open-e JovianDSS

Toshiba MG10SFA22TE SAS HDD
Certification Report

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1. INTRODUCTION

This hardware certification report comprehensively analyzes the **Toshiba MG10SFA22TE Hard Disk Drives' integration with the Open-E JovianDSS software platform**. The MG10SFA22TE, boasting a substantial 22 TB of conventional magnetic recording (CMR) capacity, is engineered for high performance with a **550 TB per year workload rating** and a **rotational speed of 7,200 rpm**. Encased in a helium-sealed, 3.5-inch industry-standard form factor, this 10-disk drive is designed to seamlessly integrate into existing drive bays, minimizing the cloud-scale storage infrastructures' footprint and operational complexities.

Open-E JovianDSS is a software platform that provides data storage solutions for various industries and markets. It is based on the **ZFS file system and supports features such as data deduplication, compression, snapshots, replication, and High Availability clustering**. It is compatible with any hardware and hypervisor, offering flexible pricing and excellent support.

The MG10SFA22TE supports File, Object, and Block storage, making it a superior choice for business-critical servers and storage systems. The MG10SFA22TE stands out for its optimal storage capacity, application compatibility, and exceptional data reliability.

Given its extensive capacity, Open-E conducted rigorous certification tests to validate the MG10SFA22TE's suitability as a data storage drive. The certification process encompassed a series of **functional and performance tests on both Single-Node systems and High-Availability data storage clusters**, ensuring the drive's compatibility and reliability across various operational conditions.

The following applications were considered during the Open-E certification process:

- **data storage drive**

2. DEVICE UNDER TEST DESCRIPTION

Table 1. Toshiba MG10SFA22TE 22 TB (MG10SFA22TE)

Product name	Toshiba MG10SFA22TE
Model name	MG10SFA22TE
Storage capacity	22 TB
Form factor	HDD 3.5”
Interface	SAS
SED	No
Rotational speed	7200 RPM
Memory disk buffer size	512 MB
Power consumption	8.86W
Mean Time To Failure (MTTF)	2,500,000 hours
Workload Rate Limit	550 TB/year
Firmware Version	0103

3. TEST ENVIRONMENT DESCRIPTION

Table 2 provides a detailed list of the hardware specifications for the environments used during the certification testing. Table 3 shows the general configuration settings for Fio, which was the tool for performance benchmarking.

Table 2. Per-Node hardware specification

System name	Supermicro SuperServer 6028U-TR4T+
Motherboard	Supermicro X9DRD-7LN4F(-JBOD)/X9DRD-EF
CPU	2x Intel(R) Xeon(R) CPU E5-2620 v2 @ 2.10GHz
RAM	128GB - 16x Kingston 8 GB 1600 MHz
Storage controller	HBA Broadcom (LSI) SAS 9400-8i8e SAS 12Gb/s
Drives	4x Toshiba MG10SFA22TE 1x NVMe Intel Optane SSD P1600X Series
System	Open-E JovianDSS up30r2 55016

Table 3. Fio test tool configuration

Version	3.28
Test size	200GB
Block size	4kB (random workload); 1MB (sequential workload)
Ramp time	30s
Runtime	90s
IOengine	libaio
Direct IO	Yes

4. FUNCTIONALITY TEST

Open-E performed functional testing, shown in Table 4.

Table 4. Functional test results

Functional aspect	Result
Open-E JovianDSS system compatibility	passed
Stripe compatibility	passed
Mirror compatibility	passed
RAID-Z1 compatibility	passed
RAID-Z2 compatibility	passed
System stability	passed
Drive failure simulation with the replacement	passed
Hot-Plug Support	passed
Disk activity and health monitoring	passed
Disk write-back cache management	passed
LED's management functionality	passed

5. HA NON-SHARED STORAGE CLUSTER TEST

Open-E performed various compatibility tests to ensure the proper operation of the Toshiba MG10SFA-22TE HDDs in the Open-E JovianDSS High Availability Non-Shared Storage Cluster environment.

All the essential and critical Non-Shared Storage Cluster Mechanisms with the tested devices were tested. Table 5 shows the list of checked functionalities.

Table 5. Results for the HA Non-Shared Storage Cluster compatibility test.

Tested functionality	Result
Manual Failover	passed
Remote disk support	passed
Automatic Failover triggered after network failure	passed
Automatic Failover triggered after system shutdown	passed
Automatic Failover triggered after system reboot	passed
Automatic Failover triggered after system power-off	passed
Failover operations under heavy load (stress test)	passed

6. HA SHARED STORAGE CLUSTER TEST

Open-E performed various compatibility tests to ensure the proper operation of the Toshiba MG10SFA-22TE HDDs in the Open-E JovianDSS High Availability Shared Storage Cluster environment.

All the essential and critical shared storage cluster mechanisms with the tested devices were tested. Table 6 shows the list of checked functionalities.

Table 6. Results for the HA Shared Storage Cluster compatibility test.

Tested functionality	Result
Manual Failover	passed
Automatic Failover triggered after network failure	passed
Automatic Failover triggered after system shutdown	passed
Automatic Failover triggered after system reboot	passed
Automatic Failover triggered after system power-off	passed
Failover operations under heavy load (stress test)	passed

7. PERFORMANCE TEST

The test cases are described in Table 7. Open-E applied every combination of thread numbers (1, 4, 8, 16) and queue depths (1, 16, 64, 128) to the Fio test tool in all instances. All tests were performed locally on the Open-E JovianDSS system.

Table 7. Test cases description

Test case	IO pattern	Read to write %	Block size
Mixed	random	70/30	4 kB
Random read	random	100/0	4 kB
Random write	random	0/100	4 kB
Sequential read	sequential	100/0	1 MB
Sequential write	sequential	0/100	1 MB

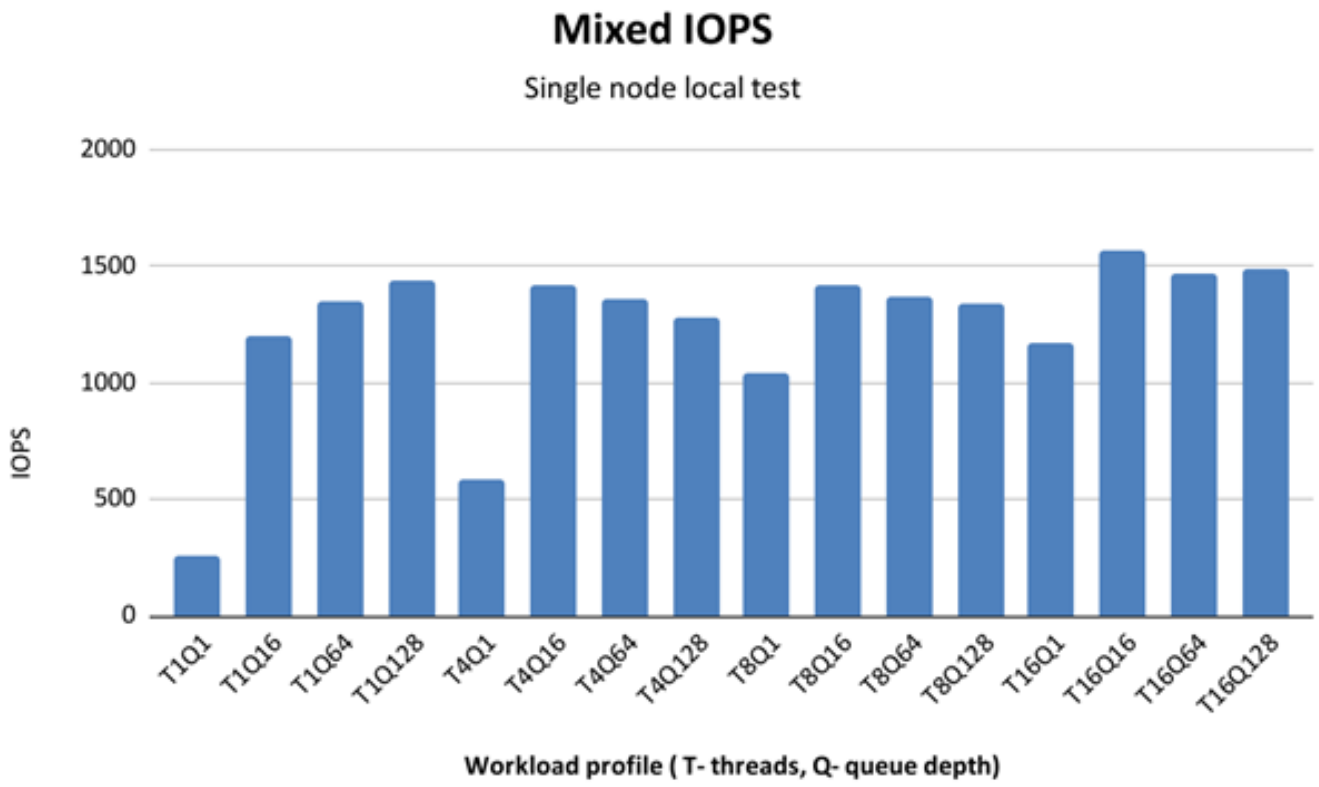
The table 8 below presents the ZFS configuration used for testing.

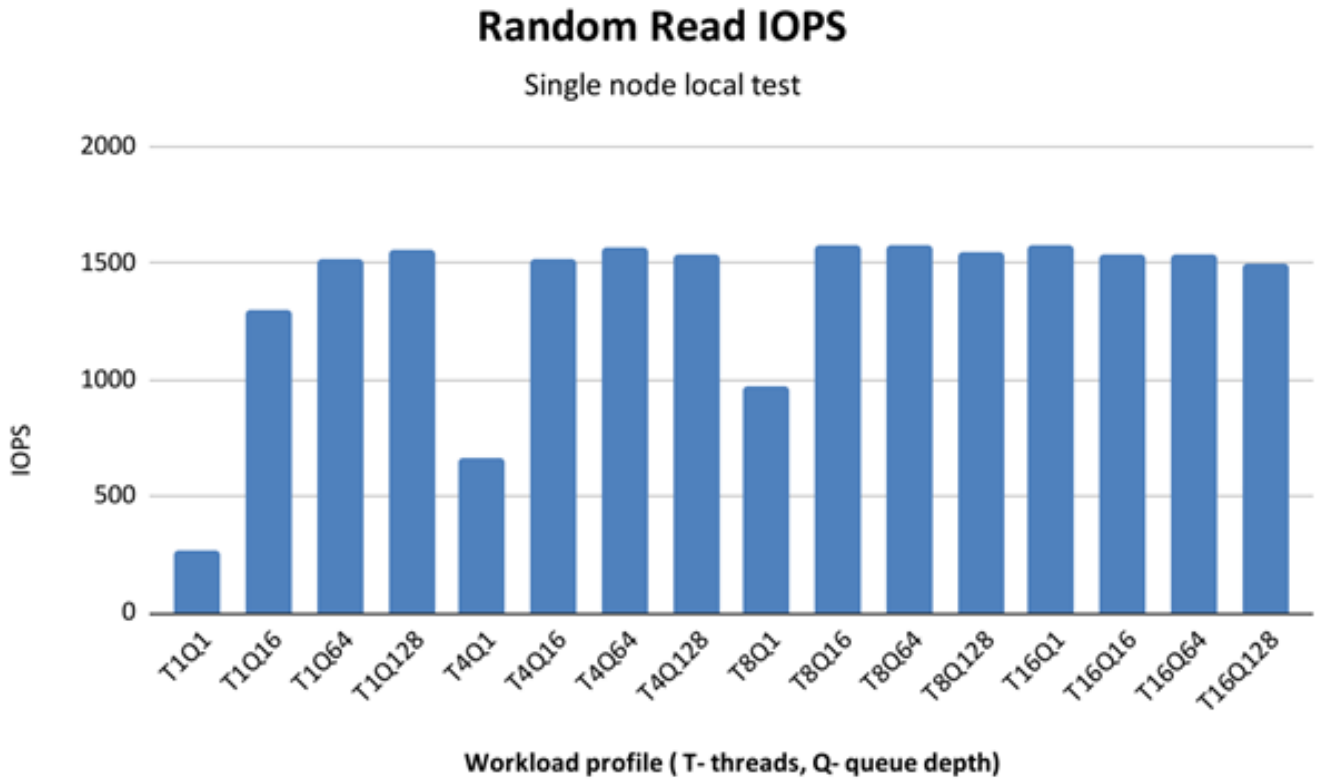
Table 8. Tested pool configuration

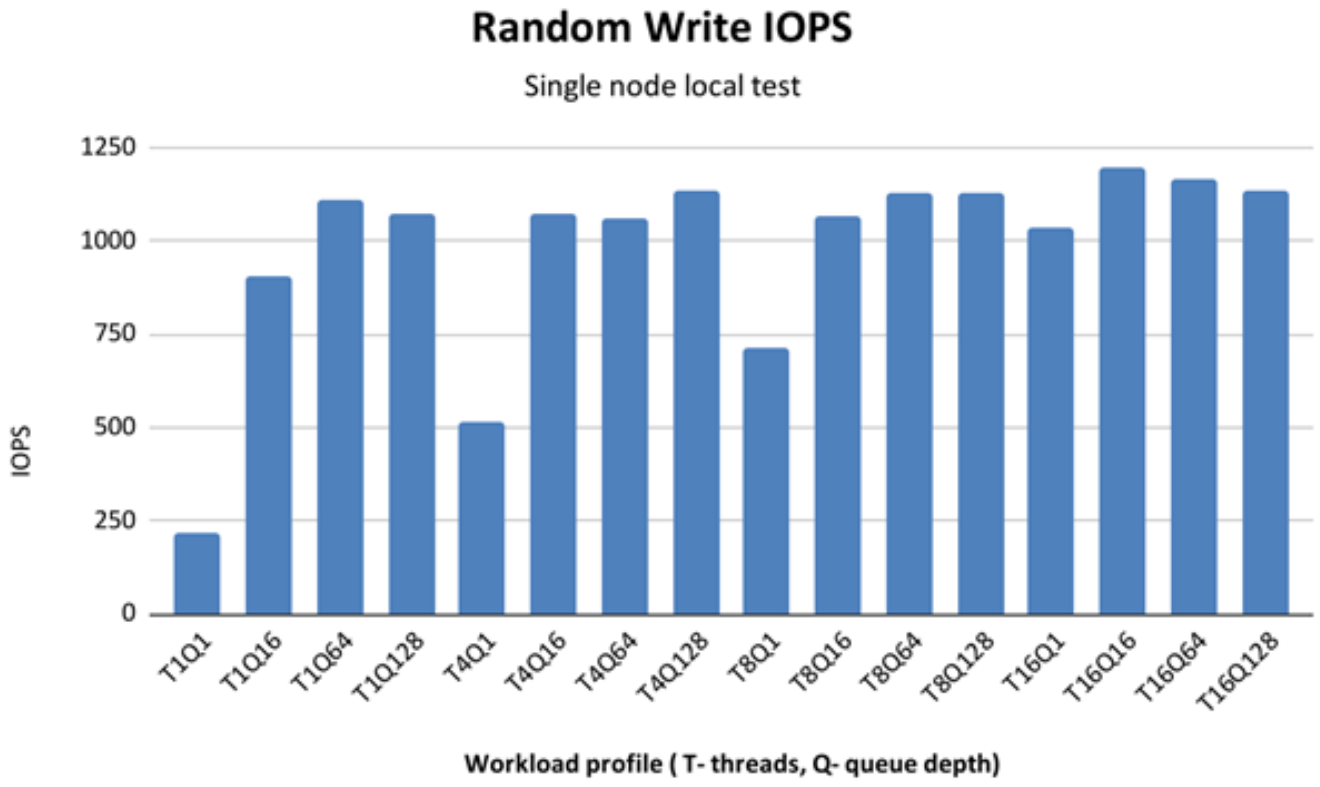
Zpool configuration	RAID-Z2
Write log	Yes (NVMe Intel Optane SSD P1600X Series)
Zvol size	200 GB
Sync	Always
Provisioning	Thin
Compression	lz4
Zvol initialization:	Zvol was initialized by writing data to it before tests began.

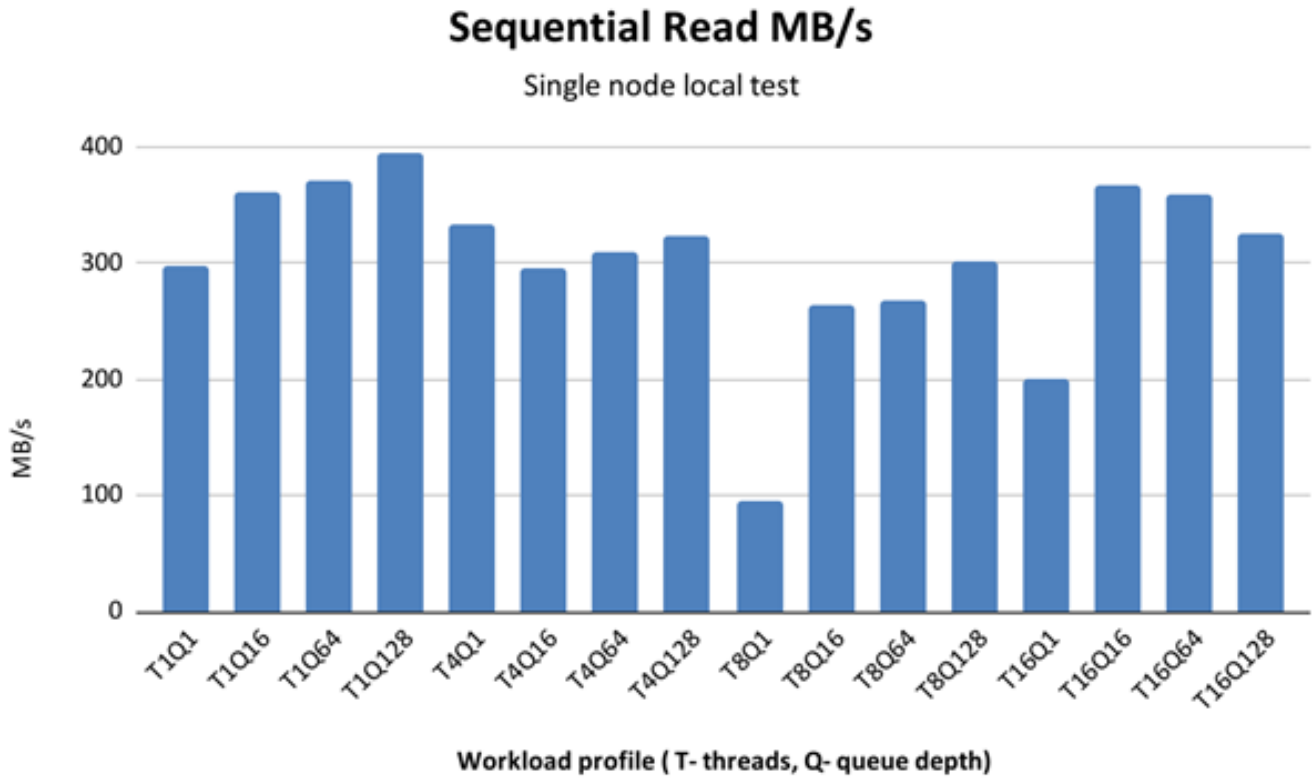
The charts below present the following performance results:

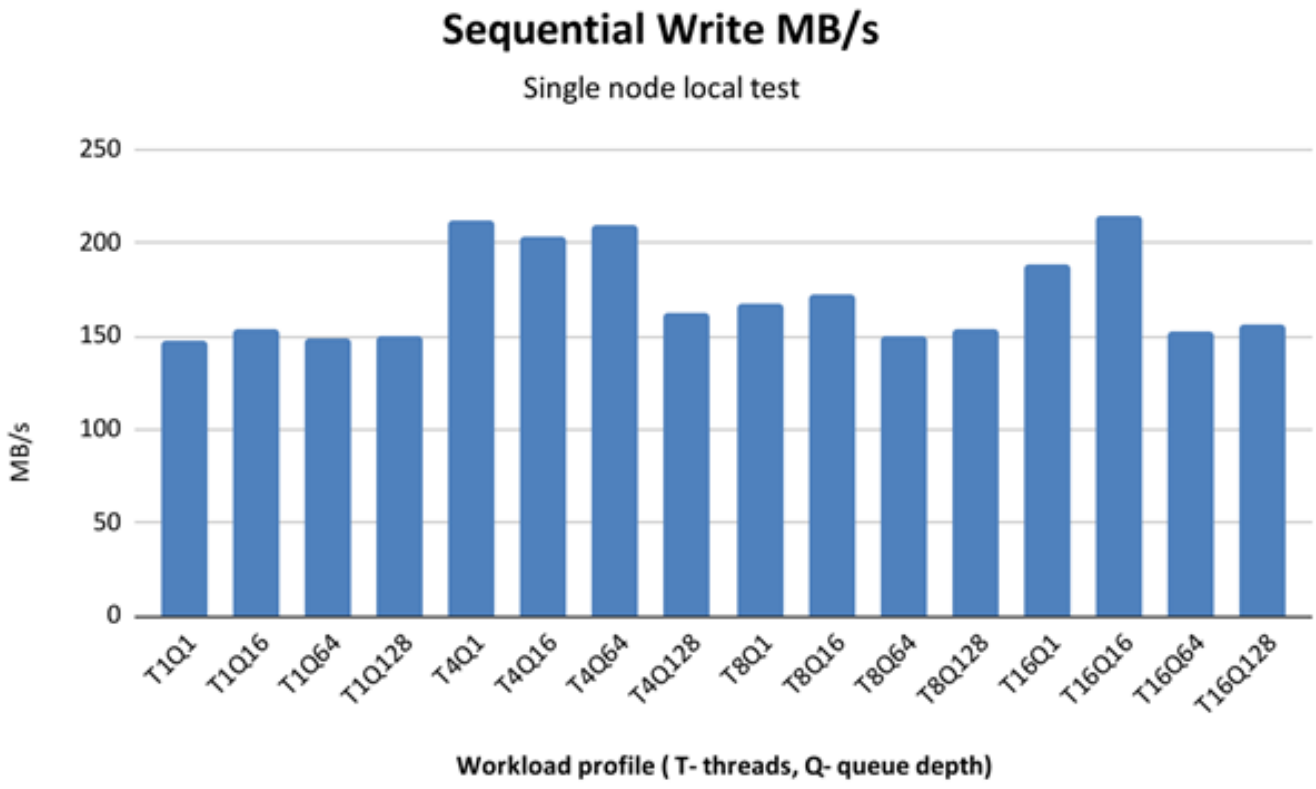
- **Mixed Random IO Performance**
- **Random Read IO Performance**
- **Random Write IO Performance**
- **Sequential Read MB/s Performance**
- **Sequential Write MB/s Performance**




Random Read IOPS
Single node local test
IOPS
2000
1500
1000
500
0
T1Q1
T1Q16
T1Q64
T1Q128
T4Q1
T4Q16
T4Q64
T4Q128
T8Q1
T8Q16
T8Q64
T8Q128
T16Q1
T16Q16
T16Q64
T16Q128
Workload profile (T- threads, Q- queue depth)


Random Write IOPS
Single node local test
IOPS
1250
1000
750
500
250
0
T1Q1
T1Q16
T1Q64
T1Q128
T4Q1
T4Q16
T4Q64
T4Q128
T8Q1
T8Q16
T8Q64
T8Q128
T16Q1
T16Q16
T16Q64
T16Q128
Workload profile (T- threads, Q- queue depth)


Sequential Read MB/s
Single node local test
MB/s
400
300
200
100
0
T1Q1
T1Q16
T1Q64
T1Q128
T4Q1
T4Q16
T4Q64
T4Q128
T8Q1
T8Q16
T8Q64
T8Q128
T16Q1
T16Q16
T16Q64
T16Q128
Workload profile (T- threads, Q- queue depth)


Sequential Write MB/s
Single node local test
MB/s
250
200
150
100
50
0
T1Q1
T1Q16
T1Q64
T1Q128
T4Q1
T4Q16
T4Q64
T4Q128
T8Q1
T8Q16
T8Q64
T8Q128
T16Q1
T16Q16
T16Q64
T16Q128
Workload profile (T- threads, Q- queue depth)

8. TEST CONCLUSIONS

The Toshiba MG10SFA22TE HDD demonstrated strong performance in our tests, confirming its reliability as a robust data storage solution. The drive exhibited consistent performance, sufficient endurance, and speed, making it well-suited for environments demanding high data integrity, substantial capacity, and high availability.

Our comprehensive testing regimen, which included stress tests, read/write operations, and long-term reliability assessments, validated the MG10SFA22TE as a high-quality enterprise device.

The results confirmed that this HDD model can manage the rigorous workloads of both Single--Node and High-Availability configurations within Open-E JovianDSS systems.

Given its high data storage capacity and reliability, the Toshiba MG10SFA22TE SAS HDD is a commendable choice for various applications. Based on the test results and the drive's specifications, Open-E recommends using this certified model in:

- Massive Enterprise-Scale Storage Infrastructures
- File and Block Data Storage Solutions
- Backup Solutions
- CCTV Recording

After successfully passing all certification tests, the Toshiba MG10SFA22TE has been added to the Open-E Hardware Certification List and has been awarded the "Certified by Open-E" status.

9. DISCLAIMER

Due to the large capacity of the single disk, which leads to a longer replacement time in case of its failure, we recommend using data groups with at least two disks of redundancy. For this purpose, the best group is the RAID-Z2, which we tested above, or at least a 3-way mirror if you use mirror groups.