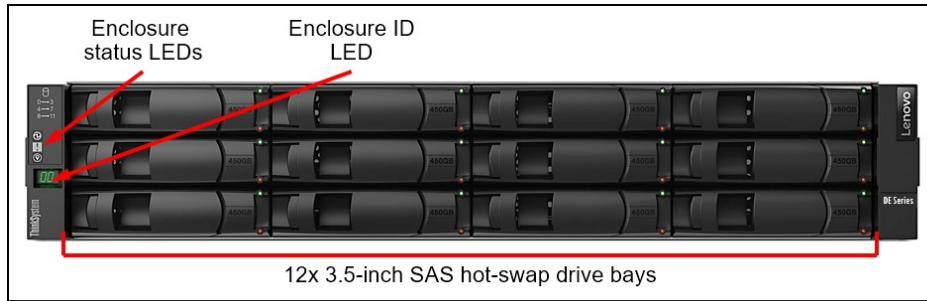


Figure 3. ThinkSystem DE120S 2U LFF enclosure front view

The front of the ThinkSystem DE120S 2U LFF enclosure includes the following components:

- 12 LFF hot-swap drive bays
- Enclosure status LEDs
- Enclosure ID LED

The following figure shows the rear of the ThinkSystem DE6000H 2U SFF controller enclosure.

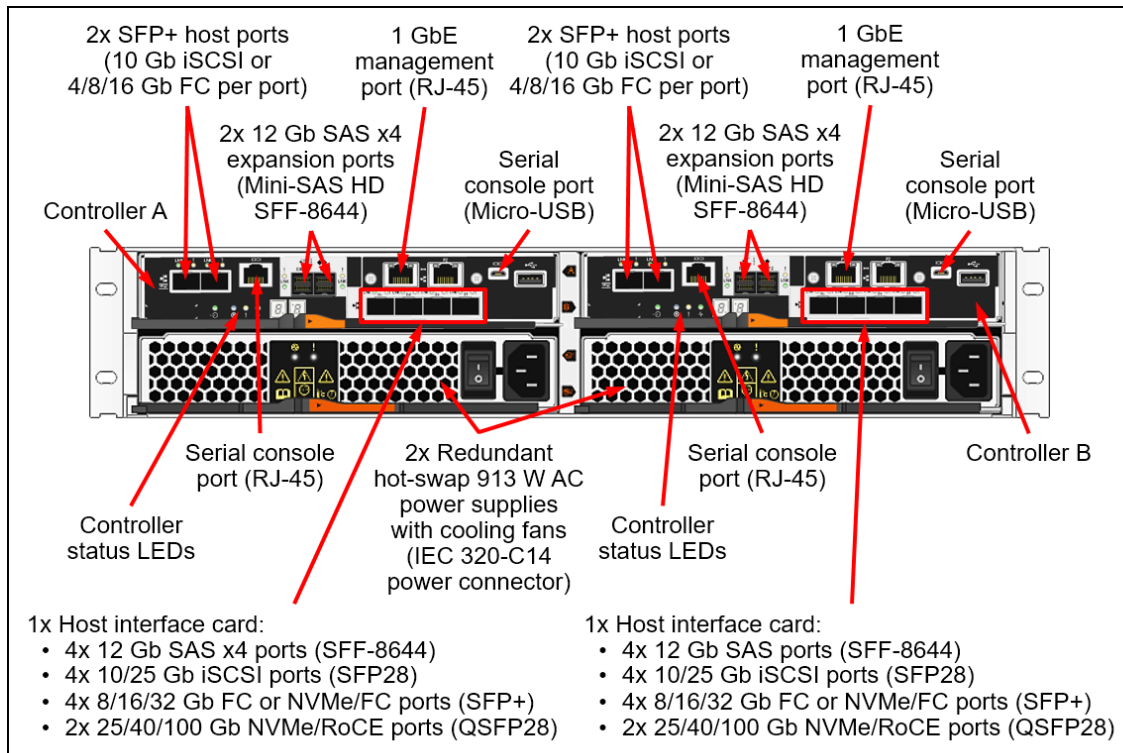


Figure 4. ThinkSystem DE6000H 2U SFF controller enclosure rear view

The rear of the ThinkSystem DE6000H 2U SFF controller enclosure includes the following components:

- Two redundant hot-swap controllers, each with the following ports:
 - Two SFP+ base host ports for 10 Gb iSCSI or 4/8/16 Gb FC connectivity.
Note: When NVMe/FC or NVMe/RoCE connectivity is enabled, the SFP+ base ports in the system are disabled and cannot be used.
 - One slot for the host interface card (a host interface card is required):
 - Four 12 Gb SAS x4 host ports (Mini-SAS HD SFF-8644).
 - Four 10/25 Gb iSCSI host ports (SFP28).
 - Four 8/16/32 Gb FC or NVMe/FC host ports (SFP+).
 - Two 25/40/100 Gb NVMe/RoCE host ports (QSFP28).
 - Two 12 Gb SAS x4 expansion ports (Mini-SAS HD SFF-8644) for connections to the expansion enclosures.
 - One RJ-45 10/100/1000 Mb Ethernet port for out-of-band management.
Note: The Ethernet port (P2) next to the GbE management port is not available for use.
 - Two serial console ports (RJ-45 and Micro-USB) for another means to configure the system.
 - One USB Type A port (reserved for factory use)
- Two redundant hot-swap 913 W AC (100 - 240 V) power supplies (IEC 320-C14 power connector) with integrated cooling fans.

The following figure shows the rear of the ThinkSystem DE240S and DE120S 2U expansion enclosures.

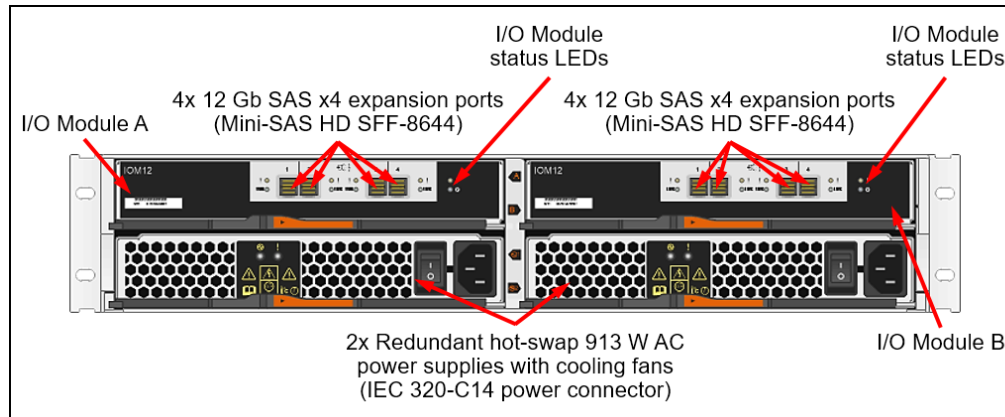


Figure 5. ThinkSystem DE240S and DE120S 2U expansion enclosures rear view

The rear of the ThinkSystem DE240S and DE120S 2U expansion enclosures includes the following components:

- Two redundant hot-swap I/O Modules; each I/O Module provides four 12 Gb SAS x4 expansion ports (Mini-SAS HD SFF-8644) for connections to the controller enclosures and for connecting the expansion enclosures between each other.
- Two redundant hot-swap 913 W AC (100 - 240 V) power supplies (IEC 320-C14 power connector) with integrated cooling fans.

The following figure shows the front of the ThinkSystem DE6000H and DE600S 4U LFF enclosures without the front bezel.

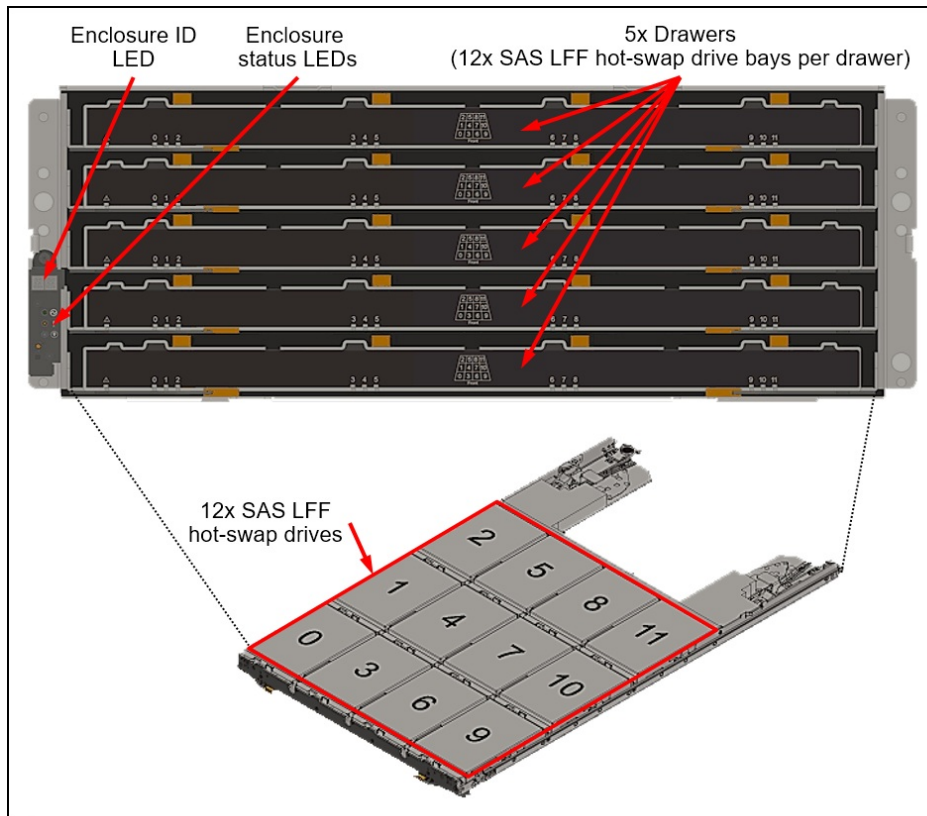


Figure 6. ThinkSystem DE6000H and DE600S 4U LFF enclosures front view (without the front bezel)

The front of the ThinkSystem DE6000H and DE600S 4U LFF enclosures includes the following components:

- Five drawers, each with 12 LFF hot-swap drive bays
- Enclosure status LEDs
- Enclosure ID LED

The following figure shows the rear of the ThinkSystem DE6000H 4U LFF controller enclosure.

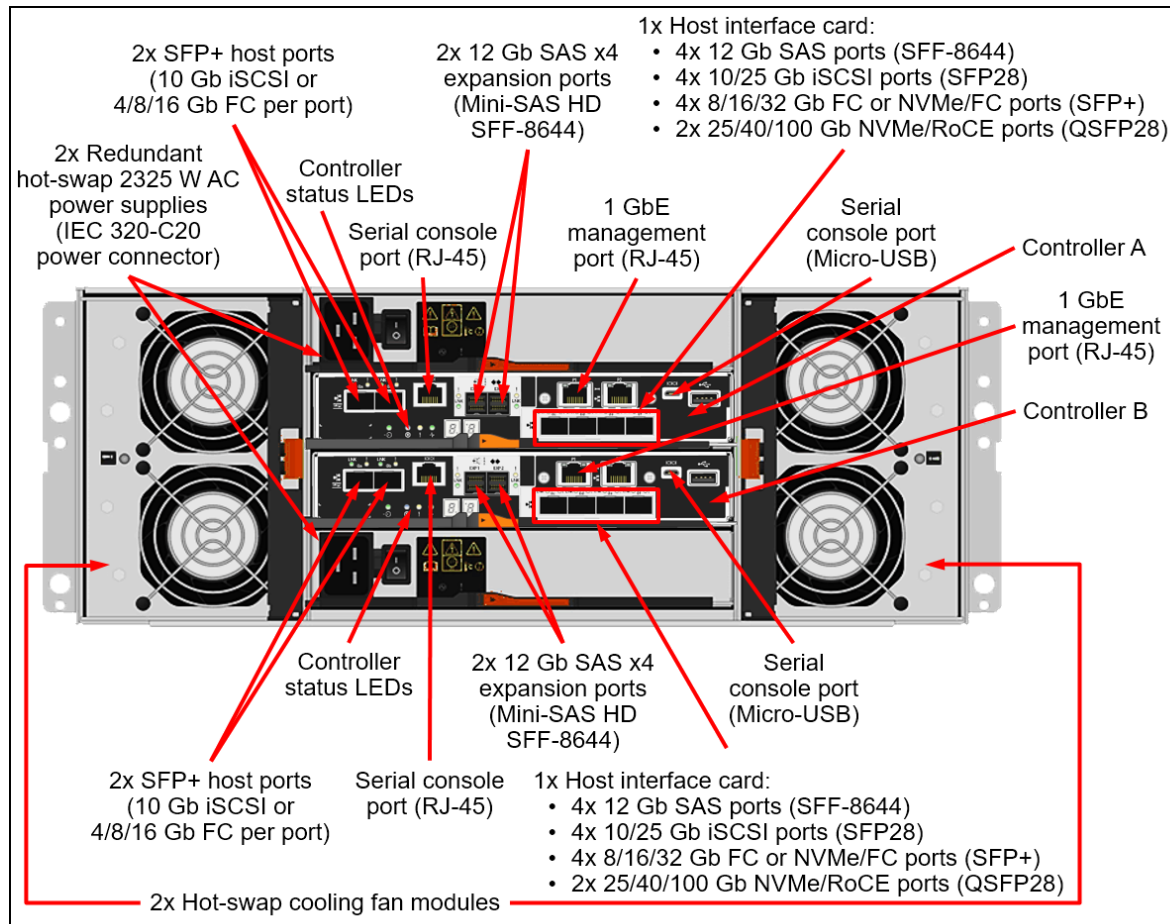


Figure 7. ThinkSystem DE6000H 4U LFF controller enclosure rear view

The rear of the ThinkSystem DE6000H 4U LFF controller enclosure includes the following components:

- Two redundant hot-swap controllers, each with the following ports:
 - Two SFP+ base host ports for 10 Gb iSCSI or 4/8/16 Gb FC connectivity.
 - Note:** When NVMe/FC or NVMe/RoCE connectivity is enabled, the SFP+ base ports in the system are disabled and cannot be used.
 - One slot for the host interface card (a host interface card is required):
 - Four 12 Gb SAS x4 host ports (Mini-SAS HD SFF-8644).
 - Four 10/25 Gb iSCSI host ports (SFP28).
 - Four 8/16/32 Gb FC or NVMe/FC host ports (SFP+).
 - Two 25/40/100 Gb NVMe/RoCE host ports (QSFP28).
 - Two 12 Gb SAS x4 expansion ports (Mini-SAS HD SFF-8644) for connections to the expansion enclosures.
 - One RJ-45 10/100/1000 Mb Ethernet port for out-of-band management.
 - Note:** The Ethernet port (P2) next to the GbE management port is not available for use.
 - Two serial console ports (RJ-45 and Micro-USB) for another means to configure the system.
 - One USB Type A port (reserved for factory use)
- Two redundant hot-swap 2325 W AC (200 - 240 V) power supplies (IEC 320-C20 power connector)
- Two hot-swap cooling fan modules; each module has two fans.
 - Note:** The failed cooling module should be replaced as soon as possible.

The following figure shows the rear of the ThinkSystem DE600S 4U LFF expansion enclosure.

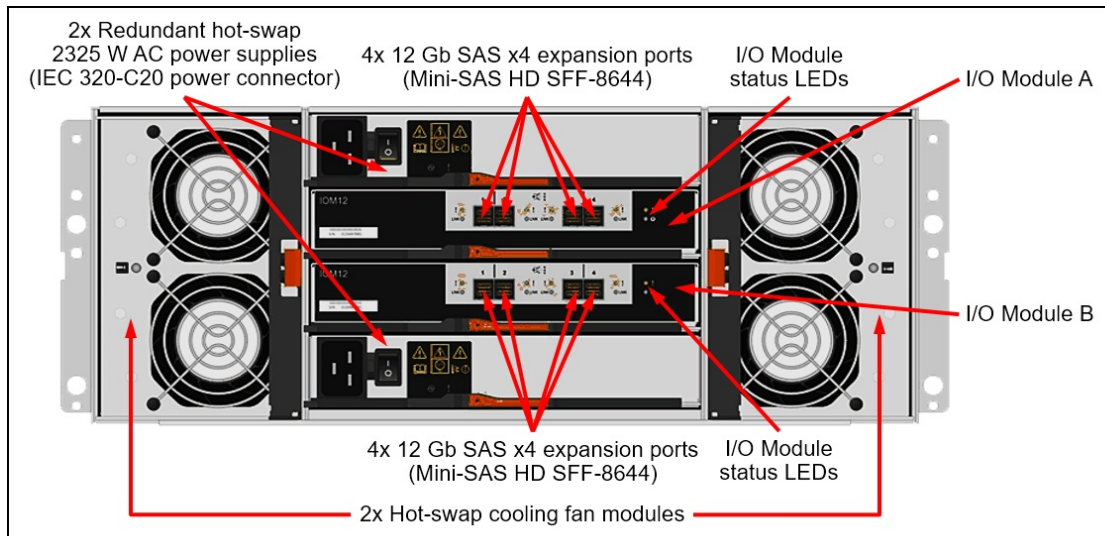


Figure 8. ThinkSystem DE600S 4U LFF expansion enclosure rear view

The rear of the ThinkSystem DE600S 4U LFF expansion enclosure includes the following components:

- Two redundant hot-swappable I/O Modules; each I/O Module provides four 12 Gb SAS x4 expansion ports (Mini-SAS HD SFF-8644) for connections to the controller enclosures and for connecting the expansion enclosures between each other.
- Two redundant hot-swappable 2325 W AC (200 - 240 V) power supplies (IEC 320-C20 power connector)
- Two hot-swappable cooling fan modules; each module has two fans.
Note: The failed cooling module should be replaced as soon as possible.

System specifications

The following table lists the ThinkSystem DE6000H storage system specifications.

Note: The supported hardware options, software features, and interoperability listed in this product guide are based on the software version 11.60. For details about specific software releases that introduced support for certain hardware options and software features, refer to the Release notes of the particular software release for the ThinkSystem DE6000H that can be found at:

<http://datacentersupport.lenovo.com>

Table 1. ThinkSystem DE6000H system specifications

Attribute	Specification
Form factor	<ul style="list-style-type: none"> DE6000H 2U24 SFF controller enclosure (Machine Type 7Y78): 2U rack mount. DE6000H 4U60 LFF controller enclosure (Machine Type 7Y80): 4U rack mount. DE240S 2U24 SFF expansion enclosure (Machine Type 7Y68): 2U rack mount. DE120S 2U12 LFF expansion enclosure (Machine Type 7Y63): 2U rack mount. DE600S 4U60 LFF expansion enclosure (Machine Type 7Y69): 4U rack mount.
Controller configuration	Dual active-active controller configuration with automatic load balancing.
RAID levels	RAID 0, 1, 3, 5, 6, and 10; Dynamic Disk Pools. Note: RAID 3 can be configured only through the CLI.
Controller cache	32 GB or 128 GB per system (16 GB or 64 GB per controller). Cache mirroring between the controllers. Flash-backed cache protection (includes battery for destaging to flash).
Drive bays	<p>Up to 8 enclosures per system (Controller enclosure with up to 3x [base] or 7x [FoD upgrade] 4U60 or 7x 2U24 or 2U12 expansion enclosures):</p> <ul style="list-style-type: none"> Up to 240 LFF hot-swap drive bays (Up to 4x 4U60 LFF enclosures in the base configuration). Up to 480 LFF hot-swap drive bays (Up to 8x 4U60 LFF enclosures with the optional FoD upgrade). Up to 192 SFF hot-swap drive bays (Up to 8x 2U24 LFF enclosures). <p>Intermix of 2U24 SFF, 2U12 LFF, and 4U60 LFF enclosures is supported.</p>
Drive technology	<ul style="list-style-type: none"> 12 Gb SAS and NL SAS HDDs and FIPS HDDs, 12 Gb SAS SSDs and FIPS SSDs. Intermix of HDDs and SSDs is supported within a system. Intermix of HDDs and SSDs is <i>not</i> supported within a volume group or disk pool. A maximum of 120 SAS SSDs is supported. Intermix of FIPS drives and non-FIPS drives is supported within a system. Intermix of FIPS drives and non-FIPS drives is <i>not</i> supported within a volume group or disk pool.
Drive expansion connectivity	<ul style="list-style-type: none"> 2x 12 Gb SAS x4 (Mini-SAS HD SFF-8644) expansion ports on each of two controllers in the controller enclosure for the attachment of the expansion enclosures. 4x 12 Gb SAS x4 (Mini-SAS HD SFF-8644) expansion ports on each of two I/O modules in the expansion enclosure for the attachment to the controller enclosure and daisy chaining of the expansion enclosures.

Attribute	Specification
Drives	<p>2U24 SFF drives:</p> <ul style="list-style-type: none"> ● 1.2 TB and 1.8 TB 10K rpm SAS HDDs ● 1.8 TB 10K rpm SAS FIPS HDDs ● 3.84 TB, 7.68 TB, and 15.36 TB SAS SSDs (1 DWD) ● 800 GB, 1.6 TB SAS SSDs (3 DWD) ● 1.6 TB SAS FIPS SSDs (3 DWD) <p>2U12 LFF drives:</p> <ul style="list-style-type: none"> ● 4 TB, 8 TB, 10 TB, 12 TB, and 16 TB 7.2K rpm NL SAS HDDs ● 6 TB and 10 TB 7.2K rpm NL SAS FIPS HDDs ● 800 GB SAS SSDs (3 DWD) ● 1.6 TB SAS FIPS SSDs (3 DWD) <p>4U60 LFF drives:</p> <ul style="list-style-type: none"> ● 4 TB, 8 TB, 10 TB, 12 TB, and 16 TB 7.2K rpm NL SAS HDDs ● 10 TB 7.2K rpm NL SAS FIPS HDDs ● 800 GB, 1.6 TB SAS SSDs (3 DWD) ● 1.6 TB SAS FIPS SSDs (3 DWD)
Storage capacity	<ul style="list-style-type: none"> ● Base configuration: Up to 3.84 PB (240x 16 TB SAS HDDs). ● FoD upgrade: Up to 7.68 PB (480x 16 TB SAS HDDs).
Storage protocols	SAN (Block access): SAS, iSCSI, FC, NVMe/FC, NVMe/RoCE.
Host connectivity	<p>Base ports (per controller enclosure with two controllers):</p> <ul style="list-style-type: none"> ● 4x 10 Gb iSCSI (DAC or SW fiber optics, LC) or 4/8/16 Gb FC (SW fiber optics, LC) SFP+ host ports (2 ports per controller) <p>Additional ports on host interface cards (per controller enclosure with two controllers):</p> <ul style="list-style-type: none"> ● 8x 12 Gb SAS host ports (Mini-SAS HD, SFF-8644) (4 ports per controller) ● 8x 10/25 Gb iSCSI SFP28 host ports (DAC or SW fiber optics, LC) (4 ports per controller) ● 8x 8/16/32 Gb FC SFP+ host ports (SW fiber optics, LC) (4 ports per controller) ● 4x 25/40/100 Gb NVMe/RoCE QSFP28 host ports (DAC cable or SW fiber optics, MPO) (2 ports per controller) <p>Note: Two host interface cards are required for selection (one per controller).</p>
Host operating systems	<p>Microsoft Windows Server 2012 R2, 2016, and 2019; Red Hat Enterprise Linux (RHEL) 6, 7, and 8; SUSE Linux Enterprise Server (SLES) 11, 12, and 15; VMware vSphere 6.5, 6.7, and 7.0.</p> <p>Note: NVMe/FC is supported with RHEL 8 and SLES 15, and NVMe/RoCE is supported with SLES 12 only (see Operating systems for specific version details).</p>
Standard software features	Dynamic Disk Pools, SSD read cache, snapshots (up to 1024 targets), volume copy, thin provisioning (DDP only), encryption (requires optional FIPS drives), and data assurance.
Optional software features	Snapshots (up to 2048 targets), scalability to 480 drives, synchronous mirroring, and asynchronous mirroring.
Performance*	<ul style="list-style-type: none"> ● Up to 1 000 000 random read IOPS (4 KB blocks). ● Up to 390 000 random write IOPS (4 KB blocks). ● Up to 21 GBps sequential read throughput (64 KB blocks). ● Up to 7 GBps sequential write throughput (64 KB blocks).

Attribute	Specification		
Configuration maximums**	<ul style="list-style-type: none"> Maximum storage capacity: 3.84 PB (base) / 7.68 PB (optional FoD upgrade) Maximum number of logical volumes: 2048 Maximum logical volume size: 2 PB Maximum thin-provisioned logical volume size (DDP only): 256 TB Maximum number of drives in a RAID volume group: <ul style="list-style-type: none"> RAID 0, 1/10: 240 (base) / 480 (optional FoD upgrade) RAID 3, 5, 6: 30 Maximum number of DDP arrays: 20 Maximum number of drives in a DDP array: 240 (base) / 480 (optional FoD upgrade); (11 drives minimum) Maximum SSD read cache size: 5 TB Maximum number of hosts: 512 Maximum number of snapshots: 1024 (base) / 2048 (optional FoD upgrade) Maximum number of mirroring pairs: 128 (requires an optional license) 		
Cooling	Redundant cooling with two cooling modules (4U60 LFF) or with the fans that are built into power supplies (2U24 SFF).		
Power supply	Two redundant hot-swap 913 W (100 - 240 V) (2U24 enclosures) or 2325 W (200 - 240 V) (4U60 enclosures) Platinum AC power supplies.		
Hot-swap parts	Controllers, I/O modules, drives, power supplies, cooling modules (4U60 LFF only), and SFP+/SFP28/QSFP28 transceivers.		
Management ports	<ul style="list-style-type: none"> 1x 1 GbE port (UTP, RJ-45) per controller for out-of-band management. 2x Serial console ports (RJ-45 and Micro-USB) for system configuration. In-band management via I/O path. 		
Management interfaces	System Manager web-based GUI; SAN Manager standalone GUI; SSH CLI; Serial console CLI; SMI-S Provider; SNMP, email, and syslog alerts; optional Lenovo XClarity.		
Security features	Secure Socket Layer (SSL), Secure Shell (SSH), user level security, role-based access control (RBAC), LDAP authentication.		
Warranty and support	Three-year customer-replaceable unit and onsite limited warranty with 9x5 next business day (NBD) parts delivered. Also available are 9x5 NBD onsite response, 24x7 coverage with 2-hour or 4-hour onsite response, or 6-hour or 24-hour committed repair (select areas), YourDrive YourData, Premier Support, and 1-year or 2-year post-warranty extensions.		
Software maintenance	Included in the base warranty and any Lenovo warranty extensions.		
Dimensions	2U24 SFF enclosure: <ul style="list-style-type: none"> Height: 85 mm (3.4 in.) Width: 449 mm (17.7 in.) Depth: 553 mm (21.8 in.) 	2U12 LFF enclosure: <ul style="list-style-type: none"> Height: 85 mm (3.4 in.) Width: 447 mm (17.6 in.) Depth: 483 mm (19.0 in.) 	4U60 LFF enclosure: <ul style="list-style-type: none"> Height: 174 mm (6.9 in.) Width: 449 mm (17.7 in.) Depth: 922 mm (36.3 in.)
Weight	<ul style="list-style-type: none"> 2U24 SFF enclosure (fully configured): 27.6 kg (60.8 lb) 2U12 LFF enclosure (fully configured): 27.6 kg (60.8 lb) 4U60 LFF enclosure (fully configured): 111.5 kg (245.8 lb) 		

* Estimated performance based on internal measurements.

** For a detailed list of configuration limits and restrictions for a specific version of the software, refer to the Lenovo Data Center Support website:

<http://datacentersupport.lenovo.com>

Controller enclosures

The following table lists the relationship models of the ThinkSystem DE6000H Hybrid Storage Array.

Table 2. ThinkSystem DE6000H relationship models

Description	Part number		
	European Union	Japan	Other markets worldwide
2U24 SFF models			
Lenovo ThinkSystem DE6000H SAS Hybrid Flash Array SFF (32 GB cache, 4x 16 Gb FC base ports [no SFPs], 8x 12 Gb SAS HIC ports)	7Y78A007EA	7Y781002JP	7Y78A000WW
Lenovo ThinkSystem DE6000H FC Hybrid Flash Array SFF (32 GB cache, 4x 16 Gb FC base ports [no SFPs], 8x 32 Gb FC HIC ports [no SFPs])	7Y78A008EA	7Y781001JP	7Y78A001WW
Lenovo ThinkSystem DE6000H iSCSI Hybrid Flash Array SFF (32 GB cache, 4x 10 Gb iSCSI base ports [no SFPs], 8x 10/25 Gb iSCSI HIC ports [no SFPs])	7Y78A009EA	7Y781000JP	7Y78A002WW
4U60 LFF models			
Lenovo ThinkSystem DE6000H SAS Hybrid Flash Array 4U60 (32 GB cache, 4x 16 Gb FC base ports [no SFPs], 8x 12 Gb SAS HIC ports)	7Y80A006EA	7Y801002JP	7Y80A000WW
Lenovo ThinkSystem DE6000H FC Hybrid Flash Array 4U60 (32 GB cache, 4x 16 Gb FC base ports [no SFPs], 8x 32 Gb FC HIC ports [no SFPs])	7Y80A007EA	7Y801001JP	7Y80A001WW
Lenovo ThinkSystem DE6000H iSCSI Hybrid Flash Array 4U60 (32 GB cache, 4x 10 Gb iSCSI base ports [no SFPs], 8x 10/25 Gb iSCSI HIC ports [no SFPs])	7Y80A008EA	7Y801000JP	7Y80A002WW

The following table lists the CTO base models for the ThinkSystem DE6000H.

Table 3. ThinkSystem DE6000H CTO base models

Description	Machine Type/Model	Feature code
Lenovo ThinkSystem Storage 2U24 Chassis (with 2x PSUs)	7Y78CTO1WW	B38L
Lenovo ThinkSystem Storage 4U60 Chassis (with 2x PSUs)	7Y80CTO1WW	B38N

Configuration notes:

- For Relationship models listed in this section, two DE6000 16 GB controllers (feature code B4JN) are included in the model configuration.
- For CTO models, two DE6000 16 GB controllers (feature code B4JN) or 64 GB controllers (feature code B4JP) must be selected.

The models of the ThinkSystem DE6000H ship with the following items:

- One chassis with the following components:
 - Two controllers
 - Two power supplies
 - Two cooling modules (4U60 LFF only)
 - Two host interface cards
- Rack Mount Kit
- 2 m USB Cable (USB Type A to Micro-USB)
- *Quick Installation Guide*
- *Electronic Publications Flyer*
- Two power cables:
 - Relationship models listed in this section:
 - 2U24 SFF: 1.5 m, 10A/100-250V, C13 to IEC 320-C14 rack power cables
 - 4U60 LFF: 2.5 m, 16A/100-240V, C19 to IEC 320-C20 rack power cables
 - CTO models: Customer-configured power cables

Note: The Relationship models of the ThinkSystem DE6000H listed in this section ship without optical transceivers, DAC cables, or SAS cables; they should be purchased for the system (see [Controllers](#) for details).

Controllers

The ThinkSystem DE6000H controller enclosures ship with two DE6000 controllers, and each controller provides 16 GB or 64 GB cache for a system total of 32 GB or 128 GB, respectively. A *controller* provides interfaces for host connectivity, management, and internal drives, and it runs storage management software.

The ThinkSystem DE6000H controller enclosures ship with four universal ports (two ports per controller) for 10 Gb iSCSI or 4/8/16 Gb FC host connectivity. Each controller also has one expansion slot for a host interface card (HIC).

The following host interfaces can be added to the ThinkSystem DE6000H controller enclosures with HICs:

- 8x 12 Gb SAS x4 (Mini-SAS HD SFF-8644) ports (4 ports per HIC) for SAS connectivity.
- 8x 10/25 GbE SFP28 ports (4 ports per HIC) for 10/25 Gb iSCSI connectivity (require optical transceivers or DAC cables that should be purchased for the HICs).
- 8x 8/16/32 Gb FC SFP+ ports (4 ports per HIC) for FC or NVMe/FC connectivity (require optical transceivers that should be purchased for the HICs).
- 4x 25/40/100 GbE RoCE QSFP28 ports (2 ports per HIC) for NVMe/RoCE connectivity (require optical transceivers or DAC cables that should be purchased for the HIC).

Each DE6000 controller also provide two 12 Gb SAS x4 expansion ports (Mini-SAS HD SFF-8644 connectors) for the attachment of the ThinkSystem DE Series expansion units.

Configuration notes:

- Both controllers must have the same cache size: 16 GB or 64 GB.
- Two host interface cards are required for selection (one per controller).
- All four SFP+ base ports in the system must have the same connectivity type (either iSCSI or FC, but not both types) and the same type of SFP+ media (either optical transceivers or DAC cables, but not both types).
- Both controllers must have the same type of the host interface card installed (12 Gb SAS SFF-8644, 32 Gb FC SFP+, 10/25 Gb iSCSI SFP28, or 100 GbE NVMe/RoCE QSFP28), and both cards must have SFP+/SFP28/QSFP28 media of the same type (either optical transceivers or DAC cables, but not both types).
- NVMe/FC or NVMe/RoCE connectivity requires controllers with 64 GB cache.
- When NVMe/FC or NVMe/RoCE connectivity is enabled, the SFP+ base ports in the system are disabled and cannot be used.

The following table lists the supported host port configurations for the ThinkSystem DE6000H controller enclosures (each row in the table represents a supported combination of the host ports).

Table 4. ThinkSystem DE6000H host port configurations

Port type and total number of ports					
12 Gb SAS (SFF-8644)	10 Gb iSCSI (SFP+) or 16 Gb FC (SFP+)	10/25 Gb iSCSI (SFP28)	32 Gb FC (SFP+)	32 Gb NVMe/FC (SFP+)	100 Gb NVMe/RoCE (QSFP28)
8 (4 per controller)	4 (2 per controller)	-	-		
-	4 (2 per controller)	8 (4 per controller)	-		
-	4 (2 per controller)	-	8 (4 per controller)		
-	-*	-	-	8 (4 per controller)	-
-	-*	-	-	-	4 (2 per controller)

* When NVMe/FC or NVMe/RoCE connectivity is enabled, the SFP+ base ports in the system are disabled and cannot be used.

The following table lists the DE6000H controllers and supported connectivity options.

Table 5. DE6000H controllers and connectivity options

Description	Part number	Feature code	Maximum quantity per controller enclosure
Controllers			
Lenovo ThinkSystem DE6000 Controller 16GB	None*	B4JN	2
Lenovo ThinkSystem DE6000 Controller 64GB	None*	B4JP	2
Host interface cards			
Lenovo ThinkSystem DE6000 12Gb SAS 4-ports HIC	4C57A14372	B4J9	2
Lenovo ThinkSystem DE6000 10/25Gb iSCSI 4-ports HIC	4C57A14371	B4J8	2
Lenovo ThinkSystem DE6000 32Gb FC 4-ports HIC	4C57A14370	B4J7	2
Lenovo ThinkSystem DE6000 100Gb NVMe-RoCE 2-port HIC	4C57A14373	B6KW	2
Transceiver options			
Lenovo 10Gb iSCSI/16Gb FC Universal SFP+ Module (for SFP+ base ports)	4M17A13527	B4B2	4
Lenovo 10/25GbE iSCSI SFP28 Module (for 10/25 Gb iSCSI HIC ports)	4M17A13529	B4B4	8
Lenovo 32Gb FC SFP+ Transceiver (for 32 Gb FC HIC ports)	4M17A13528	B4B3	8
OM4 cables for 16/32 Gb FC and 10/25 Gb iSCSI SW SFP+/SFP28 optical transceivers			
Lenovo 0.5m LC-LC OM4 MMF Cable	4Z57A10845	B2P9	12
Lenovo 1m LC-LC OM4 MMF Cable	4Z57A10846	B2PA	12
Lenovo 3m LC-LC OM4 MMF Cable	4Z57A10847	B2PB	12
Lenovo 5m LC-LC OM4 MMF Cable	4Z57A10848	B2PC	12
Lenovo 10m LC-LC OM4 MMF Cable	4Z57A10849	B2PD	12
Lenovo 15m LC-LC OM4 MMF Cable	4Z57A10850	B2PE	12

Description	Part number	Feature code	Maximum quantity per controller enclosure
Lenovo 25m LC-LC OM4 MMF Cable	4Z57A10851	B2PF	12
Lenovo 30m LC-LC OM4 MMF Cable	4Z57A10852	B2PG	12
OM3 cables for 16/32 Gb FC and 10/25 Gb iSCSI SW SFP+/SFP28 optical transceivers			
Lenovo 0.5m LC-LC OM3 MMF Cable	00MN499	ASR5	12
Lenovo 1m LC-LC OM3 MMF Cable	00MN502	ASR6	12
Lenovo 3m LC-LC OM3 MMF Cable	00MN505	ASR7	12
Lenovo 5m LC-LC OM3 MMF Cable	00MN508	ASR8	12
Lenovo 10m LC-LC OM3 MMF Cable	00MN511	ASR9	12
Lenovo 15m LC-LC OM3 MMF Cable	00MN514	ASRA	12
Lenovo 25m LC-LC OM3 MMF Cable	00MN517	ASRB	12
Lenovo 30m LC-LC OM3 MMF Cable	00MN520	ASRC	12
Active optical cables for 100 Gb NVMe/RoCE QSFP28 HIC ports			
Lenovo 3m 100G QSFP28 Active Optical Cable	7Z57A03546	AV1L	4
Lenovo 5m 100G QSFP28 Active Optical Cable	7Z57A03547	AV1M	4
Lenovo 10m 100G QSFP28 Active Optical Cable	7Z57A03548	AV1N	4
Lenovo 15m 100G QSFP28 Active Optical Cable	7Z57A03549	AV1P	4
Lenovo 20m 100G QSFP28 Active Optical Cable	7Z57A03550	AV1Q	4
DAC cables for 10 Gb iSCSI SFP+ base ports and iSCSI HIC ports			
0.5m Passive DAC SFP+ Cable	00D6288	A3RG	12
1m Passive DAC SFP+ Cable	90Y9427	A1PH	12
1.5m Passive DAC SFP+ Cable	00AY764	A51N	12
2m Passive DAC SFP+ Cable	00AY765	A51P	12
3m Passive DAC SFP+ Cable	90Y9430	A1PJ	12
5m Passive DAC SFP+ Cable	90Y9433	A1PK	12
7m Passive DAC SFP+ Cable	00D6151	A3RH	12
DAC cables for 25 Gb iSCSI SFP28 HIC ports			
Lenovo 1m Passive 25G SFP28 DAC Cable	7Z57A03557	AV1W	8
DAC cables for 100 Gb NVMe/RoCE QSFP28 HIC ports			
Lenovo 1m Passive 100G QSFP28 DAC Cable	7Z57A03561	AV1Z	4
Lenovo 3m Passive 100G QSFP28 DAC Cable	7Z57A03562	AV20	4
Lenovo 5m Passive 100G QSFP28 DAC Cable	7Z57A03563	AV21	4
SAS host connectivity cables: Mini-SAS HD (controller) to Mini-SAS HD (host)			
0.5m External MiniSAS HD 8644/MiniSAS HD 8644 Cable	00YL847	AU16	8
1m External MiniSAS HD 8644/MiniSAS HD 8644 Cable	00YL848	AU17	8
2m External MiniSAS HD 8644/MiniSAS HD 8644 Cable	00YL849	AU18	8
3m External MiniSAS HD 8644/MiniSAS HD 8644 Cable	00YL850	AU19	8
1 GbE management ports			
0.75m Green Cat6 Cable	00WE123	AVFW	2
1.0m Green Cat6 Cable	00WE127	AVFX	2
1.25m Green Cat6 Cable	00WE131	AVFY	2

Description	Part number	Feature code	Maximum quantity per controller enclosure
1.5m Green Cat6 Cable	00WE135	AVFZ	2
3m Green Cat6 Cable	00WE139	AVG0	2
10m Green Cat6 Cable	90Y3718	A1MT	2
25m Green Cat6 Cable	90Y3727	A1MW	2

* Factory-installed only.

Expansion enclosures

In the base configuration, the ThinkSystem DE6000H supports attachment of up to seven ThinkSystem DE240S 2U24 SFF or ThinkSystem DE120S 2U12 LFF, or up to three ThinkSystem DE600S 4U60 LFF, or a combination of the DE240S 2U24 SFF, DE120S 2U12 LFF, and DE600S 4U60 LFF expansion enclosures for a total of up to 240 drives per system.

With the optional FoD upgrade, the DH6000H supports attachment of up to seven ThinkSystem DE600S 4U60 LFF, or a combination of the DE240S 2U24 SFF, DE120S 2U12 LFF, and DE600S 4U60 LFF expansion enclosures for a total of eight enclosures (one controller enclosure and up to seven expansion enclosures) and up to 480 drives per system.

Intermix of 2U24 SFF, 2U12 LFF, and 4U60 LFF expansion enclosures behind a 2U24 SFF or 4U60 LFF controller enclosure is supported up to the maximum number of enclosures and drives supported per system (depending on whether the optional FoD upgrade is enabled or not). The expansion enclosures can be added to the system non-disruptively.

The following table lists the relationship models of the supported ThinkSystem DE Series expansion enclosures.

Table 6. ThinkSystem DE240S, DE120S, and DE600S relationship models

Description	Part number		
	European Union	Japan	Other markets worldwide
Lenovo ThinkSystem DE240S 2U24 SFF Expansion Enclosure	7Y68A004EA	7Y681001JP	7Y68A000WW
Lenovo ThinkSystem DE120S 2U12 LFF Expansion Enclosure	7Y63A003EA	7Y631000JP	7Y63A000WW
Lenovo ThinkSystem DE600S 4U60 LFF Expansion Enclosure	7Y69A003EA	7Y691000JP	7Y69A000WW

The following table lists the TopSeller models of the supported ThinkSystem DE Series expansion enclosures.

Table 7. ThinkSystem DE240S and DE120S TopSeller models: Brazil and Latin America

Description	Part number	
	Latin America	Brazil
Lenovo ThinkSystem DE240S 2U24 SFF Expansion Enclosure (TopSeller)	7Y681002LA	7Y681002BR
Lenovo ThinkSystem DE120S 2U12 LFF Expansion Enclosure (TopSeller)	7Y631001LA	7Y631001BR

The following table lists the CTO base models for the ThinkSystem DE Series expansion enclosures.

Table 8. ThinkSystem DE240S, DE120S, and DE600S CTO base models

Description	Machine Type/Model	Feature code
Lenovo ThinkSystem Storage 2U24 Chassis (with 2x PSUs)	7Y68CTO1WW	B38L
Lenovo ThinkSystem Storage 2U12 Chassis (with 2x PSUs)	7Y63CTO1WW	B38M
Lenovo ThinkSystem Storage 4U60 Chassis (with 2x PSUs)	7Y69CTO1WW	B38N

Configuration notes:

- For Relationship and TopSeller models, two I/O expansion modules (feature code B4BS) are included in the model configuration.
- For CTO models, two I/O expansion modules (feature code B4BS) are selected by default in the configurator, and the selection cannot be changed.

The models of the ThinkSystem DE240S, DE120S, and DE600S ship with the following items:

- One chassis with the following components:
 - Two I/O modules
 - Two power supplies
 - Two cooling modules (4U60 LFF only)
- Four 1 m MiniSAS HD 8644/MiniSAS HD 8644 cables (Models listed in Tables 6 and 7)
- Rack Mount Kit
- *Quick Installation Guide*
- *Electronic Publications Flyer*
- Two power cables:
 - Relationship and TopSeller models listed in this section:
 - 2U24 SFF, 2U12 LFF: 1.5 m, 10A/100-250V, C13 to IEC 320-C14 rack power cables
 - 4U60 LFF: 2.5 m, 16A/100-240V, C19 to IEC 320-C20 rack power cables
 - CTO models: Customer-configured power cables

Note: The Relationship and TopSeller models of the ThinkSystem DE240S, DE120S, and DE600S listed in this section ship with four 1 m SAS cables; additional SAS cables that are listed in this section can be purchased for the system, if needed.

Each ThinkSystem DE Series expansion enclosure ships with two SAS I/O expansion modules. Each *I/O expansion module* provides four external 12 Gb SAS x4 ports (Mini-SAS HD SFF-8644 connectors labelled Port 1-4) that are used for connections to the ThinkSystem DE6000H and for daisy chaining the expansion enclosures between each other.

Two expansion ports on the Controller A are connected to the Ports 1 and 2 on the I/O Module A in the first expansion enclosure in the chain, and the Ports 3 and 4 on the I/O Module A in the first expansion enclosure are connected to the Ports 1 and 2 on the I/O Module A in the adjacent expansion enclosure, and so on.

Two expansion ports on the Controller B are connected to the Ports 1 and 2 on the I/O Module B in the last expansion enclosure in the chain, and the Ports 3 and 4 on the I/O Module B in the expansion enclosure are connected to the Ports 1 and 2 on the I/O Module B in the adjacent expansion enclosure, and so on.

The connectivity topology for the DE Series expansion enclosures is shown in the following figure.

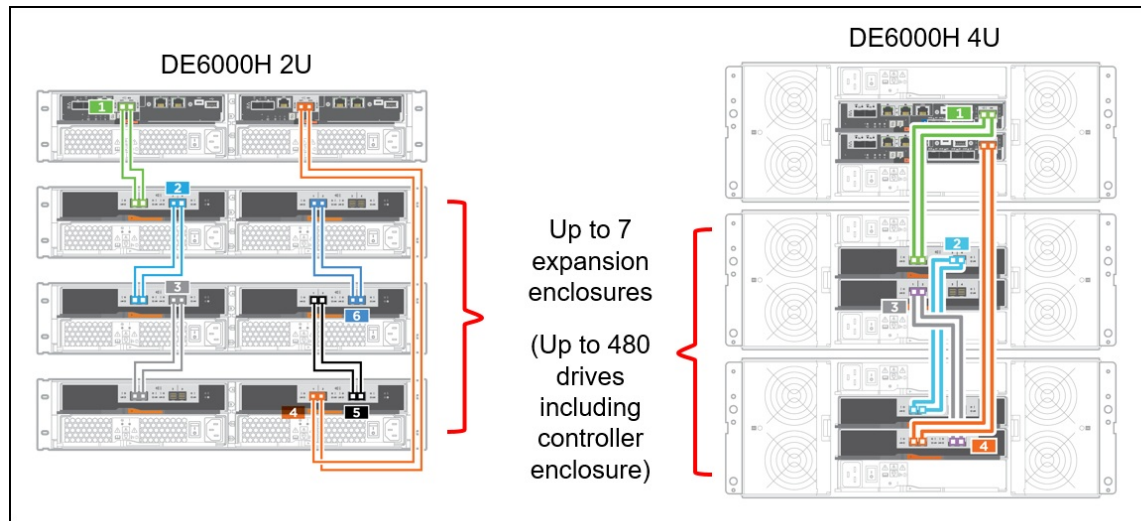


Figure 9. DE Series expansion enclosure connectivity topology

The following table lists ordering information for the supported expansion enclosure connectivity options.

Table 9. Expansion unit connectivity options

Description	Part number	Feature code	Quantity per one expansion enclosure
External MiniSAS HD 8644/MiniSAS HD 8644 0.5M Cable	00YL847	AU16	4
External MiniSAS HD 8644/MiniSAS HD 8644 1M Cable	00YL848	AU17	4
External MiniSAS HD 8644/MiniSAS HD 8644 2M Cable	00YL849	AU18	4
External MiniSAS HD 8644/MiniSAS HD 8644 3M Cable	00YL850	AU19	4

Configuration notes:

- The Relationship and TopSeller models of the ThinkSystem DE240S, DE120S, and DE600S listed in this section ship with four 1 m SAS cables.
- Four SAS cables are needed per each expansion enclosure (two SAS cables per I/O Module) for connections to the controller enclosure and for daisy chaining of the expansion enclosures.
- The length of the SAS cables that connect a 2U24 or 2U12 enclosure to an adjacent 4U60 enclosure should be at least 1 meter.

Drives

The ThinkSystem DE Series 2U24 SFF enclosures support up to 24 SFF hot-swap drives, the 2U12 LFF enclosures support up to 12 LFF hot-swap drives, and the 4U60 LFF enclosures support up to 60 LFF hot-swap drives.

The following table lists supported drive options for the 2U24 SFF controller and expansion enclosures.

Table 10. 2U24 SFF drive options

Description	Part number	Feature code	Maximum quantity per 2U24 SFF enclosure
2.5-inch 12 Gbps SAS hot-swap HDDs			
Lenovo ThinkSystem DE Series 1.2TB 10K 2.5" HDD 2U24	4XB7A14112	B4BY	24
Lenovo ThinkSystem DE Series 1.8TB 10K 2.5" HDD 2U24	4XB7A14113	B4BZ	24
2.5-inch 12 Gbps SAS hot-swap FIPS HDDs (SED HDDs)			
Lenovo ThinkSystem DE Series 1.8TB 10K 2.5" HDD FIPS 2U24	4XB7A14114	B4C0	24
2.5-inch 12 Gbps SAS hot-swap SSDs (1 Drive Write per Day)			
Lenovo ThinkSystem DE Series 3.84TB 1DWD 2.5" SSD 2U24	4XB7A14173	B4RX	24
Lenovo ThinkSystem DE Series 7.68TB 1DWD 2.5" SSD 2U24	4XB7A14176	B4RY	24
Lenovo ThinkSystem DE Series 15.36TB 1DWD 2.5" SSD 2U24	4XB7A14110	B4CD	24
2.5-inch 12 Gbps SAS hot-swap SSDs (3 Drive Writes per Day)			
Lenovo ThinkSystem DE Series 800GB 3DWD 2.5" SSD 2U24	4XB7A14105	B4BT	24
Lenovo ThinkSystem DE Series 1.6TB 3DWD 2.5" SSD 2U24	4XB7A14106	B4BU	24
2.5-inch 12 Gbps SAS hot-swap FIPS SSDs (SED SSDs) (3 Drive Writes per Day)			
Lenovo ThinkSystem DE Series 1.6TB 3DWD 2.5" SSD FIPS 2U24	4XB7A14107	B4BV	24

The following table lists supported drive options for the 2U12 LFF expansion enclosures for the DE6000H.

Table 11. Drive options for the 2U12 LFF expansion enclosures

Description	Part number	Feature code	Maximum quantity per 2U12 LFF enclosure
3.5-inch 12 Gbps NL SAS hot-swap HDDs			
Lenovo ThinkSystem DE Series 4TB 7.2K 3.5" HDD 2U12	4XB7A14099	B4C3	12
Lenovo ThinkSystem DE Series 8TB 7.2K 3.5" HDD 2U12	4XB7A14101	B4C5	12
Lenovo ThinkSystem DE Series 10TB 7.2K 3.5" HDD 2U12	4XB7A14102	B4C6	12
Lenovo ThinkSystem DE Series 12TB 7.2K 3.5" HDD 2U12	4XB7A14104	B4C8	12
Lenovo ThinkSystem DE Series 16TB 7.2K 3.5" HDD 2U12	4XB7A64875	BCVY	12
3.5-inch 12 Gbps NL SAS hot-swap FIPS HDDs (SED HDDs)			
Lenovo ThinkSystem DE Series 6TB 7.2K 3.5" HDD FIPS 2U12	4XB7A14100	B4C4	12
Lenovo ThinkSystem DE Series 10TB 7.2K 3.5" HDD FIPS 2U12	4XB7A14103	B4C7	12
3.5-inch 12 Gbps SAS hot-swap SSDs (3 Drive Writes per Day)			
Lenovo ThinkSystem DE Series 800GB 3DWD 2.5" SSD 2U12	4XB7A14097	B4C1	12
3.5-inch 12 Gbps SAS hot-swap FIPS SSDs (SED SSDs) (3 Drive Writes per Day) (2.5" drive in a 3.5" tray)			
Lenovo ThinkSystem DE Series 1.6TB 3DWD 2.5" SSD FIPS 2U12	4XB7A14098	B4C2	12

The following table lists supported drive options for the 4U60 LFF controller and expansion enclosures.

Table 12. 4U60 LFF drive options

Description	Part number	Feature code	Maximum quantity per 4U60 LFF enclosure
3.5-inch 12 Gbps NL SAS hot-swap HDDs			
Lenovo ThinkSystem DE Series 4TB 7.2K 3.5" HDD 4U60	4XB7A14124	B4GG	60
Lenovo ThinkSystem DE Series 8TB 7.2K 3.5" HDD 4U60	4XB7A14125	B4GH	60
Lenovo ThinkSystem DE Series 10TB 7.2K 3.5" HDD 4U60	4XB7A14126	B4GJ	60
Lenovo ThinkSystem DE Series 12TB 7.2K 3.5" HDD 4U60	4XB7A14128	B4GL	60
Lenovo ThinkSystem DE Series 16TB 7.2K 3.5" HDD 4U60	4XB7A64876	BCUC	60
3.5-inch 12 Gbps NL SAS hot-swap FIPS HDDs (SED HDDs)			
Lenovo ThinkSystem DE Series 10TB 7.2K 3.5" HDD FIPS 4U60	4XB7A14127	B4GK	60
3.5-inch 12 Gbps SAS hot-swap SSDs (3 Drive Writes per Day) (2.5" drive in a 3.5" tray)			
Lenovo ThinkSystem DE Series 800GB 3DWD 2.5" SSD 4U60	4XB7A14115	B4G9	60
Lenovo ThinkSystem DE Series 1.6TB 3DWD 2.5" SSD 4U60	4XB7A14116	B4GA	60
3.5-inch 12 Gbps SAS hot-swap FIPS SSDs (SED SSDs) (3 Drive Writes per Day) (2.5" drive in a 3.5" tray)			
Lenovo ThinkSystem DE Series 1.6TB 3DWD 2.5" SSD FIPS 4U60	4XB7A14117	B4GB	60

The following table lists supported drive pack options for the 4U60 LFF controller and expansion enclosures.

Table 13. 4U60 LFF drive pack options

Description	Part number	Feature code	Maximum quantity per 4U60 LFF enclosure
3.5-inch 12 Gbps NL SAS hot-swap HDD packs			
Lenovo ThinkSystem DE6000H 80TB HDD Pack (20x 4TB HDDs)	4XB7A14164	B4HY	3
Lenovo ThinkSystem DE6000H 160TB HDD Pack (20x 8TB HDDs)	4XB7A14166	B4HZ	3
Lenovo ThinkSystem DE6000H 200TB HDD Pack (20x 10TB HDDs)	4XB7A14168	B4J0	3
Lenovo ThinkSystem DE6000H 240TB HDD Pack (20x 12TB HDDs)	4XB7A14172	B4J2	3
Lenovo ThinkSystem DE6000H 320TB HDD Pack (20x 16TB HDDs)	4XB7A64878	BCUE	3
3.5-inch 12 Gbps NL SAS hot-swap FIPS HDD packs (SED HDD packs)			
Lenovo ThinkSystem DE6000H 200TB HDD FIPS Pack (20x 10TB FIPS HDDs)	4XB7A14170	B4J1	3
3.5-inch 12 Gbps SAS hot-swap SSD packs (3 Drive Writes per Day) (2.5" drive in a 3.5" tray)			
Lenovo ThinkSystem DE6000H 32TB SSD Pack (20x 1.6TB SSDs)	4XB7A14162	B4HX	3

Configuration notes:

- For hybrid (HDDs and SSDs) and all flash (SSDs only) storage configurations, a single ThinkSystem DE6000H storage system can support a maximum of 120 SSDs.
- A minimum of 20 drives is required for each 4U60 LFF enclosure (the front row of each drawer must be populated with four drives).
- Intermix of FIPS drives and non-FIPS drives is supported within the system.
- FIPS drives are not available in the following countries:

- Belarus
- Kazakhstan
- People's Republic of China
- Russia

Software

The following functions are included with every ThinkSystem DE6000H:

- **RAID levels 0, 1, 3, 5, 6, and 10** : Provide the flexibility to choose the level of performance and data protection required.
- **Dynamic Disk Pools (DDP) technology**: Helps improve performance and availability with significantly faster rebuild time and reduced exposure to multiple drive failures by allowing data and built-in spare capacity to be distributed across all physical drives in the storage pool.
- **All Flash Array (AFA) capability** : Meets the demand for higher speed storage and provide higher IOPS and bandwidth with lower power usage and total cost of ownership than hybrid or HDD-based solutions.
- **SSD Read Cache**: Helps accelerate performance of read-centric workloads.
- **Thin provisioning**: Optimizes efficiency of Dynamic Disk Pools by allocating storage space based on the minimum space required by each application at any given time, so that applications consume only the space they are actually using, not the total space that has been allocated to them, which allows customers to purchase storage they need today and add more as application requirements grow.
- **Snapshots**: Enables creation of copies of data for backup, parallel processing, testing, and development, and have the copies available almost immediately (up to 1024 snapshot targets per system).
- **Encryption**: Provides encryption for data at rest for enhanced data security with the optional FIPS 140-2 Level 2 drives and embedded key management (AES-256) or an external key management server.
- **Automatic load balancing**: Provides automated I/O workload balancing of I/O traffic from the hosts across both controllers.
- **Data assurance**: Ensures industry-standard T10-PI end-to-end data integrity in the storage system (from the host ports to the drives).
- **Dynamic volume and capacity expansion**: Allows the capacity of a volume to be expanded by adding new physical drives or making use of unused space on existing drives.

The ThinkSystem DE6000H capabilities can be expanded with optional licensed functions. Optional licensed functions include:

- **Snapshots upgrade**: Increase the supported number of snapshot targets to 2048.
- **Scalability to 480 drives**: Increases the number of supported 4U60 LFF expansion enclosures to 7 for up to 480 LFF drives per system.
- **Synchronous mirroring**: Provides storage system-based online, real-time data replication between the storage systems containing primary (local) and secondary (remote) volumes by using synchronous data transfers over Fibre Channel communication links (both storage systems must have licenses for synchronous mirroring).
- **Asynchronous mirroring**: Provides storage system-based data replication between the storage systems containing primary (local) and secondary (remote) volumes by using asynchronous data transfers over iSCSI or Fibre Channel communication links at set intervals (both storage systems must have licenses for asynchronous mirroring).

Note: The synchronous and asynchronous mirroring features of the ThinkSystem DE6000H interoperate with other ThinkSystem DE Series storage arrays.

The following table lists the Feature on Demand (FoD) upgrades for the ThinkSystem DE6000H to enable optional software features. Each optional DE6000H function is licensed on a per-system basis and covers both controller enclosure and all attached expansion enclosures.

Table 14. Optional software features

Description	Part number	Feature code
Lenovo ThinkSystem DE6000H Snapshots Upgrade 2048	4ZN7A14704	B4JA
Lenovo ThinkSystem DE6000H Max Drive Count Increase to 480	4ZN7A14710	B597
Lenovo ThinkSystem DE6000H Synchronous Mirroring	4ZN7A14706	B4JB
Lenovo ThinkSystem DE6000H Asynchronous Mirroring	4ZN7A14707	B4JC

Software maintenance is included in the ThinkSystem DE6000H base warranty and optional warranty extensions, which provides 3-year software support with the option to extend it up to 5 years in 1-year or 2-year increments (see [Warranty and support](#) for details).

Management

The ThinkSystem DE6000H supports the following management interfaces:

- Lenovo System Manager, a web-based interface via HTTPS for single-system management, that runs on the storage system itself and requires only a supported browser (Microsoft Internet Explorer, Google Chrome, or Mozilla Firefox), so there is no need for a separate console or plug-in.
- Lenovo SAN Manager, a host-installed GUI-based application, for centralized management of multiple storage systems.
- Command line interface (CLI) via SSH or through serial console.
- Syslog, SNMP, and e-mail notifications.
- Optional Lenovo XClarity for discovery, inventory, and monitoring.

Power supplies and cables

The ThinkSystem DE Series 2U24 SFF and 2U12 LFF enclosures ship with two redundant hot-swap 913 W (100 - 240 V) Platinum AC power supplies, each with an IEC 320-C14 connector. The Relationship models of the ThinkSystem DE6000H 2U24 SFF, DE240S 2U24 SFF, and DE120S 2U12 LFF enclosures listed in [Controller enclosures](#) and [Expansion enclosures](#) ship with two 1.5 m, 10A/100-250V, C13 to IEC 320-C14 rack power cables.

The ThinkSystem DE Series 4U60 LFF enclosures ship with two redundant hot-swap 2325 W (200 - 240 V) Platinum AC power supplies, each with an IEC 320-C20 connector. The Relationship models of the ThinkSystem DE6000H 4U60 LFF and DE600S 4U60 LFF enclosures listed in [Controller enclosures](#) and [Expansion enclosures](#) ship with two 2.5 m, 16A/100-240V, C19 to IEC 320-C20 rack power cables.

The CTO models require the selection of two power cables.

The following table lists the rack power cable and line cord options that can be ordered for the DE Series 2U24 SFF enclosures (two power cords per enclosure).

Table 15. Power cables for DE Series 2U24 SFF and 2U12 LFF enclosures

Description	Part number	Feature code
Rack power cables		
1.0m, 10A/100-250V, C13 to IEC 320-C14 Rack Power Cable	00Y3043	A4VP
1.0m, 13A/100-250V, C13 to IEC 320-C14 Rack Power Cable	4L67A08367	B0N5

Description	Part number	Feature code
1.5m, 10A/100-250V, C13 to IEC 320-C14 Rack Power Cable	39Y7937	6201
1.5m, 13A/100-250V, C13 to IEC 320-C14 Rack Power Cable	4L67A08368	B0N6
2.0m, 10A/100-250V, C13 to IEC 320-C14 Rack Power Cable	4L67A08365	B0N4
2.0m, 13A/125V-10A/250V, C13 to IEC 320-C14 Rack Power Cable	4L67A08369	6570
2.8m, 10A/100-250V, C13 to IEC 320-C14 Rack Power Cable	4L67A08366	6311
2.8m, 13A/125V-10A/250V, C13 to IEC 320-C14 Rack Power Cable	4L67A08370	6400
2.8m, 10A/100-250V, C13 to IEC 320-C20 Rack Power Cable	39Y7938	6204
4.3m, 10A/100-250V, C13 to IEC 320-C14 Rack Power Cable	39Y7932	6263
4.3m, 13A/125V-10A/250V, C13 to IEC 320-C14 Rack Power Cable	4L67A08371	6583
Line cords		
Argentina 2.8m, 10A/250V, C13 to IRAM 2073 Line Cord	39Y7930	6222
Argentina 4.3m, 10A/250V, C13 to IRAM 2073 Line Cord	81Y2384	6492
Australia/New Zealand 2.8m, 10A/250V, C13 to AS/NZS 3112 Line Cord	39Y7924	6211
Australia/New Zealand 4.3m, 10A/250V, C13 to AS/NZS 3112 Line Cord	81Y2383	6574
Brazil 2.8m, 10A/250V, C13 to NBR 14136 Line Cord	69Y1988	6532
Brazil 4.3m, 10A/250V, C13 to NBR14136 Line Cord	81Y2387	6404
China 2.8m, 10A/250V, C13 to GB 2099.1 Line Cord	39Y7928	6210
China 4.3m, 10A/250V, C13 to GB 2099.1 Line Cord	81Y2378	6580
Denmark 2.8m, 10A/250V, C13 to DK2-5a Line Cord	39Y7918	6213
Denmark 4.3m, 10A/250V, C13 to DK2-5a Line Cord	81Y2382	6575
Europe 2.8m, 10A/250V, C13 to CEE7-VII Line Cord	39Y7917	6212
Europe 4.3m, 10A/250V, C13 to CEE7-VII Line Cord	81Y2376	6572
India 2.8m, 10A/250V, C13 to IS 6538 Line Cord	39Y7927	6269
India 4.3m, 10A/250V, C13 to IS 6538 Line Cord	81Y2386	6567
Israel 2.8m, 10A/250V, C13 to SI 32 Line Cord	39Y7920	6218
Israel 4.3m, 10A/250V, C13 to SI 32 Line Cord	81Y2381	6579
Italy 2.8m, 10A/250V, C13 to CEI 23-16 Line Cord	39Y7921	6217
Italy 4.3m, 10A/250V, C13 to CEI 23-16 Line Cord	81Y2380	6493
Japan 2.8m, 12A/125V, C13 to JIS C-8303 Line cord	46M2593	A1RE
Japan 2.8m, 12A/250V, C13 to JIS C-8303 Line Cord	4L67A08357	6533
Japan 4.3m, 12A/125V, C13 to JIS C-8303 Line Cord	39Y7926	6335
Japan 4.3m, 12A/250V, C13 to JIS C-8303 Line Cord	4L67A08362	6495
Korea 2.8m, 12A/250V, C13 to KS C8305 Line Cord	39Y7925	6219
Korea 4.3m, 12A/250V, C13 to KS C8305 Line Cord	81Y2385	6494
South Africa 2.8m, 10A/250V, C13 to SABS 164 Line Cord	39Y7922	6214
South Africa 4.3m, 10A/250V, C13 to SABS 164 Line Cord	81Y2379	6576
Switzerland 2.8m, 10A/250V, C13 to SEV 1011-S24507 Line Cord	39Y7919	6216
Switzerland 4.3m, 10A/250V, C13 to SEV 1011-S24507 Line Cord	81Y2390	6578
Taiwan 2.8m, 10A/125V, C13 to CNS 10917-3 Line Cord	23R7158	6386
Taiwan 2.8m, 10A/250V, C13 to CNS 10917-3 Line Cord	81Y2375	6317
Taiwan 2.8m, 15A/125V, C13 to CNS 10917-3 Line Cord	81Y2374	6402
Taiwan 4.3m, 10A/125V, C13 to CNS 10917-3 Line Cord	4L67A08363	AX8B

Description	Part number	Feature code
Taiwan 4.3m, 10A/250V, C13 to CNS 10917-3 Line Cord	81Y2389	6531
Taiwan 4.3m, 15A/125V, C13 to CNS 10917-3 Line Cord	81Y2388	6530
United Kingdom 2.8m, 10A/250V, C13 to BS 1363/A Line Cord	39Y7923	6215
United Kingdom 4.3m, 10A/250V, C13 to BS 1363/A Line Cord	81Y2377	6577
United States 2.8m, 10A/125V, C13 to NEMA 5-15P Line Cord	90Y3016	6313
United States 2.8m, 10A/250V, C13 to NEMA 6-15P Line Cord	46M2592	A1RF
United States 2.8m, 13A/125V, C13 to NEMA 5-15P Line Cord	00WH545	6401
United States 4.3m, 10A/125V, C13 to NEMA 5-15P Line Cord	4L67A08359	6370
United States 4.3m, 10A/250V, C13 to NEMA 6-15P Line Cord	4L67A08361	6373
United States 4.3m, 13A/125V, C13 to NEMA 5-15P Line Cord	4L67A08360	AX8A

The following table lists the rack power cable and line cord options that can be ordered for the DE Series 4U60 LFF enclosures (two power cords per enclosure).

Table 16. Power cables for DE Series 4U60 enclosures

Description	Part number	Feature code
Rack power cables		
2.0m, 16A/100-250V, C19 to IEC 320-C20 Rack Power Cable	None*	B4L2
2.5m, 16A/100-250V, C19 to IEC 320-C20 Rack Power Cable	39Y7916	6252
Line cords		
Argentina 4.3m, 16A/250V, C19 to IRAM 2073 Line Cord	40K9777	6276
Australia/New Zealand 4.3m, 15A/250V, C19 to AS/NZS 3112 Line Cord	40K9773	6284
Brazil 4.3m, 16A/250V, C19 to NBR 14136 Line Cord	40K9775	6277
China 4.3m, 16A/250V, C19 to GB2099.1 Line Cord	40K9774	6288
Denmark/Switzerland 4.3m, 16A/250V, C19 to IEC 309 P+N+G Line Cord	40K9769	6283
Europe 4.3m, 16A/250V, C19 to CEE7-VII Line Cord	40K9766	6279
India 4.3m, 16A/250V, C19 to IS6538 Line Cord	40K9776	6285
Israel 4.3m, 16A/250V, C19 to SI 32 Line Cord	40K9771	6282
Italy 4.3m, 16A/250V, C19 to CEI 23-16 Line Cord	40K9768	6281
Japan 4.3m, 15A/200V, C19 to JIS C-8303 Line Cord	41Y9233	6291
Korea 4.3m, 15A/250V, C19 to KSC 8305 Line Cord	41Y9231	6289
South Africa 4.3m, 16A/250V, C19 to SABS 164 Line Cord	40K9770	6280
Switzerland 4.3m, 16A/250V, C19 to SEV 1011 Line Cord	81Y2391	6549
Taiwan 4.3m, 16A/250V, C19 to CNS 10917-3 Line Cord	41Y9230	6287
United Kingdom 4.3m, 13A/250V, C19 to BS 1363/A Line Cord	40K9767	6278
United States 4.3m, 15A/250V, C19 to NEMA 6-15P Line Cord	00D7197	A1NV
United States 4.3m, 18A/250V, C19 to NEMA L6-20P Line Cord	40K9772	6275

* CTO only.

Rack installation

The individually shipped ThinkSystem DE Series 2U12 enclosures come with the ThinkSystem Storage Rack Mount Kit 2U12, and the individually shipped ThinkSystem DE Series 2U24 and 4U60 enclosures come with the ThinkSystem Storage Rack Mount Kit 2U24/4U60. These rack mount kits are listed in the following table.

Table 17. 4-post rack mount kits

Description	Feature code	Quantity
Lenovo ThinkSystem Storage Rack Mount Kit 2U12	B38X	1
Lenovo ThinkSystem Storage Rack Mount Kit 2U24/4U60	B38Y	1

When the ThinkSystem DE Series enclosures are factory-integrated and shipped installed in a rack cabinet, the rack mount kits that support Ship-in-Rack (SIR) capabilities are derived by the configurator. The SIR-capable rack mount kits are listed in the following table.

Table 18. 4-post SIR rack mount kits

Description	Feature code	Quantity
Lenovo ThinkSystem Storage Rack Mount Kit 2U12	B38X	1
Lenovo ThinkSystem Storage SIR Rack Mount Kit (for 2U24 enclosures)	B6TH	1
DM/DE 4U Adjustable Rail Kit (SIR)	B742	1

The following table summarizes the rack mount kit features and specifications.

Table 19. Rack mount kit features and specifications summary

Attribute	Screw-in fixed rail with adjustable depth			
	2U12	2U24/4U60	2U24 SIR	4U SIR
Feature code	B38X	B38Y	B6TH	B742
Enclosure support	DE120S	DE6000H 2U DE6000H 4U‡ DE240S DE600S‡	DE6000H 2U DE240S	DE6000H 4U‡ DE600S‡
Rail type	Fixed (static) with adjustable depth	Fixed (static) with adjustable depth	Fixed (static) with adjustable depth	Fixed (static) with adjustable depth
Tool-less installation	No	No	No	No
In-rack maintenance	Yes*	Yes*	Yes*	Yes*
Ship-in-rack (SIR) support	Yes	No	Yes	Yes
1U PDU support	Yes	Yes	Yes	Yes
0U PDU support	Limited**	Limited**	Limited**	Limited**
Rack type	IBM or Lenovo 4-post, IEC standard-compliant	IBM or Lenovo 4-post, IEC standard-compliant	IBM or Lenovo 4-post, IEC standard-compliant	IBM or Lenovo 4-post, IEC standard-compliant
Mounting holes	Square or round	Square or round	Square or round	Square or round
Mounting flange thickness	2 mm (0.08 in.) – 3.3 mm (0.13 in.)	2 mm (0.08 in.) – 3.3 mm (0.13 in.)	2 mm (0.08 in.) – 3.3 mm (0.13 in.)	2 mm (0.08 in.) – 3.3 mm (0.13 in.)
Distance between front and rear mounting flanges [^]	605 mm (23.8 in.) – 812.8 mm (32 in.)	605 mm (23.8 in.) – 812.8 mm (32 in.)	605 mm (23.8 in.) – 812.8 mm (32 in.)	605 mm (23.8 in.) – 812.8 mm (32 in.)

‡ The rack cabinet must be at least 1100 mm (43.31 in.) deep for 4U60 enclosures.

* The majority of the enclosure components can be serviced from the front or rear of the enclosure, which does not require the removal of the enclosure from the rack cabinet.

** If a 0U PDU is used, the rack cabinet must be at least 1000 mm (39.37 in.) deep for 2U12 and 2U24 enclosures, or at least 1200 mm (47.24 in.) deep for 4U60 enclosures.

^ Measured when mounted on the rack, from the front surface of the front mounting flange to the rear most point of the rail.

Physical specifications

The ThinkSystem DE Series 2U24 SFF enclosures have the following dimensions and weight (approximate):

- Height: 85 mm (3.4 in.)
- Width: 449 mm (17.7 in.)
- Depth: 553 mm (21.8 in.)
- Weight (fully configured): 27.6 kg (60.8 lb)

The ThinkSystem DE Series 2U12 LFF enclosures have the following dimensions and weight (approximate):

- Height: 85 mm (3.4 in.)
- Width: 447 mm (17.6 in.)
- Depth: 483 mm (19.0 in.)
- Weight (fully configured): 27.6 kg (60.8 lb)

The ThinkSystem DE Series 4U60 LFF enclosures have the following dimensions and weight (approximate):

- Height: 174 mm (6.9 in.)
- Width: 449 mm (17.7 in.)
- Depth: 922 mm (36.3 in.)
- Weight (fully configured): 111.5 kg (245.8 lb)

Operating environment

The ThinkSystem DE Series 2U24 SFF and 4U60 LFF enclosures are supported in the following environment:

- Air temperature:
 - Operating:
 - DE6000H and DE240S 2U24 SFF: 5 °C - 45 °C (41 °F - 113 °F)
 - DE6000H and DE600S 4U60 LFF: 10 °C - 40 °C (50 °F - 104 °F)
 - DE120S 2U12 LFF: 10 °C - 40 °C (50 °F - 104 °F)
 - Non-operating: -10 °C - +50 °C (14 °F - 122 °F)
 - Maximum altitude: 3050 m (10,000 ft)
- Relative humidity:
 - Operating: 8% - 90% (non-condensing)
 - Non-operating: 10% - 90% (non-condensing)
- Electrical power:
 - 100 to 127 V AC (nominal); 50 Hz / 60 Hz (except 4U60 LFF enclosures)
 - 200 to 240 V AC (nominal); 50 Hz / 60 Hz
- Acoustical noise emission:
 - DE6000H 2U24 SFF, DE6000H and DE600S 4U60 SFF: 7.2 bels
 - DE240S 2U24 SFF and DE120S 2U12 LFF: 6.6 bels

The following table lists the maximum enclosure power load, inlet current, and heat output based on the source voltage.

Table 20. Enclosure power load, inlet current, and heat output

Enclosure	Source voltage (nominal)	Maximum power load	Current per inlet	Heat output
DE6000H 2U24 SFF	100 - 127 V AC	814 W	8.57 A	2778 BTU/hour
	200 - 240 V AC	705 W	3.72 A	2406 BTU/hour
DE6000H 4U60 LFF	200 - 240 V AC	1638 W	8.63 A	5589 BTU/hour
DE240S 2U24 SFF	100 - 127 V AC	389 W	4.1 A	1328 BTU/hour
	200 - 240 V AC	382 W	2.02 A	1304 BTU/hour
DE120S 2U12 LFF	100 - 127 V AC	306 W	3.3 A	1045 BTU/hour
	200 - 240 V AC	300 W	1.58 A	1024 BTU/hour
DE600S 4U60 LFF	200 - 240 V AC	1446 W	7.62 A	4934 BTU/hour

Warranty and support

The ThinkSystem DE Series enclosures have a three-year customer-replaceable unit (CRU) and onsite limited (for field-replaceable units [FRUs] only) warranty with standard call center support during normal business hours and 9x5 Next Business Day Parts Delivered.

Lenovo's additional support services provide a sophisticated, unified support structure for a customer's data center, with an experience consistently ranked number one in customer satisfaction worldwide.

The following Lenovo support services are available:

- **Premier Support** provides a Lenovo-owned customer experience and delivers direct access to technicians skilled in hardware, software, and advanced troubleshooting, in addition to the following capabilities:
 - Direct technician-to-technician access through a dedicated phone line.
 - 24x7x365 remote support.
 - Single point of contact service.
 - End to end case management.
 - 3rd Party collaborative software support.
 - Online case tools and live chat support.
 - On-demand remote system analysis.
- **Warranty Upgrades (Preconfigured Support)** are available to meet the on-site response time targets that match the criticality of customer's systems:
 - 3, 4, or 5 years of service coverage.
 - 1-year or 2-year post-warranty extensions.
 - **Foundation Service:** 9x5 service coverage with next business day onsite response, with optional YourDrive YourData.
 - **Essential Service:** 24x7 service coverage with 4-hour onsite response or 24-hour committed repair (available only in select regions), with optional YourDrive YourData.
 - **Advanced Service:** 24x7 service coverage with 2-hour onsite response or 6-hour committed repair (available only in select regions), with optional YourDrive YourData.
- **Managed Services**

Lenovo Managed Services provide continuous 24x7 remote monitoring (plus 24x7 call center availability) and proactive management of a customer's data center using state of the art tools, systems, and practices by a team of highly skilled and experienced Lenovo services professionals.

Quarterly reviews check error logs, verify firmware and operating system device driver levels, and software as needed. Lenovo will also maintain records of latest patches, critical updates, and firmware levels, to ensure customer's systems are providing business value through optimized performance.
- **Technical Account Management (TAM)**

A Lenovo Technical Account Manager helps customers optimize operations of their data centers based on a deep understanding of customer's business. Customers gain direct access to a Lenovo TAM, who serves as their single point of contact to expedite service requests, provide status updates, and furnish reports to track incidents over time. Also, a TAM helps proactively make service recommendations and manage service relationship with Lenovo to make certain that customer's needs are met.
- **YourDrive YourData**

Lenovo's YourDrive YourData service is a multi-drive retention offering that ensures that customer's data is always under their control, regardless of the number of drives that are installed in their Lenovo system. In the unlikely event of a drive failure, customers retain possession of their drive while Lenovo replaces the failed drive part. Customer's data stays safely on customer premises, in their hands. The YourDrive YourData service can be purchased in convenient bundles with Foundation, Essential, or Advanced Service upgrades and extensions.

- **Health Check**

Having a trusted partner who can perform regular and detailed health checks is central to maintaining efficiency and ensuring that customer systems and business are always running at their best. Health Check supports Lenovo-branded server, storage, and networking devices, as well as select Lenovo-supported products from other vendors that are sold by Lenovo or a Lenovo-Authorized Reseller.

Some regions might have different warranty terms and conditions than the standard warranty. This is due to local business practices or laws in the specific region. Local service teams can assist in explaining region-specific terms when needed. Examples of region-specific warranty terms are second or longer business day parts delivery or parts-only base warranty.

If warranty terms and conditions include onsite labor for repair or replacement of parts, Lenovo will dispatch a service technician to the customer site to perform the replacement. Onsite labor under base warranty is limited to labor for replacement of parts that have been determined to be field-replaceable units (FRUs). Parts that are determined to be customer-replaceable units (CRUs) do not include onsite labor under base warranty.

If warranty terms include parts-only base warranty, Lenovo is responsible for delivering only replacement parts that are under base warranty (including FRUs) that will be sent to a requested location for self-service. Parts-only service does not include a service technician being dispatched onsite. Parts must be changed at customer's own cost and labor and defective parts must be returned following the instructions supplied with the spare parts.

Lenovo support services are region-specific. Not all support services are available in every region. For information about Lenovo support services that are available in a specific region, refer to the following resources:

- Service part numbers in Data Center Solution Configurator (DCSC):
<http://dcsc.lenovo.com/#!/services>
- Lenovo Services Availability Locator
<https://lenovocator.com/>

For service definitions, region-specific details, and service limitations, refer to the following documents:

- Lenovo Statement of Limited Warranty for Data Center Group (DCG) Servers and System Storage
<http://pcsupport.lenovo.com/us/en/solutions/ht503310>
- Lenovo Data Center Services Agreement
<http://support.lenovo.com/us/en/solutions/ht116628>

Services

Lenovo Services is a dedicated partner to your success. Our goal is to reduce your capital outlays, mitigate your IT risks, and accelerate your time to productivity.

Note: Some service options may not be available in all countries. For more information, go to <https://www.lenovo.com/systems/services>. For information about Lenovo service upgrade offerings that are available in your region, contact your local Lenovo sales representative or business partner.

Here's a more in-depth look at what we can do for you:

- **Asset Recovery Services**

Asset Recovery Services (ARS) helps customers recover the maximum value from their end-of-life equipment in a cost-effective and secure way. On top of simplifying the transition from old to new equipment, ARS mitigates environmental and data security risks associated with data center equipment disposal. Lenovo ARS is a cash-back solution for equipment based on its remaining market value, yielding maximum value from aging assets and lowering total cost of ownership for your customers. For more information, see the ARS page, <https://lenovopress.com/lp1266-reduce-e-waste-and-grow-your-bottom-line-with-lenovo-ars>.

- **Assessment Services**

An Assessment helps solve your IT challenges through an onsite, multi-day session with a Lenovo technology expert. We perform a tools-based assessment which provides a comprehensive and thorough review of a company's environment and technology systems. In addition to the technology based functional requirements, the consultant also discusses and records the non-functional business requirements, challenges, and constraints. Assessments help organizations like yours, no matter how large or small, get a better return on your IT investment and overcome challenges in the ever-changing technology landscape.

- **Design Services**

Professional Services consultants perform infrastructure design and implementation planning to support your strategy. The high-level architectures provided by the assessment service are turned into low level designs and wiring diagrams, which are reviewed and approved prior to implementation. The implementation plan will demonstrate an outcome-based proposal to provide business capabilities through infrastructure with a risk-mitigated project plan.

- **Basic Hardware Installation**

Lenovo experts can seamlessly manage the physical installation of your server, storage, or networking hardware. Working at a time convenient for you (business hours or off shift), the technician will unpack and inspect the systems on your site, install options, mount in a rack cabinet, connect to power and network, check and update firmware to the latest levels, verify operation, and dispose of the packaging, allowing your team to focus on other priorities.

- **Deployment Services**

When investing in new IT infrastructures, you need to ensure your business will see quick time to value with little to no disruption. Lenovo deployments are designed by development and engineering teams who know our Products & Solutions better than anyone else, and our technicians own the process from delivery to completion. Lenovo will conduct remote preparation and planning, configure & integrate systems, validate systems, verify and update appliance firmware, train on administrative tasks, and provide post-deployment documentation. Customer's IT teams leverage our skills to enable IT staff to transform with higher level roles and tasks.

- **Integration, Migration, and Expansion Services**

Move existing physical & virtual workloads easily, or determine technical requirements to support increased workloads while maximizing performance. Includes tuning, validation, and documenting ongoing run processes. Leverage migration assessment planning documents to perform necessary migrations.

Regulatory compliance

The ThinkSystem DE Series enclosures conform to the following regulations:

- United States: FCC Part 15, Class A; UL 60950-1 and 62368-1
- Canada: ICES-003, Class A; CAN/CSA-C22.2 60950-1 and 62368-1
- Argentina: IEC60950-1
- Mexico NOM
- European Union: CE Mark (EN55032 Class A, EN55024, IEC/EN60950-1 and 62368-1); ROHS Directive 2011/65/EU
- Russia, Kazakhstan, Belarus: EAC
- China: CCC GB 4943.1, GB 17625.1, GB 9254 Class A; CELP; CECP
- India: BIS
- Japan: VCCI, Class A
- Taiwan: BSMI CNS 13438, Class A; CNS 14336-1
- Korea KN32/35, Class A
- Australia/New Zealand: AS/NZS CISPR 22 Class A

Interoperability

Lenovo provides end-to-end storage compatibility testing to deliver interoperability throughout the network. The ThinkSystem DE6000H Hybrid Storage Array supports attachment to Lenovo ThinkSystem, System x, and Flex System hosts by using SAS, iSCSI, Fibre Channel, NVMe over Fibre Channel (NVMe/FC), or NVMe over RoCE (RDMA over Converged Ethernet) (NVMe/RoCE) storage connectivity protocols.

The following sections list adapters and Ethernet LAN and FC SAN switches that are currently offered by Lenovo that can be used with the ThinkSystem DE6000H Hybrid Storage Array in IT solutions:

- [Adapters](#)
- [Ethernet LAN switches](#)
- [Fibre Channel SAN switches](#)

Note: Tables that are provided in these sections are for ordering reference purposes only.

For end-to-end storage configuration support, refer to the Lenovo Storage Interoperation Center (LSIC): <https://datacentersupport.lenovo.com/us/en/lxic>

Use the LSIC to select the known components of your configuration and then get a list all other supported combinations, with details about supported hardware, firmware, operating systems, and drivers, plus any additional configuration notes. View results on screen or export them to Excel.

Adapters

This section lists the adapters for the following types of storage connectivity:

- [SAS connectivity](#)
- [iSCSI connectivity](#)
- [Fibre Channel and NVMe/FC connectivity](#)
- [NVMe/RoCE connectivity](#)

SAS connectivity

The following table lists currently available SAS adapters for Lenovo servers that are compatible with the ThinkSystem DE6000H SAS storage (direct attach). Other SAS HBAs also might be supported (see the Interoperability Matrix for details).

Table 21. SAS adapters

Description	Part number
ThinkSystem SAS HBAs	
ThinkSystem 430-8e SAS/SATA 12Gb HBA	7Y37A01090
ThinkSystem 430-16e SAS/SATA 12Gb HBA	7Y37A01091
System x SAS HBAs	
N2225 SAS/SATA HBA (12Gb)	00AE912
N2226 SAS/SATA HBA (12Gb)	00AE916

iSCSI connectivity

The ThinkSystem DE6000H supports iSCSI attachments via standard 10 Gb or 25 Gb Ethernet connections (direct attach or switch-based). Any compatible Ethernet switch, including Lenovo ThinkSystem and RackSwitch Ethernet switches and embedded Flex System Ethernet I/O modules, can be used to provide iSCSI connectivity for the ThinkSystem DE6000H storage.

With software iSCSI initiators, any supported 10 Gb or 25 Gb Ethernet adapter for Lenovo servers is compatible with the ThinkSystem DE6000H iSCSI storage.

Fibre Channel and NVMe/FC connectivity

The ThinkSystem DE6000H supports direct FC attachments and FC switch-based attachments for Fibre Channel and NVMe over Fibre Channel connectivity. Lenovo B Series and DB Series FC SAN switches and directors can be used to provide FC and NVMe/FC connectivity.

Currently available FC adapters for Lenovo servers that are compatible with the ThinkSystem DE6000H storage are listed in the following table. Other FC HBAs also might be supported (see the Interoperability Matrix for details).

Table 22. Fibre Channel adapters

Description	Part number
ThinkSystem HBAs: 32 Gb FC, NVMe/FC	
ThinkSystem Emulex LPe35000 32Gb 1-port PCIe Fibre Channel Adapter	4XC7A08250
ThinkSystem Emulex LPe35002 32Gb 2-port PCIe Fibre Channel Adapter	4XC7A08251
ThinkSystem Emulex LPe32000-M6-LP PCIe 32Gb 1-Port SFP+ Fibre Channel Adapter	7ZT7A00517
ThinkSystem Emulex LPe32002-M6-LP PCIe 32Gb 2-Port SFP+ Fibre Channel Adapter	7ZT7A00519
ThinkSystem HBAs: 32 Gb FC	
ThinkSystem QLogic QLE2740 PCIe 32Gb 1-Port SFP+ Fibre Channel Adapter	7ZT7A00516
ThinkSystem QLogic QLE2742 PCIe 32Gb 2-Port SFP+ Fibre Channel Adapter	7ZT7A00518
System x HBAs: 16 Gb FC	
Emulex 16Gb Gen6 FC Single-port HBA (LPe31000)	01CV830
Emulex 16Gb Gen6 FC Dual-port HBA (LPe31002)	01CV840
Emulex 16Gb FC Single-port HBA (LPe16000)	81Y1655
Emulex 16Gb FC Dual-port HBA (LPe16002)	81Y1662
QLogic 16Gb Enhanced Gen5 FC Single-port HBA (QLE2690)	01CV750
QLogic 16Gb Enhanced Gen5 FC Dual-port HBA (QLE2692)	01CV760
QLogic 16Gb FC Single-port HBA (QLE2660)	00Y3337
QLogic 16Gb FC Dual-port HBA (QLE2662)	00Y3341
Flex System HBAs: 16 Gb FC	
ThinkSystem Emulex LPm16002B-L Mezz 16Gb 2-Port Fibre Channel Adapter	7ZT7A00521
ThinkSystem Emulex LPm16004B-L Mezz 16Gb 4-Port Fibre Channel Adapter	7ZT7A00522
ThinkSystem QLogic QML2692 Mezz 16Gb 2-Port Fibre Channel Adapter	7ZT7A00520

NVMe/RoCE connectivity

The ThinkSystem DE6000H supports direct and Ethernet switch-based attachments for NVMe over RoCE connectivity.

Currently available RoCE network adapters for Lenovo servers that are compatible with the ThinkSystem DE6000H are listed in the following table. Other RoCE network adapters also might be supported (see the Interoperability Matrix for details).

Table 23. RoCE network adapters

Description	Part number
NVMe/RoCE connectivity - 25 Gb Ethernet	
Mellanox ConnectX-6 Lx 10/25GbE SFP28 2-port PCIe Ethernet Adapter	4XC7A62580
Mellanox ConnectX-4 Lx 10/25GbE SFP28 1-port ML2 Ethernet Adapter	00MN990
Mellanox ConnectX-4 Lx 10/25GbE SFP28 2-port ML2 Ethernet Adapter	7ZT7A00507

Description	Part number
Mellanox ConnectX-4 Lx 10/25GbE SFP28 2-Port PCIe Ethernet Adapter	01GR250
NVMe/RoCE connectivity - 40 Gb Ethernet	
Mellanox ConnectX-4 Lx 1x40GbE QSFP+ Adapter	00MM950
Mellanox ConnectX-4 PCIe FDR 1-Port QSFP VPI Adapter	7XC7A05524
Mellanox ConnectX-4 PCIe FDR 2-Port QSFP VPI Adapter	7ZT7A00500
NVMe/RoCE connectivity - HDR100 InfiniBand/100 Gb Ethernet	
Mellanox ConnectX-6 HDR100/100GbE QSFP56 1-port PCIe VPI Adapter	4C57A14177
Mellanox ConnectX-6 HDR100/100GbE QSFP56 2-port PCIe VPI Adapter	4C57A14178
Mellanox ConnectX-4 1x100GbE/EDR IB QSFP28 VPI Adapter	00KH924
Mellanox ConnectX-4 2x100GbE/EDR IB QSFP28 VPI Adapter	00MM960
NVMe/RoCE connectivity - HDR InfiniBand /200 Gb Ethernet	
Mellanox ConnectX-6 HDR QSFP56 1-port PCIe 4 InfiniBand Adapter	4C57A15326

Ethernet LAN switches

The following table lists currently available embedded Ethernet switches and pass-thru modules for Flex System that can be used with the ThinkSystem DE6000H Hybrid Storage Array in IT solutions.

Table 25. Embedded Ethernet switches for Flex System

Description	Part number
10 Gb Ethernet (iSCSI connectivity)	
Lenovo Flex System Fabric EN4093R 10Gb Scalable Switch	00FM514
Lenovo Flex System SI4091 10Gb System Interconnect Module	00FE327
Lenovo Flex System Fabric SI4093 System Interconnect Module	00FM518
25 Gb Ethernet (iSCSI connectivity)	
Lenovo ThinkSystem NE2552E Flex Switch	4SG7A08868
Pass-thru modules (require a compatible external switch)	
Lenovo Flex System EN4091 10Gb Ethernet Pass-thru	88Y6043

For more information, see the list of Product Guides in the Blade Network Modules category:
<http://lenovopress.com/servers/blades/networkmodule#rt=product-guide>

Fibre Channel SAN switches

Lenovo offers the ThinkSystem DB Series of Fibre Channel SAN switches and directors for high-performance storage expansion. See the DB Series product guides for models and configuration options:

- ThinkSystem DB Series SAN Switches and Directors:
<https://lenovopress.com/storage/switches/rack#rt=product-guide>

Rack cabinets

The following table lists the supported rack cabinets.

Table 26. Rack cabinets

Part number	Description
93072RX	25U Standard Rack
93072PX	25U Static S2 Standard Rack
93634PX	42U 1100mm Dynamic Rack
93634EX	42U 1100mm Dynamic Expansion Rack
93604PX	42U 1200mm Deep Dynamic Rack
93614PX	42U 1200mm Deep Static Rack
93084EX	42U Enterprise Expansion Rack
93084PX	42U Enterprise Rack
93074RX	42U Standard Rack

For specifications about these racks, see the Lenovo Rack Cabinet Reference, available from:

<https://lenovopress.com/lp1287-lenovo-rack-cabinet-reference>

For more information, see the list of Product Guides in the Rack cabinets category:

<https://lenovopress.com/servers/options/racks>

Power distribution units

The following table lists the power distribution units (PDUs) that are offered by Lenovo.

Table 27. Power distribution units

Part number	Description
0U Basic PDUs	
00YJ776	0U 36 C13/6 C19 24A/200-240V 1 Phase PDU with NEMA L6-30P line cord
00YJ777	0U 36 C13/6 C19 32A/200-240V 1 Phase PDU with IEC60309 332P6 line cord
00YJ778	0U 21 C13/12 C19 32A/200-240V/346-415V 3 Phase PDU with IEC60309 532P6 line cord
00YJ779	0U 21 C13/12 C19 48A/200-240V 3 Phase PDU with IEC60309 460P9 line cord
Switched and Monitored PDUs	
00YJ780	0U 20 C13/4 C19 Switched and Monitored 32A/200-240V/1Ph PDU w/ IEC60309 332P6 line cord
00YJ781	0U 20 C13/4 C19 Switched and Monitored 24A/200-240V/1Ph PDU w/ NEMA L6-30P line cord
00YJ782	0U 18 C13/6 C19 Switched / Monitored 32A/200-240V/346-415V/3Ph PDU w/ IEC60309 532P6 cord
00YJ783	0U 12 C13/12 C19 Switched and Monitored 48A/200-240V/3Ph PDU w/ IEC60309 460P9 line cord
46M4003	1U 9 C19/3 C13 Switched and Monitored 60A 3 Phase PDU with IEC 309 3P+Gnd line cord
46M4004	1U 12 C13 Switched and Monitored DPI PDU (without line cord)
46M4005	1U 12 C13 Switched and Monitored 60A 3 Phase PDU with IEC 309 3P+Gnd line cord
Ultra Density Enterprise PDUs (9x IEC 320 C13 + 3x IEC 320 C19 outlets)	
71762NX	Ultra Density Enterprise C19/C13 PDU Module (without line cord)
71763NU	Ultra Density Enterprise C19/C13 PDU 60A/208V/3ph with IEC 309 3P+Gnd line cord
C13 Enterprise PDUs (12x IEC 320 C13 outlets)	
39M2816	DPI C13 Enterprise PDU+ (without line cord)
39Y8941	DPI Single Phase C13 Enterprise PDU (without line cord)

Part number	Description
C19 Enterprise PDUs (6x IEC 320 C19 outlets)	
39Y8948	DPI Single Phase C19 Enterprise PDU (without line cord)
39Y8923	DPI 60A 3 Phase C19 Enterprise PDU with IEC 309 3P+G (208 V) fixed line cord
Front-end PDUs (3x IEC 320 C19 outlets)	
39Y8938	DPI 30amp/125V Front-end PDU with NEMA L5-30P line cord
39Y8939	DPI 30amp/250V Front-end PDU with NEMA L6-30P line cord
39Y8934	DPI 32amp/250V Front-end PDU with IEC 309 2P+Gnd line cord
39Y8940	DPI 60amp/250V Front-end PDU with IEC 309 2P+Gnd line cord
39Y8935	DPI 63amp/250V Front-end PDU with IEC 309 2P+Gnd line cord
NEMA PDUs (6x NEMA 5-15R outlets)	
39Y8905	DPI 100-127V PDU with Fixed NEMA L5-15P line cord
Line cords for PDUs that ship without a line cord	
40K9611	DPI 32a Line Cord (IEC 309 3P+N+G)
40K9612	DPI 32a Line Cord (IEC 309 P+N+G)
40K9613	DPI 63a Cord (IEC 309 P+N+G)
40K9614	DPI 30a Line Cord (NEMA L6-30P)
40K9615	DPI 60a Cord (IEC 309 2P+G)
40K9617	DPI Australian/NZ 3112 Line Cord
40K9618	DPI Korean 8305 Line Cord

For more information, see the Lenovo Press documents in the PDU category:
<https://lenovopress.com/servers/options/pdu>

Uninterruptible power supply units

The following table lists the uninterruptible power supply (UPS) units that are offered by Lenovo.

Table 28. Uninterruptible power supply units

Part number	Description
55941AX	RT1.5kVA 2U Rack or Tower UPS (100-125VAC)
55941KX	RT1.5kVA 2U Rack or Tower UPS (200-240VAC)
55942AX	RT2.2kVA 2U Rack or Tower UPS (100-125VAC)
55942KX	RT2.2kVA 2U Rack or Tower UPS (200-240VAC)
55943AX	RT3kVA 2U Rack or Tower UPS (100-125VAC)
55943KX	RT3kVA 2U Rack or Tower UPS (200-240VAC)
55945KX	RT5kVA 3U Rack or Tower UPS (200-240VAC)
55946KX	RT6kVA 3U Rack or Tower UPS (200-240VAC)
55948KX	RT8kVA 6U Rack or Tower UPS (200-240VAC)
55949KX	RT11kVA 6U Rack or Tower UPS (200-240VAC)
55948PX	RT8kVA 6U 3:1 Phase Rack or Tower UPS (380-415VAC)
55949PX	RT11kVA 6U 3:1 Phase Rack or Tower UPS (380-415VAC)
55943KT†	ThinkSystem RT3kVA 2U Standard UPS (200-230VAC) (2x C13 10A, 2x GB 10A, 1x C19 16A outlets)
55943LT†	ThinkSystem RT3kVA 2U Long Backup UPS (200-230VAC) (2x C13 10A, 2x GB 10A, 1x C19 16A outlets)
55946KT†	ThinkSystem RT6kVA 5U UPS (200-230VAC) (2x C13 10A outlets, 1x Terminal Block output)
5594XKT†	ThinkSystem RT10kVA 5U UPS (200-230VAC) (2x C13 10A outlets, 1x Terminal Block output)

† Only available in China and countries in the Asia Pacific region.

For more information, see the list of Product Guides in the UPS category:

<https://lenovopress.com/servers/options/ups>

Lenovo Financial Services

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We work with businesses, non-profit organizations, governments and educational institutions to finance their entire technology solution. We focus on making it easy to do business with us. Our highly experienced team of finance professionals operates in a work culture that emphasizes the importance of providing outstanding customer service. Our systems, processes and flexible policies support our goal of providing customers with a positive experience.

We finance your entire solution. Unlike others, we allow you to bundle everything you need from hardware and software to service contracts, installation costs, training fees, and sales tax. If you decide weeks or months later to add to your solution, we can consolidate everything into a single invoice.

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For your region specific offers please ask your Lenovo sales representative or your technology provider about the use of Lenovo Financial Services. For more information, see the following Lenovo website:

<https://www.lenovo.com/us/en/landingpage/lenovo-financial-services/>

Related publications and links

For more information, see the following resources:

- Lenovo SAN Storage product page
<http://www.lenovo.com/us/en/c/storage-area-network>
- ThinkSystem DE Series product page
<https://www.lenovo.com/us/en/data-center/storage/storage-area-network/c/thinksystem-de-series>
- ThinkSystem DE Hybrid Storage interactive 3D Tour
<https://lenovopress.com/lp0957-thinksystem-de-hybrid-interactive-3d-tour>
- ThinkSystem DE Hybrid Storage datasheet
<https://lenovopress.com/ds0049-lenovo-thinksystem-de-series-hybrid-array>
- Lenovo Data Center Solution Configurator
<http://dcsc.lenovo.com>
- Lenovo Data Center Support
<http://datacentersupport.lenovo.com>

Related product families

Product families related to this document are the following:

- [Lenovo Storage](#)
- [DE Series Storage](#)
- [External Storage](#)

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