S1000D in theory and practice

S1000D is often considered complex and difficult to approach. In practice, however, the specification offers much more than a set of guidelines—it opens up new possibilities for technical documentation.

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Content

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Documentation according to S1000D is a requirement that is becoming increasingly common in technical documentation. However, anyone who begins exploring the specification is often quickly overwhelmed by its size, which can reach up to 3,700 pages.

This article provides a brief and accessible introduction to the fundamentals of S1000D and explains the key concepts behind this complex but highly influential standard.

S1000D is an international specification for the creation, management, and delivery of technical publications for complex products. Originally developed for European military aviation, it is now used across a wide range of industries, including defense, rail transportation, shipbuilding, wind energy, and mechanical engineering. The specification is freely available, and each edition can be downloaded from the official website (www.s1000d.org.) together with additional supporting data.

The specification serves to standardize the creation and maintenance of technical documentation for complex products and to ensure that information can be managed in a media-neutral format throughout the entire lifecycle of a product, which in many industries may span several decades.

Infobox 01

Integrated Product Support (IPS)

Integrated Product Support (IPS) is a concept for planning and providing technical support throughout the entire life cycle of a complex product.
The objective is to maximize the product's operational readiness while minimizing lifecycle costs.

S1000D is closely embedded in the concept of Integrated Product Support (IPS), also known as Integrated Logistic Support (ILS) (see Infobox 01). IPS is designed to ensure that a complex product involving many project partners can be operated and maintained efficiently throughout its entire life cycle, from planning to decommissioning. This covers a wide range of support activities, including maintenance planning, materials management, staff training, spare parts supply, and technical documentation. In order to implement this concept in the best possible way, the ASD (AeroSpace and Defense Industries Association of Europe) publishes a family of related specifications known as the S-Series.

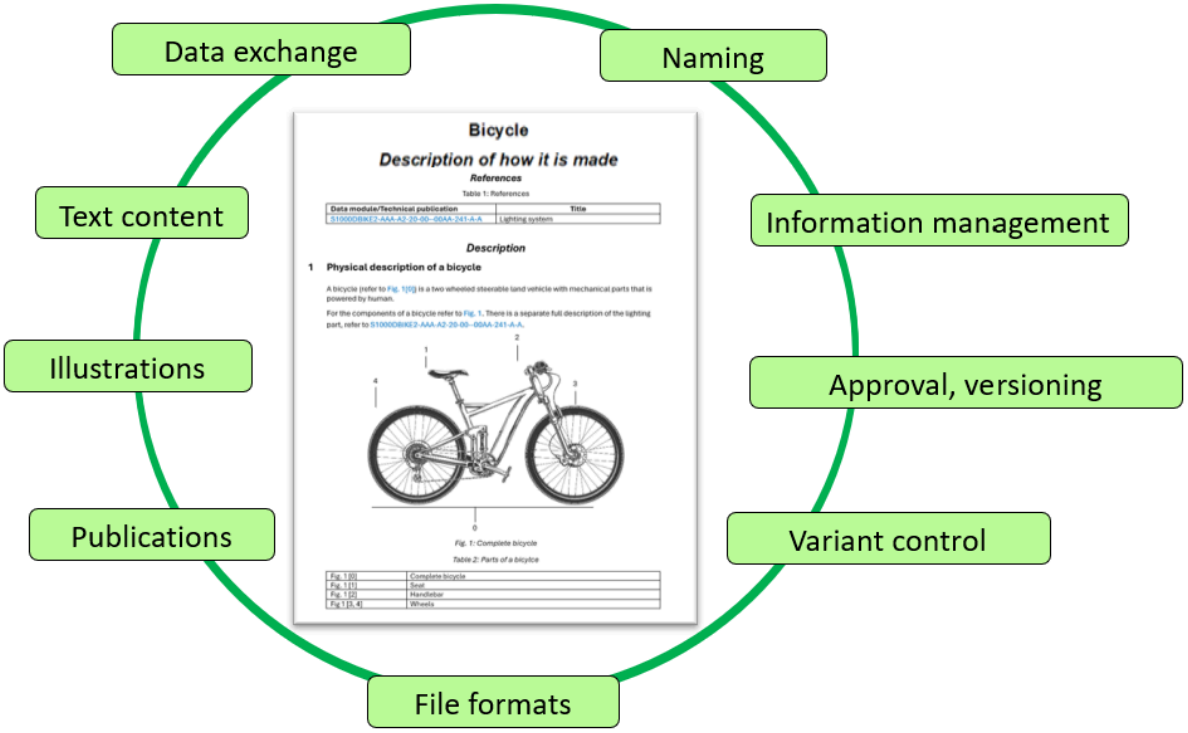


Fig. 01 Detailed information according to S1000D. Source: Pia Grubitz

History, Development, and Use

Today, the S1000D specification is jointly maintained by ASD, AIA (Aerospace Industries Association) in the United States, and ATA (Air Transport Association of America). Infobox 02 illustrates how it has evolved from the 1980s to this day.

S1000D has been released in several editions, referred to as issues, currently ranging from Issue 1 to Issue 6. Each new Issue introduces corrections, additional functionality, and adaptations to new technologies.

The specification continues to evolve through the work of a dynamic and dedicated community. The strategic direction is defined by the S1000D Steering Committee, while working groups and task teams focus on specific topics and enhancements.
An annual S1000D User Conference brings together industry representatives, system vendors, military organizations, and users. You could say it's a family reunion for all S1000D aficionados.

Infobox 02

The Development of S1000D

→ 1980s – Developed by AECMA (now ASD – AeroSpace and Defense Industries) for European military aviation

→ 1990s – Expanded to additional defense projects

→ 2000s – Transatlantic collaboration between ASD, AIA, and ATA

→ Today – Worldwide use in major civil and military projects

Objectives of the Specification

The primary objective of S1000D is to ensure consistent creation of technical documentation, maximum content reuse, and efficient collaboration between multiple project partners. To achieve these goals, S1000D contains comprehensive and detailed information. An overview of these elements is shown in Figure 01.

Infobox 03

Practical Example

A manufacturer creates step-by-step instructions for installing a component. Information about the required materials and support equipment is provided by the design and logistics departments. These departments create and manage their data according to other S-Series specifications, such as the S2000M for material management.
The final instruction data module can then be reused in the maintenance manual, on a training platform, or in a fault diagnosis application.

In the newer Issues, integration of S1000D into IPS processes has become increasingly important. This includes interfaces with other IPS specifications, such as S2000M (material management) and S3000L (logistics support analysis), as well as integration with enterprise systems such as ERP platforms like SAP. An example of this is shown in Infobox 03.

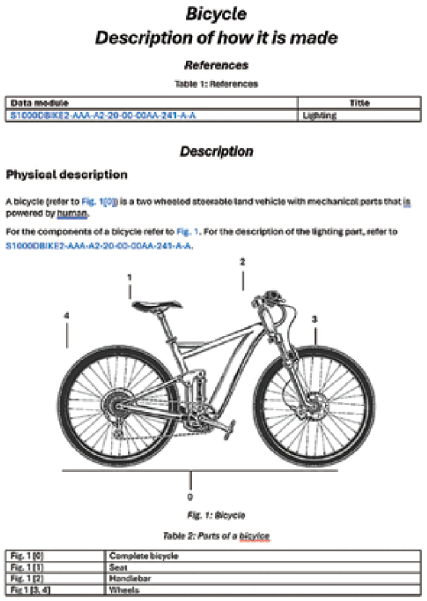
Basic Principles of S1000D

Principle 1 - Data Modules DM:

At the heart of S1000D is the data module (DM). A DM is a complete, self-contained unit of information that provides all the information required for a user to understand or perform a specific task or function. This could be, for example, a work instruction or a functional description.

DMs are versionable, media-neutral, and reusable wherever possible. This allows the same information to be used across different manuals, publications, or systems. Data modules are written in XML format (previously also SGML) using S1000D XML schemas or DTDs.

In addition to the main content, each DM also contains metadata. The header of the XML file contains descriptive information about the content, therefore the DM is self-descriptive and independent of any specific software for authoring or management. Important metadata includes, for example, the Data Module Code (DMC), the technical title, and the information source. Publications are compiled from multiple DMs according to a defined scope and structure. Therefore, technical authors typically write individual DMs rather than entire manuals.



Bicycle
Description of how it is made

References

Table 1: References

Data module	Title
S1000DBIKE2-AAA-A2-20-00-00AA-241-A-A	Lighting

Description

1 Physical description

A bicycle (refer to Fig. 1(0)) is a two wheeled steerable land vehicle with mechanical parts that is powered by human.

For the components of a bicycle refer to Fig. 1. For the description of the lighting part, refer to S1000DBIKE2-AAA-A2-20-00-00AA-241-A-A.

Fig. 1: Bicycle

Table 2: Parts of a bicycle

Fig. 1 (0)	Complete bicycle
Fig. 1 (1)	Seat
Fig. 1 (2)	Handlebar
Fig. 1 (3, 4)	Wheels

Fig. 02 Data module (title page) with a complete functional description.
Source: Author's own illustration based on S1000D

Principle 2 - Data Module Code DMC:

Each data module is assigned a unique Data Module Code (DMC), which consists of various elements (the abbreviations for the elements can be found above the code). As illustrated in Figure 03, the DMC can generally be divided into two parts: a system-related section (shown in blue) that describes the object or device addressed by the DM, and a content-related section (shown in green) that describes the type and purpose of the information.

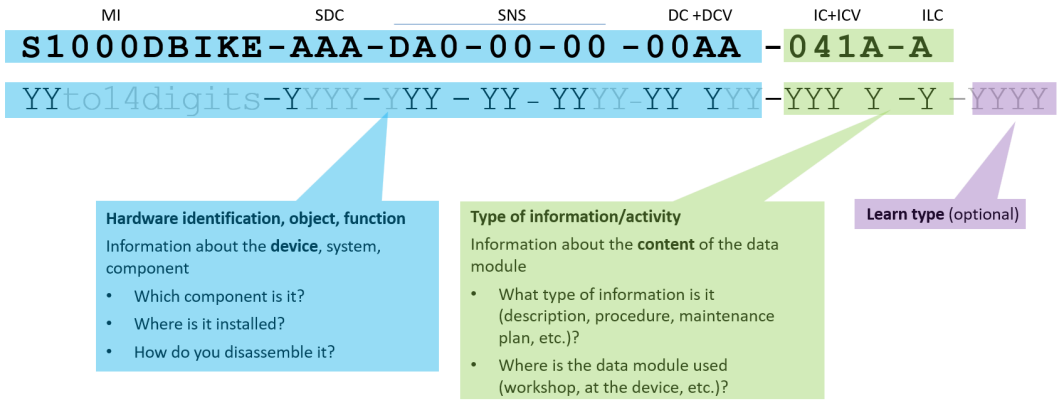


Fig. 03 Structure of a data module code. Source: Author's own illustration based on S1000D

For an initial overview, it is sufficient to know three key elements from the DMC:

- MI (Model Identifier): The MI identifies the project or product, for example "1B = Eurofighter". For military projects, the MI is defined and maintained by the NSPA (NATO Support and Procurement Agency).
- SNS (Standard Numbering System): The SNS identifies the relevant system or subsystem of the product using a hierarchical numbering structure. For example, "29-10-05" could represent Hydraulics → Main System → Tank. The first two levels of SNS are defined or recommended by S1000D.
- IC (Information Code): The IC defines the type of information contained in the data module, such as "720 = Installation Instructions." Information codes are defined or recommended by S1000D.

Other elements of the DMC (such as variant or installation location) are defined at the project level. An example of a fictitious DMC according to S1000D is shown in Infobox 04.

Infobox 04

Example DMC Checklist

DRN100-A-62-10-05-00A-720A-D

→ MI = Which project/product?
→ SNS = Which system/component?
→ IC = What type of information?

→ MI = DRN100: Drone model DRN100
→ SNS = 62-10-05: Main rotor – Rotor blades – Rotor blade
→ IC = 720: Installation Instructions

Principle 3 - Data Module Types:

In S1000D, there are various information classes that can be loosely compared to "topic types." The most commonly used data module types include:

- Procedural DM – step-by-step instructions for assembly, maintenance, or repair
- Descriptive DM – functional and structural descriptions of systems, subsystems, or components
- Fault DM – instructions for troubleshooting and fault rectification
- IPD – illustrated spare parts data for spare parts catalogues
- Maintenance Planning DM – data modules used for maintenance planning

Each DM type is based on a specific XML structure defined by its own DTD/XSD. This ensures that each type of information is structured consistently and presented in a standardized way.

Principle 4 - Data Module Requirement List (DMRL):

The Data Module Requirement List (DMRL) defines all data modules required for a project. It is typically created at an early stage, mostly in connection with spare parts planning, in collaboration with all project partners and updated throughout the project lifecycle as the product configuration evolves. Technical authors then populate the listed data modules with actual content during the documentation process.

Principle 5 - Common Source Database (CSDB):

Traditionally, all project content in an S1000D environment is managed in a Common Source Database (CSDB). This includes DMRL, data modules (DM), illustrations, multimedia, and rule files. The CSDB is used to control content-related processes such as versioning, approvals, publication compilation, and data exchange between project partners (manufacturers, customers, and service providers). S1000D does not prescribe a specific tool for implementing a CSDB. The selected system must be capable of supporting S1000D requirements, including the ability to create and manage data modules using the S1000D DTDs or XML schemas. In practice, organizations implement CSDB capabilities using different tool architectures depending on project scale and complexity.

Principle 6 - Business Rules (BR) and BREX:

S1000D is a specification with a large number of requirements covering various aspects of documentation, such as terminology, attribute usage, data exchange, and layout specifications. At the same time, it is intentionally flexible — there are always multiple options and alternative approaches to the specifications so that it can be adapted to different projects.

Business Rules (BR) define how S1000D is applied in a specific project. The specification currently contains about 550 guidelines that all project participants use as a basis to jointly define their own rules at the start of a project. These rules are typically documented in style guides or guidance documents and are binding for all project participants. This ensures that all components fit together in the end.

The German Armed Forces, for example, has published a National Style Guide (NSG) that applies to all projects. Individual programs may additionally define Project Specific Guidance Documents (psGD) with more restrictive rules.
To validate content against these rules, CSDB systems typically include BREX (Business Rules Exchange) files, where rules are stored in a machine-readable format and used for automated compliance checks.

Principle 7 - Information Control Number (ICN):

S1000D supports a wide range of illustrations and multimedia elements, including vector graphics, raster images, animations, and interactive content.

The specification defines the Information Control Number (ICN) system for identifying and managing illustrations. It also specifies rules for structuring and referencing visual content.

Currently, the CGM4 format has been used to create callout graphics with hotspots and associated interactive links. In the future, the CGM4 format is expected to be replaced by the SVG.

These parts of S1000D are particularly relevant not only for technical writers but also for technical illustrators and graphic designers.

Principle 8 - Information Sets and Publication Modules (PM):

To publish complete manuals, individual data modules are assembled into larger structures.

Information sets define groups of related information that correspond to a specific information use case defined by the customer or project partners. S1000D provides guidance and recommendations for typical information set structures.

Publication Modules (PM) use these information sets to organize and compile data modules in the required hierarchy and sequence.

A PM is a XML file that contains references to the relevant data modules rather than the content itself.

S1000D defines structural and naming conventions for publication modules as well as requirements for different publication types, such as maintenance manuals or illustrated parts catalogues.

Formatting and final output, for example as PDF or Interactive Electronic Technical Publication (IETP) are produced by a separate publication engine.

Authoring, management, and publishing are typically supported by specialized tools that implement the S1000D standard.

IPS Integration in Detail

S1000D is part of the ASD S-Series, a family of specifications designed to support various aspects of IPS. Together, these standards aim to cover as many IPS processes as possible. The individual specifications and related information are available on the website www.asd-europe.org.

Key specifications include:

- S2000M – Material Management
- S3000L – Logistics Analysis, LSA
- S5000F – In-Service-Feedback

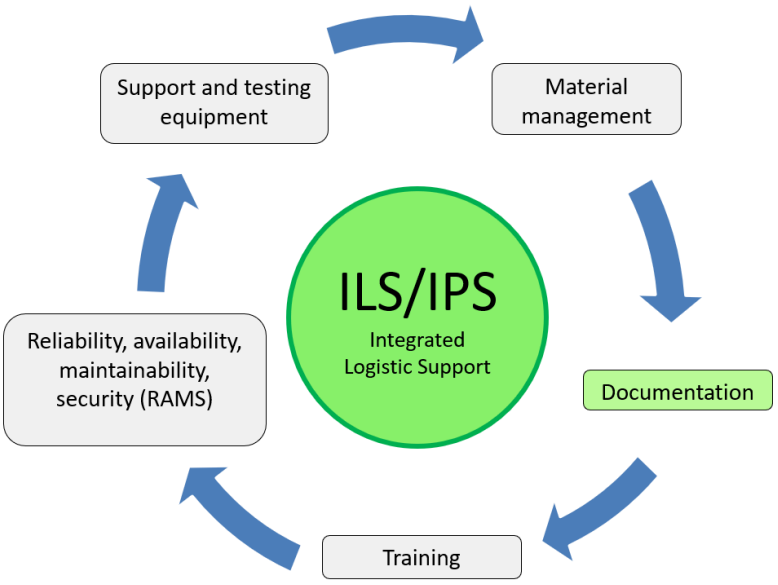


Fig. 04 Example of the interlinking of specifications; this creates a uniform data basis. Source: Author's own illustration

By linking these specifications, organizations can establish a consistent and shared data foundation across different domains such as logistics, training, operations, and technical documentation (see Fig. 04). For example, spare parts lists used in technical publications can be generated automatically from logistics databases. This reduces duplication of work and ensures that information remains consistent across systems.

AI and automation

The use of AI in S1000D is still at an early stage but is becoming increasingly important. While there are few practical applications, many topics are actively being explored. AI offers significant potential, particularly through the integration of the various IPS specifications. For example, predictive maintenance data could be used to automatically generate or suggest maintenance instructions for technical publications.

Requirements for the Editorial Team

Working with S1000D is demanding and requires extensive skills. Some of these are already common in technical writing, while others are more specialized:

Technical skills

- Strong understanding of complex technical systems
- Knowledge of standards such as S1000D and IPS concepts
- Ability to describe technical procedures precisely

Methodological skills

- XML and XSD knowledge
- Understanding of modular documentation principles

Tool-related skills

- XML authoring tools
- S1000D CSDB systems
- Illustration software
- Terminology management and translation tools

Soft skills

- Collaboration with many stakeholders working in parallel (clients, partners, engineers, and auditors)
- Long-term project planning and time management

Infobox 05

Checklist – Ready to Get Started with S1000D?

→ Do I understand complex technical systems?

→ Can I read and edit XML documents?

→ Do I understand the structure of a DMC?

→ Do I know the differences between the most common DM types?

→ Do I have experience working with S1000D authoring tools or CSDB systems?

Tips for Getting Started

Starting an S1000D project often introduces several new challenges:

- Client requirements tend to be much more detailed and strictly defined
- Planning and coordination phases are typically longer
- Initial investments in tools and training can be significant
- The learning curve can be steep

The complete specification, including sample data and additional resources, is available free of charge at www.s1000d.org. The Bike Data Set, a fictional bicycle project that demonstrates many S1000D document types in practice, is helpful for getting started with S1000D. My recommendations for beginners:

- Download the full specification and accompanying resources from www.s1000d.org
- If you are working on German defense-related projects, you may need to download Issue 2.3 and possibly Issue 4.x
- Even though the full specification can appear overwhelming, start by reading Chapters 1 and 2, which provide a solid introduction

- Keep Chapter 8 – “Terms and Abbreviations” available as a reference when learning the terminology (You can find a short German glossary of terms on my website *www.grubitz.de*)
- Install an XML editor that supports S1000D
- Practice with the sample DMs provided in the Bike Data Set
- Participate in a basic training course on S1000D
- For project managers: participate in training courses on S2000M and IPS concepts can also be valuable
- Work with experienced S1000D partners when starting your first projects
- Plan budgets realistically and ensure that sales teams understand the effort involved

What counts in the end

S1000D is much more than a specification for creating manuals. It is a comprehensive framework for organizing, reusing, and exchanging technical information.

S1000D often introduces new ways of working, more structured processes, and higher initial investments for documentation teams. At the same time, the specification is mandatory in certain industries and offers significant long-term benefits in these environments. Many of the underlying principles can also be applied in simplified form to other documentation projects. I find it fascinating how comprehensive and forward-looking S1000D was designed from the beginning, and how it continues to evolve today.