



X201E

High-endurance Gen5 storage for write-intensive tiers

Solutions Brief



- U.2 and E3.S form factors
- Single- or dual-port PCIe 5.0

PHISON

PCIe Gen5 throughput, 3 DWPD endurance, and 1.88 million mixed-workload IOPS for the tiers that absorb every write.

The Pascari X201E is Phison's high-endurance PCIe Gen5 SSD, built for infrastructure that absorbs writes for everything else: HPC checkpoint targets and burst buffers, database log devices, streaming ingest buffers, and moderate write-back caching tiers. It pairs a 3 DWPD rating and a five-year limited warranty with the full X201 performance envelope, reaching up to 14,500 MB/s sequential read, 12,000 MB/s sequential write, 3,300K random read IOPS, and 1,050K random write IOPS. Phison ships the drive at 12.8 TB and 25.6 TB in both U.2 and E3.S form factors, with a configurable PCIe Gen5 x4 or dual-port 2x2 interface that supports failover in high-availability designs.

Endurance defines the drive. A 25.6 TB Pascari X201E SSD carries a 140,160 TBW rating, 2.5 times the lifetime write budget of a 30.72 TB 1 DWPD drive. That means it can absorb 76.8 TB per day of writes for five years without leaving warranty coverage. The high-endurance design earns that budget by holding more of the NAND in reserve, and the same reserve pays a second dividend in sustained mixed-workload throughput. Against the previous-generation X200E, the X201E averages 12% more 4K random IOPS at a 70/30 read/write mix. Against a leading current-generation competitor, it averages 20% more throughput.

The Pascari X201E and X201P Enterprise SSDs share one platform, so a cluster can mix endurance tiers within a single chassis, qualification cycle, and management domain, with no second firmware baseline, telemetry format, or support relationship. Active power stays under 25 W even in dense E3.S chassis, where thermal headroom limits rack design.

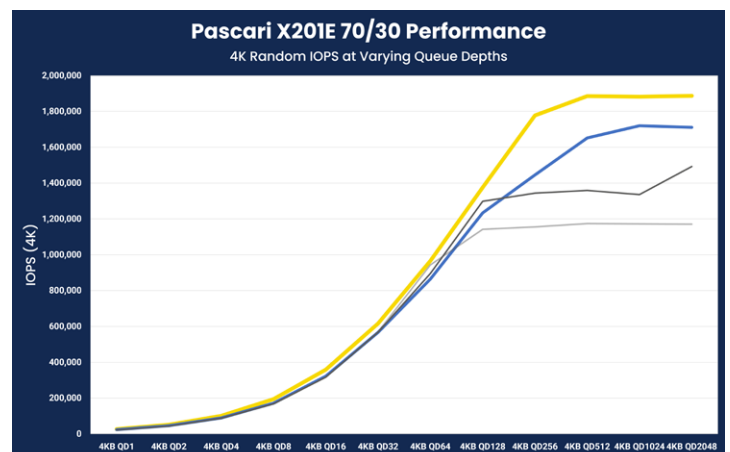


Mixed-workload performance

Write-absorbing tiers almost never see a pure read or a pure write profile. They see a blend, dominated by reads but carrying enough writes that garbage collection never goes idle. A 70/30 read/write mix at 4K models that condition, and it predicts production behavior far better than any single-direction benchmark. Phison measured the 12.8 TB X201E against the previous-generation X200E and against

a leading current-generation Gen5 enterprise drive from a competing vendor (Comp A), at queue depths from QD1 to QD2048.

The Pascari X201E leads the X200E at all 12 measured queue depths, by an average of 12% and never by less than 9%. Consistency of that kind matters more than a peak figure, because a uniform lift across all concurrency points to platform-level gains in the Gen5 controller, the 1Tb TLC NAND, and the firmware that schedules garbage collection, rather than tuning for a benchmark sweet spot. The QD1 depth governs synchronous commits to write-ahead logs, journals, and metadata, and the X201E delivers gains of 10%, continuing to an 11% to 13% lead through QD16.



The generational gap peaks at QD256, where the X201E runs 23% ahead of the X200E and beats the best result the X200E posts at any queue depth. The X201E also saturates earlier and higher, coming within 6% of its ceiling by QD256 and then holding a plateau of roughly 1.88 million IOPS across QD512, QD1024, and QD2048, a spread of less than 0.3%. That ceiling sits 10% above the previous generation's maximum throughput. For a tier that runs permanently in steady state, a flat and predictable ceiling counts as much as a high one.

Comp A tells a different story. It tracks the Pascari drives through the mid-range, then stops scaling above QD128, plateauing between 1.33 and 1.36 million IOPS and dipping before it recovers at QD2048. The X201E lead widens from 32% at QD256 to 41% at QD1024, and even against Comp A's best result the X201E stays 26% faster, having passed that figure back at QD256 at one-eighth the queue depth. A plateau that arrives early, sits low, and then dips points to internal housekeeping competing with host I/O under sustained mixed load.

Endurance and performance from one design

The Pascari X201E reaches 3 DWPD on the same 1Tb 3D TLC NAND as the rest of the X201 family, and the capacity it holds in reserve shapes how the drive behaves under load. A deeper pool of free blocks lets the controller schedule garbage collection opportunistically rather than reactively, which lowers internal write amplification, holds 99.99th percentile write latency in check, and narrows the gap between fresh-out-of-box and steady-state performance. Drives that reserve little surrender much of their random write throughput once a workload touches every LBA, and every write-absorbing tier lives in that state permanently after its first few days in production.

Endurance also decides refresh cadence. Looking just at cost per terabyte of capacity uses the wrong yardstick for a write-absorbing tier; cost per terabyte written across the service life is the right approach. Matching the X201E write budget with 1 DWPD media takes either far more capacity than the workload needs or a mid-life replacement cycle that drags procurement, data migration, rebuild traffic, and production risk along with it. Host figures understate real write volume as well. Journaling doubles writes by design, LSM-tree compaction commonly amplifies 10 to 30 times, and erasure coding multiplies every write across the cluster.



Pascari X201E U.2 Specifications

Capacity	12.8 TB	25.6 TB
Interface	PCIe 5.0	PCIe 5.0
	1x4, 2x2	1x4, 2x2
NVMe Protocol	2.0d	2.0d
NAND Flash	3D TLC	3D TLC
Sequential Read (MB/s)	14,800	14,800
Sequential Write (MB/s)	11,800	10,000
4K Random Read (IOPS)	3,250K	2,800K
4K Random Write (IOPS)	1,080K	1,000K
Random Read Latency (µs)	55	55
Random Write Latency (µs)	8	8
Active Power (W)	≤25	≤25
Idle Power (W)	≤5	≤5
DWPD	3	3
MTBF (million hours)	2.5	2.5
Warranty	5	5

Pascari X201E E3.S Specifications

Capacity	12.8 TB	25.6 TB
Interface	PCIe 5.0	PCIe 5.0
	1x4, 2x2	1x4, 2x2
NVMe Protocol	2.0d	2.0d
NAND Flash	3D TLC	3D TLC
Sequential Read (MB/s)	14,800	14,800
Sequential Write (MB/s)	11,000	10,000
4K Random Read (IOPS)	3,000K	2,800K
4K Random Write (IOPS)	1,050K	1,000K
Random Read Latency (µs)	55	55
Random Write Latency (µs)	8	8
Active Power (W)	≤25	≤25
Idle Power (W)	≤5	≤5
DWPD	3	3
MTBF (million hours)	2.5	2.5
Warranty	5	5



Where the Pascari X201E fits

The Pascari X201E makes the best case for High-performance computing (HPC). Checkpoint tiers write cluster state on a fixed cadence for the life of the machine, reading it back only when something breaks. Burst buffers take the write punishment on behalf of the parallel filesystem, and scratch volumes and metadata targets add continuous small synchronous writes. Large-model training repeats the pattern with optimizer checkpoints, dataset re-staging between epochs, and activation offload to local NVMe. And this happens on clusters where idle accelerators cost more than anything else in the building.

The same argument holds across the enterprise. Database log devices commit small synchronous writes continuously, and the X201E advantage at QD1 lands directly on that path. Kafka brokers, observability pipelines, and time-series stores overwrite their full capacity on a predictable retention cycle, while dense virtualization aggregates hundreds of tenants into a demanding and highly random write profile.

Caching deserves a caveat. A 3 DWPD drive suits moderate write-back and tiering roles, but the hottest cache tiers turn over many multiples of drive capacity every day, and those belong on maximum-endurance media such as the 60 DWPD Pascari X200Z. Size the tier by its measured daily write volume, then choose the endurance class that covers it with headroom. The X201E owns the broad middle of that range, where 1 DWPD media falls short and 60 DWPD media buys more endurance than the workload can use.



Pascari X201E: The bottom line

Architects don't need high endurance everywhere. They need it where write traffic occurs, without giving up the Gen5 performance and density that justified the flash investment in the first place. The Pascari X201E delivers both from one design decision. The reserve capacity that produces a 3 DWPD rating and a 140,160 TBW budget at 25.6 TB also produces 23% more mixed-workload throughput than the previous generation and up to 41% more than the competing drive at high concurrency.

Because the Pascari X201E shares its platform, firmware baseline, and telemetry with the 1 DWPD X201P, adopting it costs one qualification cycle rather than two. A fleet can place X201E drives in its checkpoint, journal, and log tiers and X201P drives in its capacity and read-serving tiers, then manage the result as a single population. For the tiers that need to absorb everything, the X201E takes endurance off the list of design constraints.



Testing Details: All testing was conducted on an Intel Xeon w5-3435X processor, using an ASUS Pro WS W790E-SAGE SE motherboard, equipped with 128GB (8x16GB) of DDR5-4800 memory. Benchmarks were collected on Ubuntu 24.04.4 LTS, with testing done running FIO 3.36 after full SSD conditioning.

Legal Disclaimer: 1 TB = 1,000,000,000,000 bytes. Performance figures, specifications, and other technical information are based on specified test conditions and are provided for informational purposes only. Actual performance can vary depending on system configuration, workload, operating environment, firmware, and other factors. Specifications and product availability are subject to change without notice.