

ISO/IEC JTC 1 "Information technology"

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SC 23 Business Plan 2025

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Description

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BUSINESS PLAN

ISO/IEC JTC 1/SC 23

Digitally Recorded Media for Information Interchange and Storage

Period Covered: October 2024 – September 2025

1.0 Executive Summary

1.1 Title and Scope

The title of SC 23 is “Digitally Recorded Media for Information Interchange and Storage” under the following scope.

“Removable digital storage media utilizing optical, holographic, and magnetic recording technologies, and flash memory technologies for digital information interchange, including;

- algorithms for the lossless compression of data,
- volume and file structure,
- methods for determining the life expectancy of digital storage media, and
- methods for error monitoring of digital storage media.”

The scope of SC 23 covers almost all digital data storage media, not only for physical specifications, but also volume and file format and applications for long-term data preservation.

1.2 Brief history

SC 23 was established in 1987, when JTC 1 was established, and Figure 1 briefly illustrates the transition of work items since then.

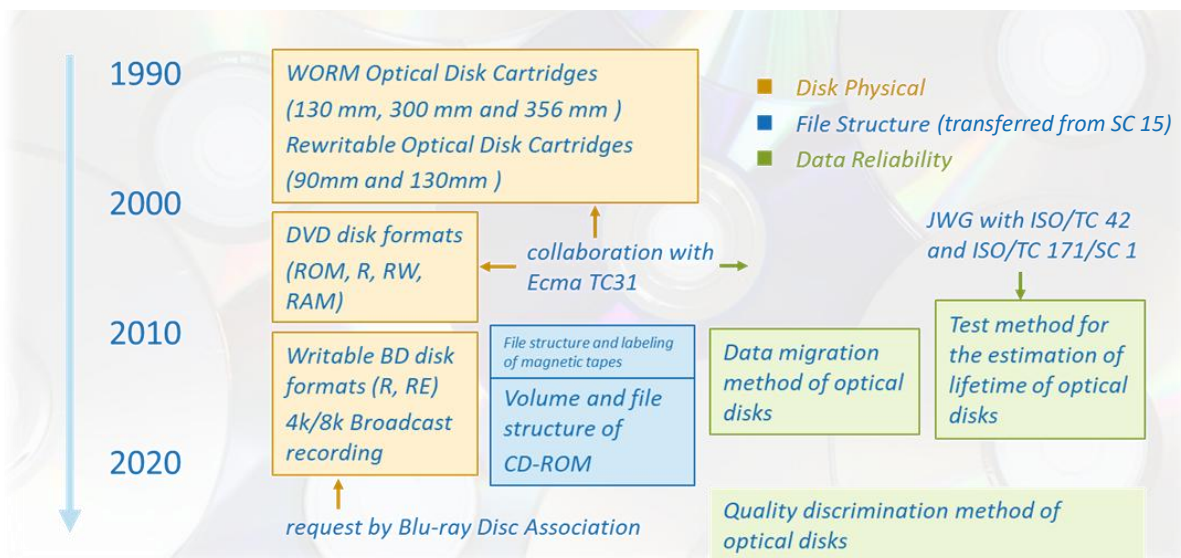


Figure 1: Transition overview of work items

SC 23 started with the development of several WORM (Write Once and Read Many) and rewritable optical cartridge formats, and through a strong collaboration with the DVD Forum and Ecma TC31, all DVD disk formats have been developed since around 2000. Subsequently from around 2010, SC 23 developed writable BD disk formats and addressed 4k/8k Broadcast

recording on writable BD disks through a close collaboration with Blu-ray Disc Association (BDA).

As for the file structure, SC 15 (Labeling and file structures) was disbanded in 1996 and its projects were assigned to SC 23, and later, SC 23 developed the file structure and labeling of magnetic tapes and the revision of volume and file structure of CD-ROM taking user's benefit into account. In addition, SC 11 (Flexible magnetic media for digital data interchange) was disbanded in 2003 and its projects were also assigned to SC 23.

Recently, SC 23 is focusing on data reliability standards for long-term data preservation, such as data migration method by error monitoring, and the test method for lifetime estimation of optical disks.

SC 23 has also started investigation on the basic operations and characteristics of the other storage media, such as multi-bit flash memory for reliable applications.

1.3 Market, Benefit, and Objective

Digitally Recorded Information is an essential element in the field of Information Technology, and SC 23 continues to provide technically rigorous standards to meet user requirements.

While the scope of SC 23 covers almost all digital data storage media, the main objective has been the development of optical disk-related standards contributing to the market demands, such as ease of digital-data content distribution, long-term data preservation with reliability, low cost, and low power consumption.

Governments in many countries began to archive official documents using optical disks instead of paper since the 1990s. Archiving documents on optical disks saves space in the office and does not require the large energy for archiving data in a data center. In order to procure optical disks, international standards of optical disks are required.

The general public is also the end-user of AV contents distribution, and all types of organizations that need to preserve critical digital data, from the smallest to the largest, such as national libraries, public record offices, national museums, and data centers, etc., can benefit from SC 23 deliverables.

In addition to current activities, SC 23 is seeking to expand its activity into new work areas with the potential for standardization in light of drastic changes in the storage environment, such as the explosive growth of digital data generation. As a first step to expand the variety of digital data storage media to apply, SC 23 has started the investigation on the basic operations and characteristics of multi-bit flash memory for reliable data storage applications.

2.0 Environment

2.1 Data generation and Storage capacity

The overall amount of data is being created and replicated at an unusually high pace around the world. As a result, global data creation and replication between 2023 to 2028 will result a compound annual growth rate (CAGR) of 24% and is predicted to reach more than 394 ZB (zettabytes) by 2028 as shown in Figure 2.

Meanwhile, the global installed base of storage capacity reached 11 ZB in 2023, and its expansion is forecast to result a CAGR of 19% to reach 21 ZB by 2026 in the worldwide data

storage capacity. While it is growing, its growth is rather slower than that of data generation, and as a result, the world is storing less than 10% of the data created.

While the difference of the growth-speed between data generation and storage capacity is reasonable (because not all data needs to be stored or retained), but it has become too big and more attention to data storage will be required. Organizations should now consider preparing to store and retain more data for business purposes, including innovation, resiliency, and optimization of the customer experience.

(Source: IDC Global DataSphere and StorageSphere Forecasts, Mar.2022 and IDC Worldwide Global DataSphere Forecast 2024-2028; May 2024)

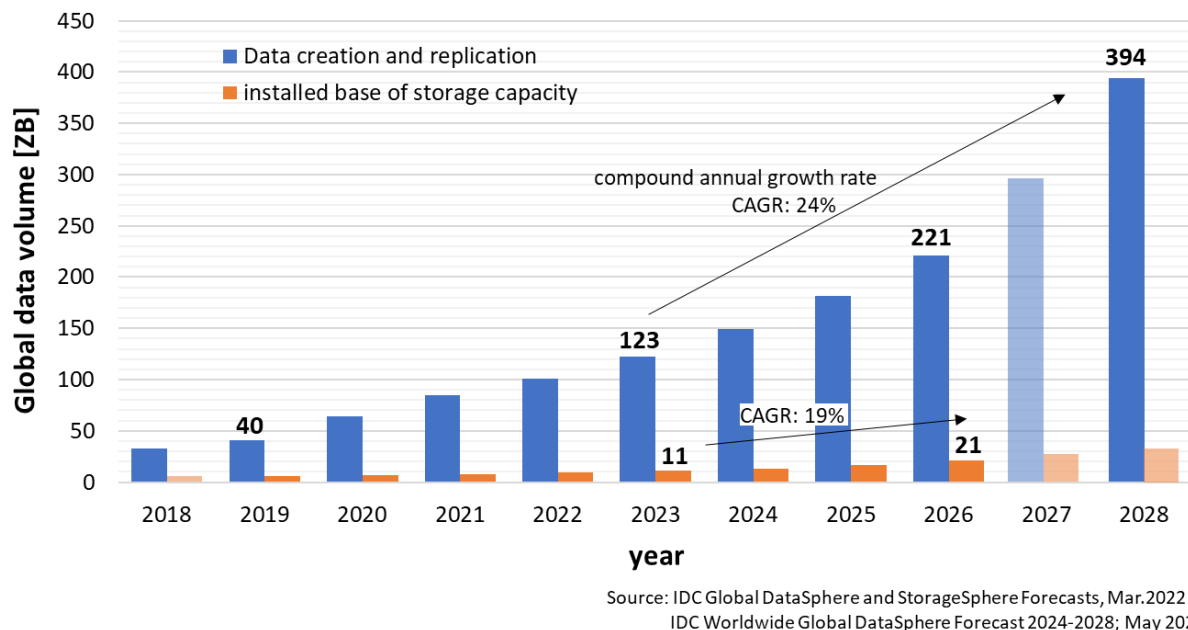


Figure 2: forecast of digital data growth

2.2 Energy consumption and Sustainability

An energy-consumption forecasting indicated that realistic energy consumption forecasts are achievable only when significant volumes of data are moved to offline “cold” storage. The general assumption that all useful data is instantly available online “hot” storage at any time is neither sustainable nor realistically achievable.

Hot storage is often used to actively access and maintain data in real time. This use model means that hot storage servers require faster hardware capable of dealing with multiple access points and it requires a commensurate power consumption.

The core purpose of cold storage, on the other hand, is to give users cheap, safe, and low power consumption systems for storing important data that they can't be removed. Rarely used data that needs to be retained for documentation, reporting, and compliance requires a specialized system for safekeeping using cold storage.

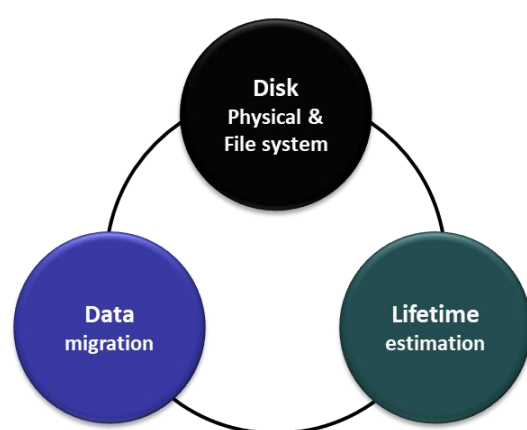
Among cold storages, optical disks have fundamental features superior for data archiving applications, such as water-proof function, long lifetime, low power consumption, and so on. Those unique characteristics will help users to recover important data from damage on disasters

and to make easier the constructions and managements of data archive system under ultra-low power consumption.

3.0 Achievements and benefits

3.1 General

The main achievements of SC 23 have been a number of optical disk related standards contributing to the market demand, such as ease of digital-data content distribution, and data archiving with high reliability, low cost, and low power consumption. Especially in data archival applications, it is necessary to maintain a combination of a high-quality optical disk and a drive that performs optimal recording on the optical disk. For this reason, standards are important and fall into the following three categories, as shown in Figure 3.



- Disk physical & File system
 - To keep compatibility and readability for digital- data content distribution
 - Basic standard to apply optical disks
- Data migration and archive operation
 - To ensure reliable data preservation for long-term
 - To provide actual operation for data archiving
- Test method of lifetime estimation
 - To estimate the lifetime of recorded data on a disk
 - To enable selection of long-lifetime disk for data archiving

Figure 3: Standard categories

By using products that comply with these standards, users can ensure the compatibility and readability of digital-data content distribution and operate a highly reliable data archive system.

3.2 Sustainable Development Goals

With respect to the Sustainable Development Goals and ISO and IEC strategies, the following Goals are directly relating to SC 23's work.

Goal 8: Decent Work and Economic Growth



A number of SC 23 standards promote economic growth by internationally agreed specifications that can be applied in the development of national and international regulation and those standards are recognized as technical regulations. Therefore, products that adopt the SC 23 standards are an essential tool for reducing barriers to international trade and are recognized by the World Trade Organization's Agreement on Technical Barriers to Trade (TBT Agreement).

Goal 9: Industry, Innovation and Infrastructure



The various standards developed by SC 23 create a huge infrastructure for AV content distribution and data storage, while keeping product quality and compatibility, while at the same time promoting inclusive and sustainable industrialization and fostering innovation.

Goal 11: Sustainable Cities and Communities

Goal 12: Responsible Consumption and Production



One of the important goals of SC 23 is to contribute to the creation of a sustainable power-consuming environment in response to the explosive growth in data generation, by expanding the use of cold storage with low-power consumption in data storage systems.

4.0 Participation and cooperation/collaboration

4.1 Membership

SC 23 has 7 Participating-member countries, China, Japan, Kazakhstan, Korea, Netherlands, Russia, Switzerland, and 20 Observing-member countries. The number of those member countries has not changed since the last business plan was published. The 21st plenary meeting, held in virtual format in 2022, had 14 participants from 5 national bodies and two liaison organizations, and the 22nd plenary meeting, held in Geneva, Switzerland in 2024 in hybrid format, had 13 participants from 4 national bodies and two liaison organizations.

Since the development and manufacturing facilities of the storage industry have recently been concentrated in a few countries and the current experts are aging, it is becoming difficult to keep adequate resources and participants available for the development of standards in the current activity domain. In order to recruit new experts and participants, it is necessary to expand the activity domain as well as evolving new storage media and data recording methods. To this end, SC 23 is engaged in extensive research on data storage technologies, whether magnetic, optical, or electronic, including exchanging views with other industry groups and soliciting input from current member states.

As one of the results to expand the variety of digital data storage media for standardization, SC 23 has initiated the preparation of PWI for the basic operations and characteristics of multi-bit flash memory for reliable data storage applications. This activity is expected to be the first step in increasing the number of new experts and participants in various domains of storage technology. SC 23 will continue such activities and support to enable new experts/participants to develop next-generation standards.

4.2 Liaisons

The full SC 23 membership list can be found at "[SC 23 Member Listing](#)". SC 23 is always making a conscious effort to reduce and eliminate competition from other standardization committees by establishing an extensive liaison-network inside and outside of JTC 1.

The list of liaisons can also be found at the web-site link above.

The noteworthy liaisons are;

- ISO/TC 42: Photography,
- ISO/TC 171/SC 1: Quality, preservation, and integrity of information,
- IEC/TC 100: Audio, video and multimedia equipment and systems,
- Ecma TC31: Information Storage.

In addition, SC 23 is promoting international standardization through a close cooperation with

international organization that is developing forum standards, such as Blu-ray Disc Association (BDA).

The cooperative/collaborative projects/activities with the liaison committees are as follows.

- 1) SC 23 organized Joint Working Group with ISO/TC 42 and ISO/TC 171/SC 1 for the following project.
 - ISO/IEC 16963: Test method for the estimation of lifetime of optical disks for long term data storage
- 2) The following two projects were placed in IEC/TC 100/TA 6, and SC 23 experts contributed to complete them.
 - IEC 62702-1-1 ED2: Audio archive system Part 1-1: DVD disk and data migration for long term audio data storage
 - IEC 62702-1-2 ED2: Audio archive system Part 1-2: BD disk and data migration for long term audio data storage
- 3) The Category A liaison with Ecma International has been resulted in numerous additions to the SC 23 standards catalogue by adopting the Fast-Track Procedure. In normal cases, SC 23 plenary meetings are held in conjunction with Ecma TC31 meetings to encourage mutual understanding among each membership. SC 23 is investigating possible joint activities with Ecma TC31 for future standardization items.

5.0 Objectives and strategies

5.1 Objectives

While the scope of SC 23 covers almost all digital data storage media, the main objective has been the development of optical disk related standards contributing to the market demands, such as ease of digital-data content distribution, long-term data preservation keeping reliability with low cost and low power consumption, and so on.

Considering future directions, it is essential to evolve new storage media and data recording methods, and to expand the scope of activities to data storage systems using various storage media. Whether magnetic, optical, or electronic, the future data storage technologies and systems will require innovations that can cope with the explosion of generated data and sustainable energy consumption. In this sense, the development of standards that respond to new storage technology innovations and enable combinatorial operations that take advantage of the characteristics of various storage media must be the objectives in the near future.

These activities will be important and worthwhile not only for SC 23 but also for the other standardization committees and the world toward digital data explosion era. SC 23 will pursue to establish a platform across entire domain of digital data storage in collaboration with relevant standardization organizations.

5.2 Strategies

In preparation for the development of new standards according to the future objectives, SC 23 has started and is continuing to conduct surveys and research the status of various storage media in collaboration with relevant organizations in each member country.

Currently, the following work items are the candidates of Preliminary Work Items.

- Basic operations and characteristics of multi-bit flash memory for reliable data storage applications,
- Integrated operation guideline for various storage media,
- Integrated test method for estimating the lifetime of various storage media,
- Tiered digital data storage system constructed with hot and cold storage,
- New digital data storage technologies.

Figure 4 shows a conceptual diagram of a tiered storage system to achieve a big data library with low energy consumption. Considering the explosive growing data and CO₂ emissions, it is neither sustainable nor realistic to store all the data in hot storage for all time. It is important to make good use of the characteristics of hot and cold storages in various use cases. It is necessary to devise ways to efficiently use SSD high-speed data processing, HDD data processing and temporary storage, magnetic tape, and optical data archive applications. It is also important to consider the data format and data management method for successfully exchanging data between these media considering data attribute and lifecycle. To this end, it is necessary to consider technological development in collaboration with system users and developers who use a large amount of storage media.

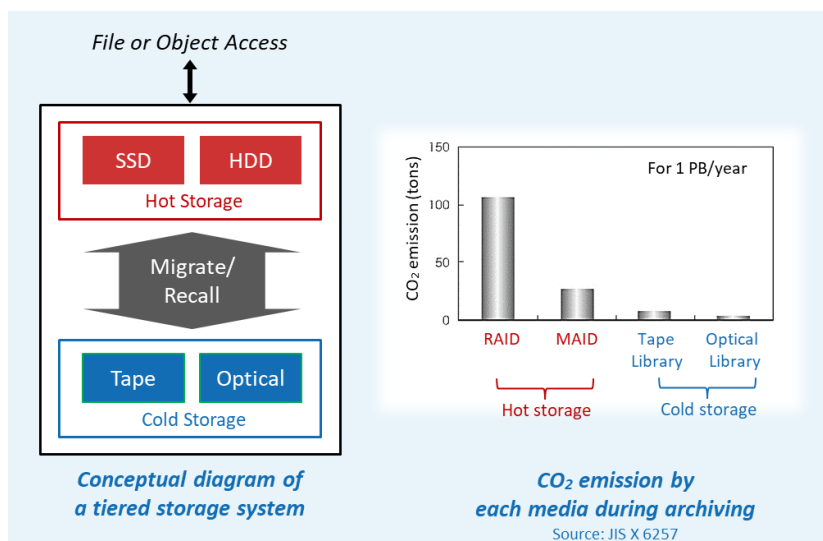


Figure 4: Tiered data storage system with low energy consumption

SC 23 believes that new storage system innovation and standardization activities as future objectives are important taking a sustainable future into account.

"The door is open for a new, lower-cost storage technology to be developed and commercialized to expand the Global StorageSphere more rapidly, especially to address the demand by enterprises for longer-term data retention" by IDC.

6.0 Factors affecting completion and adoption of the work program

Since SC 23 currently has only seven P-member countries, the following factors could adversely affect new projects and deliverables.

- The rule that NP ballot requires favor votes and experts from at least four countries is a high hurdle to launch a new project.
- It is difficult to confirm the use of the standard in five or more countries in the systematic review every five years, therefore it is desirable to confirm it at the JTC 1 level.

7.0 Structure, current projects, and publications

7.1 Structure

With respect to the organizational structure of SC 23, currently there is no WG in SC 23 and all projects have been handled by SC 23 itself as shown in Figure 5.



Figure 5: Organizational structure of SC 23

7.2 Recent project

ISO/IEC 18630 Quality discrimination method for optical disks and operating method of storage system for long-term data preservation

This project develops quality discrimination criteria using the initial quality of recordable optical disks as an index, and defect management can be adopted for BD recordable disks. It also develops a quality judgement method for storage systems for long-term data preservation, including the consistency of the recordable optical disks and recording drives, to ensure the quality of recorded digital data.

Figure 6 shows data archive procedure specified for recordable disks in ISO/IEC 18630.

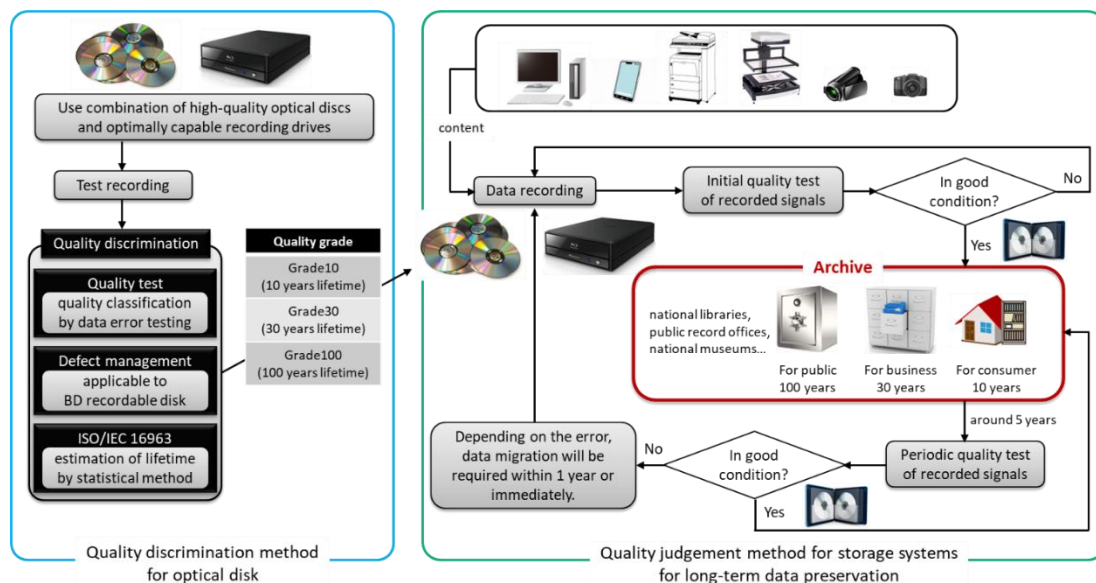


Figure 6: Data archive procedure specified for recordable disks in ISO/IEC 18630

By using products that comply with this international standard, it is possible to operate a highly

reliable archive system, which benefits all types of organizations that need to preserve critical digital data, from the smallest to the largest, such as national libraries, public record offices, and national museums, etc.

The construction of a low-power archiving system using optical disks will contribute to a sustainable society, and offline storage will create an environment in which valuable digital data can be stored safely and securely for a long period of time.

7.3 New project

PWI “Information technology - Definition and characteristics of pseudo single-level cell operation in multi-bit flash memory”

This project aims to define the basic operations of single-level cell operation in multi-bit flash memory and clarifies the associated terminologies and operational characteristics.

With the widespread adoption of multi-level flash memory technologies such as multi-level cell (MLC), triple-level cell (TLC) and quad-level-cell (QLC), so-called "pseudo-SLC (pSLC)" operation has been developed for operating these cells with expanded bit decision margins which are comparable to those of single-level cell (SLC) NAND. It offers higher endurance, improved temperature characteristics, faster write speeds and lower error rates than normal operation with MLC, TLC and QLC in exchange for reduced capacity. This operation is now widely used in various NAND flash-based storage devices, such as SD cards and embedded memories for applications requiring high reliability at a lower cost than SLC.

Figure 7 shows the basic configuration and characteristics of each flash memory type.

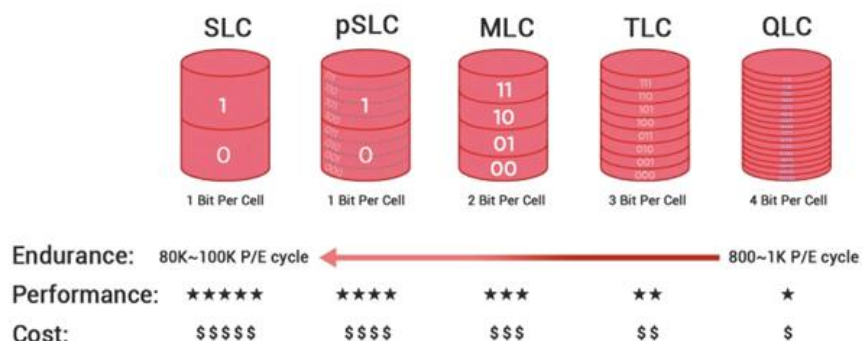


Figure 7: Configuration and characteristics of each flash memory

However, since there is currently no standardized or widely accepted definition for pseudo-SLC, the term is used inconsistently across the industry and the actual performance and implementation details are often unclear or vary between manufacturers. This lack of clarity can hinder appropriate evaluation and utilization of the technology across a wide range of applications, and the absence of common terminologies and understanding has led to inconsistencies in technical documentation and interoperability issues.

In order to address these challenges, this project has been launched.

7.4 Publications

SC23 is directly responsible for 84 published International Standards in the field of its scope < [ISO/IEC JTC 1/SC 23 - Digitally recorded media for information interchange and storage](#)>.

The main publications of SC 23 have been a number of optical disk related standards contributing to the market demand, such as ease of digital-data content distribution, and data archiving with high reliability, low cost, and low power consumption. Main publications for content distribution and data archiving are shown in Table 1.

Table 1: Optical disk standards for content distribution and data archiving

Disc physical & File system	
Standard	Disk type
ISO/IEC 10149	CD-ROM
ISO/IEC 16448	DVD-ROM
ISO/IEC 23912	DVD-R (Single Layer)
ISO/IEC 17344	+R (Single Layer)
ISO/IEC 12862	DVD-R (Dual Layer)
ISO/IEC 25434	+R (Double Layer)
ISO/IEC 30190	BD Recordable (Single Layer/Dual Layer)
ISO/IEC 30191	BD Recordable (Triple Layer/Quadruple Layer) , (Double sided)
ISO/IEC 9660	Volume and file structure of CD-ROM
Data migration and archive operation	
Standard	Applicable disk type
ISO/IEC 29121	CD/DVD/BD Writable disks
ISO/IEC 18630	CD/DVD/BD Recordable disks & Read-only disks
Test method of lifetime estimation	
Standard	Applicable disk type
ISO/IEC 10995	DVD Writable disks
ISO/IEC 16963	CD/DVD/BD Writable disks

By using products that comply with these standards, users can ensure the compatibility and readability of digital-data content distribution and operate a highly reliable data archive system.

The general public is the end-user of AV contents distribution, and all types of organizations that need to preserve critical digital data, from the smallest to the largest, such as national libraries, public record offices, national museums, and data centers, etc., can benefit from SC 23 deliverables, including:

- excellent in-home audio and video experience of keeping them as physical collections,
- high reliability of digital data preservation for long-term,
- providing data security with a write-once feature,
- preserving critical data from disaster damage through water-proof function,
- enabling development of large data-archiving system under ultra-low power consumption.

- End of Document