**DELL**EMC

VMAX
450F/850F

VMAX 250F

# VMAX ALL FLASH FAMILY

## VMAX 250F, 450F, 850F

The exciting Dell EMC VMAX® family of all-flash arrays includes three members, with the addition of the VMAX 250F.  The VMAX 250F delivers unparalleled performance as a mission-critical multi-controller platform and utilizes the latest ES-2650 v4 based Intel® Xeon® processors.  With higher capacity 7.68 and 15.36TB Enterprise Flash drives, and a compact single tile footprint, the VMAX 250F offers a compelling value proposition.  Common to all members of the All Flash family, your data always resides in the fastest possible tier (Diamond) to deliver the highest IOPS throughput and lowest possible latency.

VMAX All Flash arrays extend the long tradition of VMAX® Reliability, Availability and Serviceability that customers have come to expect.   Ranging from 1 to 8 V-Bricks packaged in dual V-Brick racks along with their associated DAEs, the all-flash family offers unprecedented scale and footprint efficiency.  The built-in hypervisor enables VMAX All Flash to offer Unified block and file support through Embedded NAS (eNAS), as well as Embedded Management.

VMAX All Flash arrays are available in two software packages, the standard "F" package and the application rich "FX" package, which makes ordering easy. The FX package includes SRDF S/A/STAR/Metro, Data at Rest Encryption, eNAS, and SnapVX to name a few, along with our VASA Provider Certified support for VVols.  Finally, VMAX All Flash arrays come fully pre-configured out of the factory to significantly shorten the time to first I/O.

## Specifications

### APPLIANCE-BASED PACKAGING: THE V-BRICK

The Dynamic Virtual Matrix Architecture that allows aggregate scaling of system resources has been extended to VMAX All Flash Arrays, where basic storage building blocks are defined by appliance-based entities called V-Bricks.  Each V-Brick includes an engine with two VMAX directors, packaged software, and, depending on the platform, from 512GB to 2TB of cache, two 25-slot Drive Array Enclosures (DAEs) housing a minimum base capacity of 11TBu of flash capacity in the VMAX 250F, or two 120- slot DAEs with a base capacity of 53TBu in the VMAX 450F/850F.  Multi V-Brick systems also include redundant Infiniband interfaces to connect all V-Bricks in the array.  Additional flash capacity can be added to each V-Brick in varying increments up to a total usable capacity of 4.3 Petabytes Effective (PBe, which represents PBu plus inline compression invoked) on the VMAX 850F.

Inline compression is supported across the entire VMAX All Flash family with the Q3 2016 HYPERMAX 5977 release.  Each director consolidates front-end, global memory, and back-end functions, enabling direct memory access to data for optimized I/O operations.  Depending on the array chosen, up to eight (8) VMAX All Flash V-Bricks can be supported for highly scalable performance and high availability.

Detailed specifications and a comparison of the VMAX 250F, 450F and 850F arrays follow.

| ARRAY FAMILY | VMAX 250F/VMAX 250FX | VMAX 450F/VMAX 450FX | VMAX 850F/VMAX 850FX |
|---|---|---|---|
| **V-BRICKS** | | | |
| **NUMBER OF V-BRICKS** | 1 to 2 | 1 to 4 | 1 to 8 |
| **ENGINE ENCLOSURE** | 4u | 4u | 4u |
| **CPU** | Intel Xeon E5-2650-v4 2.2 GHz 12 core | Intel Xeon E5-2650-v2 2.6 GHz 8 core | Intel Xeon E5-2697-v2 2.7 GHz 12 core |
| **# CORES PER CPU/PER ENGINE/PER SYSTEM** | 12/48/96 | 8/32/128 | 12/48/384 |
| **DYNAMIC VIRTUAL MATRIX INTERCONNECT** | Direct Connect Infiniband 56Gbps per port | InfiniBand Dual Redundant Fabric: 56Gbps per port | InfiniBand Dual Redundant Fabric: 56Gbps per port |
| **CACHE** | | | |
| **CACHE-SYSTEM MIN (RAW)** | 512GB | 1024GB | 1024GB |
| **CACHE-SYSTEM MAX (RAW)** | 4TB (with 2048GB engine) | 8TB (with 2048GB engine) | 16TB (with 2048GB engine) |
| **CACHE-PER ENGINE OPTIONS** | 512GB, 1TB and 2TB | 1TB, 2TB | 1TB, 2TB |
| **VAULT** | | | |
| **VAULT STRATEGY** | Vault to Flash | Vault to Flash | Vault to Flash |
| **VAULT IMPLEMENTATION** | 2 to 6 NVMe Flash SLICs / Engine | 4 to 8 NVMe Flash SLICs / Engine | 4 to 8 NVMe Flash SLICs / Engine |
| **FRONT END I/O MODULES** | | | |
| **MAXIMUM FRONT-END I/O MODULES/V-BRICK** | 8 | 6 | 6 |
| **FRONT-END I/O MODULES AND PROTOCOLS SUPPORTED** | FC:  4 x 8Gbs (FC, SRDF) FC:  4 x 16Gbs (FC, SRDF) 10GbE:  4 x10GbE (iSCSI, SRDF) GbE:  4 x 1GbE (2 Cu/2 Opt SRDF) | FC:  4 x 8Gbs (FC, SRDF) FC:  4 x 16Gbs (FC, SRDF) 10GbE iSCSI:  4 x10GbE 10GbE SRDF  2 x 10GbEGbE: 4 x 1GbE (2 Cu/2 Opt SRDF) FICON:  4 x 16Gbs (FICON) | FC:  4 x 8Gbs (FC, SRDF) FC:  4 x 16Gbs (FC, SRDF) 10GbE iSCSI:  4 x10GbE 10GbE SRDF :  2 x 10GbE GbE:  4 x 1GbE (2 Cu/2 Opt SRDF) FICON:  4 x 16Gbs (FICON) |
| **ENAS I/O MODULES** | | | |
| **MAX ENAS I/O MODULES/ SOFTWARE DATA MOVER** | [1]up to 3 | [1]up to 3 | [1]up to 3 |
| **ENAS I/O MODULES SUPPORTED** | 10GbE:  2 x 10GbE Optical [1]10GbE:  2 x 10GbE Cu [1]8Gbs: 4 x 8Gbs FC (Tape BU) | 10GbE: 2 x 10GbE Optical [1]10GbE:  2 x 10GbE Cu [1]GbE:  4 x 1GbE Cu [1]8Gbs: 4 x 8Gbs FC (Tape BU) | 10GbE: 2 x 10GbE Optical [1]10GbE:  2 x 10GbE Cu [1]GbE:  4 x 1GbE Cu [1]8Gbs: 4 x 8Gbs FC (Tape BU) |
| **ENAS SOFTWARE DATA MOVERS** | | | |
| **MAX SOFTWARE DATA MOVERS** | 4 (3 Active + 1 Standby) (4 Data Movers requires minimum 2 V-Bricks) | 4 (3 Active + 1 Standby) (4 Data Movers requires minimum 2 V-Bricks) | [1]8 (7 Active and 1 Standby) (8 Data Movers requires minimum 4 V-Bricks) |
| **MAX NAS CAPACITY/ARRAY (TERABYTES USABLE)** | 1150 (cache limited) | 1536 | 3584 |

[1]Max quantity of eNAS I/O module types/Data Mover, or support of 8 Data Movers on the VMAX 850F/FX is available by request. Quantity one (1) 2 x 10GbE Optical module is the default choice/Data Mover.

| ARRAY FAMILY | VMAX 250F/VMAX 250FX | VMAX 450F/VMAX 450FX | VMAX 850F/VMAX 850FX |
|---|---|---|---|
| **CAPACITY, DRIVES** | | | |
| **Max Capacity per Array**[1] | 1.1PBe | 2.3PBe | 4.3PBe |
| **Base Capacity per V-Brick** | 11.3TBu | 52.6TBu | 52.6TBu |
| **Incremental Capacity Blocks** | 11.3TBu | 13.2TBu | 13.2TBu |
| **Max Drives per V-Brick** | 50 | 240 | 240 |
| **Max Drives per Array** | 100 | 960 | 1920 |
| **Max Drives per System Bay** | 100/200[2] | 480 | 480 |
| **Min Drive Count per V-Brick** | 8 + 1 Spare | 16 + 1 spare | 16 + 1 spare |
| **FLASH DRIVES** | | | |
| **Flash Drives Supported (2.5")** | 960GB, 1.92TB, 3.84TB, 7.68TB, 15.36TB | 960GB, 1.92TB, 3.84TB | 960GB, 1.92TB, 3.84TB |
| **BE Interface** | 12Gbps SAS | 6Gbps SAS | 6Gbps SAS |
| **RAID Options Supported** | RAID 5(3 +1) RAID 6(6+2) | RAID 5(7 +1) RAID 6(14+2) | RAID 5(7 +1) RAID 6(14+2) |
| **Mixed RAID Group Support** | No | No | No |
| **Support for Mixed Drive Capacities** | Yes | Yes | Yes |
| **FLASH ARRAY ENCLOSURES** | | | |
| **120 x 2.5" Drive DAE** | No | Yes | Yes |
| **25 x 2.5" Drive DAE** | Yes | No | No |
| **CABINET CONFIGURATIONS** | | | |
| **Standard 19" bays** | Yes | Yes | Yes |
| **Single V-Brick System Bay Configuration** | No (Packaging based on Dual V-Bricks, but initial V-Brick in each System Bay supported) | No (Packaging based on Dual V-Bricks, but initial V-Brick in each System Bay supported) | No (Packaging based on Dual V-Bricks, but initial V-Brick in each System Bay supported) |
| **Dual V-Brick System Bay Configuration** | Yes (Default packaging) | Yes (Default packaging) | Yes (Default packaging) |
| **Third Party Rack Mount Option** | Yes | Yes | Yes |
| **DISPERSION** | | | |
| **System Bay Dispersion** | N/A-single floor tile system | Yes (Initially via RPQ) | Yes (Initially via RPQ) |
| **PRE-CONFIGURATION FROM FACTORY** | | | |
| **100% Virtually Provisioned** | Yes | Yes | Yes |
| **HOST SUPPORT** | | | |
| **Open Systems** | Yes | Yes | Yes |
| **Mainframe** | No | Yes | Yes |
| **POWER OPTIONS** | | | |
| **Input Power Options** | Single or Three Phase Delta or Wye | Single or Three Phase Delta or Wye | Single or Three Phase Delta or Wye |

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[1] Max capacity per array based on over provisioning ratio of 1.0.
[2] 200 drives can be supported in **a** single cabinet when two systems are packaged in the same rack.

# VMAX ALL FLASH ARRAY CONNECTIVITY

| ARRAY FAMILY | VMAX 250F/VMAX 250FX | VMAX 450F/VMAX 450FX | VMAX 850F/VMAX 850FX |
|---|---|---|---|
| **I/O PROTOCOLS SUPPORTED** | | | |
| 8 Gb/s FC Host/SRDF Ports | | | |
| Maximum/V-Brick | 32 | 24 | 24 |
| Maximum/array | 64 | 96 | 192 |
| 16 Gb/s FC Host Ports | | | |
| Maximum/V-Brick | 32 | 24 | 24 |
| Maximum/array | 64 | 96 | 192 |
| 16 Gb/s FICON Host Ports | | | |
| Maximum/V-Brick | N/A | 32 | 32 |
| Maximum/array | N/A | 128 | 256 |
| 10 GbE iSCSI Ports | | | |
| Maximum/V-Brick | 32 | 24 | 24 |
| Maximum/array | 64 | 96 | 192 |
| 10 GbE SRDF Ports (Optical) | | | |
| Maximum/V-Brick | 32 | 12 | 12 |
| Maximum/array | 64 | 48 | 96 |
| GbE SRDF Ports (Optical/Cu) | | | |
| Maximum/V-Brick | 16/16 | 12/12 | 12/12 |
| Maximum/array | 64 | 48 | 96 |
| **EMBEDDED NAS PORTS** | | | |
| 10GbE Optical Ports | | | |
| Max ports/Software Data Mover | 2 | 2 | 2 |
| Maximum ports/array | 8 | 8 | 16 |
| [1]10GbE Copper Ports | | | |
| Max ports/Software Data Mover | 2 | 2 | 2 |
| Maximum ports/array | 8 | 8 | 16 |
| [1]1GbE Copper Ports | | | |
| Max ports/Software Data Mover | N/A | 4 | 4 |
| Maximum ports/array | N/A | 16 | 32 |
| [1]8 Gb/s FC Tape Back Up Ports | | | |
| Max ports/Software Data Mover | 2 | 2 | 2 |
| Maximum ports/array | 8 | 8 | 16 |

[1] Indicated eNAS I/O Modules are available by request.

## SYSTEM BAY DISPERSION



# 82 feet / 25 meters
## System Bay Dispersion
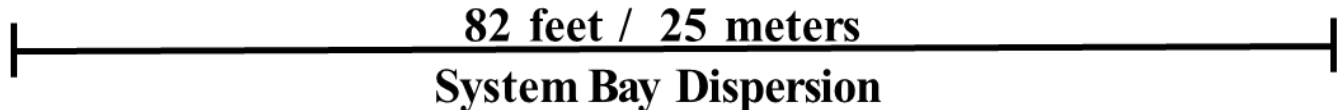
System Bay Dispersion allows customers to separate any individual or contiguous group of system bays by up to a distance of 82 feet (25 meters) from System Bay 1.  This provides unsurpassed datacenter flexibility in solving floor loading constraints or working around obstacles that mighty preclude fully contiguous configurations.

## FLASH DRIVE SUPPORT

The VMAX 250F/FX (12Gb/s) and the 450F/FX and 850F/FX (6Gb/s) support the latest dual ported native SAS Flash drives.  All Flash drives support two independent I/O channels with automatic failover and fault isolation.  Check with your Dell EMC sales representative for the latest list of supported drives and types.    All capacities are based on 1 GB = 1,000,000,000 bytes.  Actual usable capacity may vary depending upon configuration.

## 2.5" FLASH DRIVES USED IN V-BRICKS AND CAPACITY UPGRADES

| PLATFORM SUPPORT | VMAX 250F, 450F, 850F | VMAX 250F, 450F, 850F | VMAX 250F, 450F, 850F | VMAX 250F | VMAX 250F |
|---|---|---|---|---|---|
| NOMINAL CAPACITY (GB) | [1]960 | [1]1920 | [1]3840 | [1]7680 | [1]15360 |
| SPEED (RPM) | Flash | Flash | Flash | Flash | Flash |
| AVERAGE SEEK TIME (READ/WRITE MS) | N/A | N/A | N/A | N/A | N/A |
| RAW CAPACITY (GB) | 960 | 1920 | 3840 | 7680 | 15360 |
| [3]OPEN SYSTEMS FORMATTED CAPACITY (GB) | 939.38 | 1880.08 | 3761.47 | 7522.95 | 15047.2 |
| MAINFRAME 3390 FORMATTED CAPACITY | [2]913.09 | [2]1826.18 | [2]3652.36 | N/A | N/A |

[1]V-Bricks and Capacity upgrades in any given configuration could contain different underlying drive sizes in order to achieve the desired Usable Capacity.  This is automatically optimized by the Sizer Tool.
[2]Mainframe not supported on VMAX 250F.
[3]Open Systems Formatted Capacity is also referred to as TBu in this document.

## POWER CONSUMPTION AND HEAT DISSIPATION AT 35 DEGREES C

| COMPONENTS | VMAX 250F/FX | | VMAX 450F/FX | | VMAX 850F/FX | |
|---|---|---|---|---|---|---|
| Power dissipation at temperatures > 35°C will be higher based on adaptive cooling[2] | Maximum Total power consumption (kVA) | Maximum Heat dissipation (Btu/Hr) | Maximum Total power consumption (kVA) | Maximum Heat dissipation (Btu/Hr) | Maximum Total power consumption (kVA) | Maximum Heat dissipation (Btu/Hr) |
| SYSTEM BAY 1, DUAL ENGINE | 5.19 | 16,316 | 9.05 | 29,638 | 9.30 | 30,638 |
| SYSTEM BAY 2, DUAL ENGINE[1] | N/A | | 8.38 | 27,538 | 8.59 | 28,338 |

[1]Power Values for System Bay 2 and all subsequent System Bays where applicable

[2]Power Values and Heat Dissipations shown reflect the higher power levels associated during the battery recharge cycle, and measured at 35 degrees C.  Steady State ambient temperature values during normal operation will be lower.

## PHYSICAL SPECIFICATIONS

| COMPONENTS | HEIGHT (IN/CM) | WIDTH (IN/CM) | DEPTH (IN/CM) | WEIGHT (MAXIMUM LBS/KG) |
|---|---|---|---|---|
| SYSTEM BAY, DUAL ENGINE 450F/850F | 75/190 | 24/61 | 47/119 | 1860/844 |
| SYSTEM BAY, DUAL ENGINE 250F | 75/190 | 24/61 | 42/106.7 | 850/385 |
| SYSTEM BAY, DUAL ENGINE, DUAL SYSTEM 250F | 75/190 | 24/61 | 42/106.7 | 1410/640 |

## INPUT POWER REQUIREMENTS

## SINGLE-PHASE NORTH AMERICAN, INTERNATIONAL, AUSTRALIAN

| SPECIFICATION | NORTH AMERICAN 3 WIRE CONNECTION (2 L & 1 G)[1] | INTERNATIONAL AND AUSTRALIAN 3 WIRE CONNECTION (1 L & 1 N & 1 G)[1] |
|---|---|---|
| INPUT NOMINAL VOLTAGE | 200 – 240 VAC +/- 10% L- L nom | 220 – 240 VAC +/- 10% L - N nom |
| FREQUENCY | 50 – 60 Hz | 50 – 60 Hz |
| CIRCUIT BREAKERS | 30 A | 32 A |
| POWER ZONES | Two | Two |
| Power requirements at customer site (min) | • One 30A, single phase drop per zone (250F)<br>• Three 30A, single phase drops per zone (450F/850F)<br>• Two power zones require 2 drops (250F), 6 drops (450/850F) with each drop rated for 30A | |

[1] L = line or phase, N = neutral, G = ground

# THREE-PHASE NORTH AMERICAN, INTERNATIONAL, AUSTRALIAN

| SPECIFICATION | NORTH AMERICAN (DELTA)<br>4 WIRE CONNECTION (3 L & 1 G)[1] | INTERNATIONAL (WYE)<br>5 WIRE CONNECTION (3 L & 1 N & 1 G)[1] |
|---|---|---|
| INPUT VOLTAGE[2] | 200 – 240 VAC +/- 10% L- L nom | 220 – 240 VAC +/- 10% L - N nom |
| FREQUENCY | 50 – 60 Hz | 50 – 60 Hz |
| CIRCUIT BREAKERS | 50 A | 32 A |
| POWER ZONES | Two | Two |
| POWER REQUIREMENTS AT CUSTOMER SITE (MIN) | Two 50 A, three-phase drops per bay | Two 32 A, three-phase drops per bay |

[1] L = line or phase, N = neutral, G = ground

[2] An imbalance of AC input currents may exist on the three-phase power source feeding the array, depending on the configuration. The customer's electrician must be alerted to this possible condition to balance the phase-by-phase loading conditions within the customer's data center

# RADIO FREQUENCY INTERFERENCE

Electro-magnetic fields which include radio frequencies can interfere with the operation of electronic equipment. Dell EMC products have been certified to withstand radio frequency interference in accordance with standard EN61000-4-3. In Data Centers that employ intentional radiators, such as cell phone repeaters, the maximum ambient RF field strength should not exceed 3 Volts /meter.

| REPEATER POWER LEVEL (WATTS) | RECOMMENDED MINIMUM DISTANCE (FEET/METERS) |
|---|---|
| 1 | 9.84 FT (3M) |
| 2 | 13.12 FT (4 M) |
| 5 | 19.69 FT (6M) |
| 7 | 22.97 FT (7M) |
| 10 | 26.25 FT (8M) |
| 12 | 29.53 FT (9M) |
| 15 | 32.81 FT (10M) |

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**SPECIFICATION SHEET**