



CATALOGUE OF INDIAN STANDARDS FOR SPACE INDUSTRY



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Bureau of Indian Standards (BIS)
&
Indian National Space Promotion and
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SECRETARY, DOS / CHAIRMAN, ISRO

The rapidly evolving landscape of space exploration and utilization has propelled humanity into a new era of technological advancement and scientific discovery. As we venture beyond the confines of our planet, it becomes increasingly crucial to establish internationally recognized standards that ensure the safety, sustainability, and effectiveness of activities conducted in space.

In this regard, the collaboration between INSPACe and the Bureau of Indian Standards (BIS) stands as a testament to the commitment of the global community towards fostering responsible and innovative practices in space. The development of comprehensive space standards by these agencies reflects the collective wisdom and dedication of experts, engineers, and professionals who recognize the need to harmonize procedures and norms across a myriad of space-related endeavours.

Space standards provide a framework that transcends borders, cultures, and missions. They lay the foundation for interoperability, risk mitigation, and the successful execution of missions, regardless of their nature or scope. Whether it is launching satellites, establishing space habitats, conducting scientific research, or engaging in interplanetary exploration, adherence to well-defined standards enhances mission reliability, minimizes conflicts, and maximizes the potential for ground breaking discoveries.

As we navigate the infinite possibilities that space offers, we are reminded of our responsibility to safeguard not only the interests of our own generation but those of future generations as well. The Indian Standards for Space Industry, elucidated through the collaboration between INSPACe and BIS encapsulate the latest knowledge, technological prowess, and

ethical considerations necessary to create a sustainable and prosperous spacefaring future. It is heartening to note that they could successfully generate 15 such important standards in the areas of Programme Management, Safety engineering, Product Assurance etc., and many more are on anvil.

As these standards are adopted and implemented, they will undoubtedly inspire other budding entrepreneurs, organizations, and individuals to contribute their expertise and aspirations to the collective quest for understanding, innovation, and advancement.

Let us embrace these standards as a guiding light, illuminating the path to a future where the boundless wonders of space are accessible to all, where collaboration transcends competition, and where the spirit of discovery remains an eternal flame that ignites the human soul.

S. Somanath



DR. PAWAN KUMAR GOENKA

CHAIRMAN, INSPACE

The unveiling of "Catalogue of Indian Standards for Space Industry," today is a pivotal moment in India's space journey. Developed through collaborative efforts between the Bureau of Indian Standards (BIS), the Indian Space Research Organization (ISRO), and the Indian National Space Promotion and Authorisation Centre (IN-SPACE), this comprehensive collection of standards symbolizes our unwavering commitment to excellence, innovation, and global collaboration in the field of space technology.

In a world where space exploration is at the forefront of scientific and technological advancement, the need for precision, reliability, and adherence to global best practices is paramount. The Catalogue of Indian Standards for Space Industry is our collective response to this imperative. It is a result of the dedicated efforts of the teams at BIS, ISRO, and IN-SPACE, who have worked together to develop these standards, ensuring that they encapsulate the essence of quality and reliability in every aspect of the space industry.

This catalogue spans a wide array of domains, encompassing Space System Program Management, Systems Engineering principles, Product Assurance Mechanisms across all sectors of space activities, including satellites, launch systems, and ground systems. By providing a unified framework of guidelines and benchmarks, this catalogue not only will help to standardize operations but also enable to align India's space activities with international best practices. It is a testament to our commitment to safety, efficiency, and cost-effectiveness in space missions, a commitment that resonates with space professionals, researchers, and policymakers alike.

The adoption of these standards will not only enhance the reliability and safety of our space missions but will also drive cost reduction and shorten development cycles. As we move forward, this catalogue will serve as an invaluable resource for our space industry professionals, researchers, and policymakers, aiding them in making informed decisions, driving technological advancements, and formulating policies that empower India's ascent in the global space arena.

I extend my gratitude to all those who have contributed to this monumental effort, and I eagerly anticipate the transformative impact of these standards on our space industry.

Pawan Kumar Goenka



SHRI. PRAMOD KUMAR TIWARI

DIRECTOR GENERAL, BUREAU OF INDIAN STANDARDS

As our nation propels itself into the cosmos, the significance of standards for Indian Space Industry cannot be overstated. These standards are the guiding stars that navigate our space endeavors towards success and safety. They ensure that every facet of our space missions, from launch vehicles to satellite technology, adheres to the highest benchmarks of quality, reliability, and interoperability. By embracing these standards, we not only fortify the foundation of our space industry but also position ourselves as a global leader in space exploration. These standards foster innovation, collaboration, and trust, serving as the bedrock upon which our dreams of reaching for the stars are built. As we tread the path of cosmic discovery, let us remember that adherence to these standards is not merely a choice, but a responsibility we owe to our nation's quest for the infinite unknown.

Pramod Kumar Tiwari



SHRI. RAJEEV JYOTI

DIRECTOR, TECHNICAL DIRECTORATE, IN-SPACE

It is with great pleasure I introduce the "Catalogue of Indian Standards for Space Industry." This catalogue marks a major step in India's space sector's quest for excellence, a sector known for pushing boundaries and achieving remarkable feats in exploration and innovation.

The Bureau of Indian Standards (BIS), in collaboration with the Indian National Space Promotion and Authorization Centre (IN-SPACe), is releasing this compilation of 15 standards that are tailor-made to cater to the unique and demanding requirements of the space industry.

These standards focus on space endeavours, from materials and processes to quality management and safety protocols. The release of these standards is the first step by IN-SPACe, whose primary goal is to define framework for developing space industry standards based on global benchmarks. These standards will serve as guiding principles for space industries, and academia alike. By adhering to these standards, we are not only ensuring the reliability of our space missions but also strengthening our position in the global space community. These standards reflect teamwork and dedication, and only through such collaborations can we advance our nation's space goals.

IN-SPACe is continuously working with BIS and ISRO to define standards in both upstream and downstream segments of space sector. I encourage the Indian space industry to adopt these standards to build quality products thereby thriving not only towards self-reliance but also make globally preferred products.

Rajeev Jyoti



DR. BRINDA V.

DIRECTOR, DIRECTORATE OF SAFETY, RELIABILITY & QUALITY, ISRO-HQ

In India, the space economy is recognized as a driving force behind technological innovation, economic growth, and societal advancement. With the introduction of space reforms, the journey of exploring and harnessing space resources has entered into an exciting new phase, marked by the rise of the spirit of entrepreneurship, collaborative efforts, and the imperative for effective regulation. The spirit of entrepreneurship is reshaping the landscape of space activities.

In this complex and rapidly evolving realm of space technology, standards play a pivotal role in ensuring safety, interoperability, and reliability. They serve as the bedrock upon which our missions are built, enabling seamless collaboration, reducing risks, and fostering technological advancements. As we venture into new frontiers of space exploration, it becomes imperative to establish a robust framework of standards that reflect the cutting-edge nature of our endeavors.

Towards this, the first set of standards, generated through the combined efforts of INSPACE and Bureau of Indian Standards, embody the values of precision, safety, and sustainability that are synonymous with India's approach to space exploration. These standards are a testament to our vision for a future where the exploration and utilization of space resources go hand in hand with our responsibility to preserve and protect the celestial environment.

Brinda V.

OVERVIEW

The "Catalogue of Indian Standards for Space Industry" unveiled by the Bureau of Indian Standards (BIS), Indian Space Research Organization (ISRO) and Indian National Space Promotion and Authorisation Centre (IN-SPACe) marks a significant stride towards enhancing the quality and reliability of India's space endeavors. This collection of standards is aimed at streamlining the processes and technologies within the Indian space industry, fostering innovation, and bolstering international collaboration.

Curated by IN-SPACe in collaboration with the other industry stakeholders, the catalogue covers a spectrum of domains, encompassing Space System Program Management strategies, Systems Engineering principles and Product Assurance Mechanisms, and more in all sectors of space endeavors like satellite, launch systems, ground systems etc. By establishing a unified framework of guidelines and benchmarks, the catalogue ensures consistency in operations and aligns India's space activities with global best practices.

This initiative not only ensures the safety and efficiency of space missions but also contributes to cost reduction and shortened development cycles. It serves as a valuable resource for space industry professionals, researchers, and policymakers, aiding them in decision-making, technology development, and policy formulation.

The "Catalogue of Indian Standards for Space Industry" embodies India's commitment to becoming a prominent player in the international space arena. It reinforces the nation's dedication to excellence, quality, and advancement in space technology, setting the stage for a future of remarkable achievements and contributions to humanity's exploration of the cosmos.

In the subsequent volumes of the catalogue, IN-SPACe intends to publish Indian Standards for Space Industry published by Bureau of Indian Standards in all domains in space industry such as management of space programs, design, test, production, launch, maintenance, operation and disposal of space vehicles.



STANDARDS PUBLISHED

1. IS 18326 : 2023 SPACE SYSTEMS - PROGRAMME MANAGEMENT - MATERIAL MECHANICAL PARTS AND PROCESSES

- This document defines the programme management requirements for material, mechanical parts and processes for projects covering mission definition, design, development, production and operations of space systems, including disposal. It applies to all space deliverable products and all programme phases and covers — management, including organization, reviews, acceptance status and documentation control — selection criteria and rules — evaluation, validation and qualification, or verification testing — procurement and receiving inspection; and — utilization criteria and rules.

2. IS 18327 (PART 2) : 2023 SPACE SYSTEMS - PROGRAMME MANAGEMENT PART 2 PRODUCT ASSURANCE

- This standard defines the product assurance (PA) policy, objectives, principles, and requirements for the establishment and implementation of PA programmes covering mission definition, design, development, production and operations of space products, including disposal. This also covers product assurance management, quality assurance, safety assurance, dependability (reliability, availability and maintainability) assurance of software and hardware products, as well as parts (including electrical, electromechanical and electronic components, and mechanical parts), materials and processes assurance.

3. IS 18328 (PART 1) : 2023 SPACE SYSTEMS - SAFETY REQUIREMENTS PART 1 SYSTEM SAFETY

- This document defines the safety programme and the technical safety requirements that are implemented in order to comply with the safety policy. It is intended to protect flight and ground personnel, the launch vehicle, associated payloads, ground support equipment, the general public, public and private property, and the environment from hazards associated with space systems.

4. IS 18329 (PART 1) : 2023 SPACE SYSTEMS - ELECTRICAL ELECTRONIC AND ELECTROMECHANICAL (EEE) PARTS PART 1 PARTS MANAGEMENT

- This document addresses the key elements for an EEE parts management programme for space systems and is written in general terms as a baseline for developing, implementing, validating, and evaluating a space parts management programme. The family of EEE parts includes electro-optical parts.



STANDARDS PUBLISHED

5. IS 18329 (PART 2) : 2023 SPACE SYSTEMS - ELECTRICAL ELECTRONIC AND ELECTROMECHANICAL (EEE) PARTS PART 2 CONTROL PROGRAMME REQUIREMENTS

- This document establishes technical guidelines for developing and documenting an electrical, electronic and electromechanical (EEE) parts control program, in order to assure that the parts used in the flight hardware are acceptable and possess adequate functional, radiation and reliability characteristics to meet the system requirements. The family of EEE parts includes electro-optical parts. This document identifies a set of management guidelines for dealing with space systems engineering activities and defines the minimum existing processes on the subject. These guidelines are tailorable to the needs of each individual programme based on the project performance criteria, risk tolerance, budget, mission duration, environment, schedule and other considerations. This document is applicable to all customers and suppliers furnishing flight hardware and is suitable for reference in proposal instructions.

6. IS 18330 : 2023 SPACE SYSTEMS - DEFINITION OF THE TECHNOLOGY READINESS LEVELS (TRLs) AND THEIR CRITERIA OF ASSESSMENT

- This Standard defines Technology Readiness Levels (TRLs). It is applicable primarily to space system hardware, although the definitions could be used in a wider domain in many cases. The definition of the TRLs provides the conditions to be met at each level, enabling accurate TRL assessment.

7. IS 18331 : 2023 SPACE SYSTEMS - PROGRAMME MANAGEMENT - REQUIREMENTS MANAGEMENT

- This document presents the requirements for requirements management (RM) for space projects. This document addresses the space programme/project management requirements, applicable through a top-down approach in a contractual relationship between customers and suppliers. The objective of this document is to state and establish a common reference framework for all the customers and suppliers in the space sector to deploy requirements management for all space products and projects. This document on requirements management includes — a definition of the requirements management scope for the space sector, — the standard processes for requirements management within the product lifecycle management, and — a set of rules for requirements management activities to be implemented by the actors (customers and suppliers), including rules derived from best practices.



STANDARDS PUBLISHED

8. IS 18333 : 2023 SPACE SYSTEMS - FUNCTIONAL AND TECHNICAL SPECIFICATIONS

- This standard provides an overview of the respective purposes and positions of functional and technical specifications, their required contents, and the process for developing these documents. This standard is applicable to all types of space systems, all product elements, and projects.

9. IS 18334 : 2023 SPACE PROJECTS - PROGRAMME MANAGEMENT - DEPENDABILITY ASSURANCE REQUIREMENTS

- This document specifies the requirements for a dependability (reliability, availability and maintainability) assurance programme for space projects. It defines the dependability requirements for space products as well as for system functions implemented in software, and the interaction between hardware and software. This document is applicable to all programme phases..

10. IS 18335 : 2023 SPACE SYSTEMS - PROGRAMME MANAGEMENT - NON-CONFORMANCE CONTROL SYSTEM

- This standard specifies a control system for non-conformances related to any product for space systems, such as electrical, electronic, and electromechanical components and software, as well as operational non-conformances and anomalies. This standard applies to all deliverable products and supplies, at all levels, which fail to conform to specification requirements and design baselines. This document is applicable throughout phases of: a) procurement, production, qualification, integration, and test; b) acceptance, delivery, and transportation; c) launch preparation and flight or launch readiness; d) operational validation or qualification; e) operation; f) refurbishment. This document also specifies requirements for the interfaces with company internal non-conformance reporting and processing.

11. IS 18336 : 2023 SPACE SYSTEMS - PROGRAMME MANAGEMENT - QUALITY ASSURANCE REQUIREMENTS

- This standard defines the quality assurance (QA) requirements for the establishment and implementation of QA programmes for projects covering mission definition, design, development, production and operations of space systems, including disposal. It is applicable to the customer-supplier relationship for space products to the extent agreed by both parties. The requirements of this Standard and its associated referenced standards are tailored to the needs and classes of specific projects. When viewed from the perspective of a specific project context, the requirements defined are tailored to match the genuine requirements of a particular profile and circumstances of a project.



STANDARDS PUBLISHED

12. IS 18337 : 2023 SPACE SYSTEMS - PROGRAMME MANAGEMENT - INFORMATION AND DOCUMENTATION MANAGEMENT

- This document describes the processes and the requirements for the management of information/ documentation within space programmes and projects. The requirements specified in this document apply to and affect the customer and supplier at all levels. When viewed from the perspective of a specific project context, the requirements defined in this document need to be tailored to match the specific requirements of the particular profile and circumstances of a project.

13. IS 18338 : 2023 SPACE SYSTEMS - PROGRAMME MANAGEMENT AND QUALITY - VOCABULARY

- This document provides definitions of all common terms used in the area of space systems and operations for programme management and quality. It does not contain terms specific to an individual International Standard in the area of space systems and operations, which are defined in that particular Standard.

14. IS 18339 : 2023 SPACE SYSTEMS - PROGRAMME MANAGEMENT - PROJECT ORGANIZATION

- This document defines the project organization principles and requirements needed to provide satisfactory and coherent management of space projects. It addresses the following, in particular: responsibility and authority of the actors (all actors, customer, supplier), interrelations between the actors (meetings, action monitoring, reporting, assessments and audits), information technologies, and project organization documentation. The requirements specified in this standard applies to and affect the supplier and customer at all levels. This document is applicable to the customer-supplier relationship for space products to the extent agreed by both parties. It is intended to be used as a basis when establishing and negotiating customer program/project management requirements and to guide the supplier's responses. When viewed in a specific project context, the requirements defined in this Standard should be tailored to match the specific requirements of a particular profile and circumstances of a project.

15. IS 18346 : 2023 SPACE SYSTEMS - OFF-THE-SHELF ITEM UTILIZATION

- This document contains requirements and guidelines for the utilization of off-the-shelf (OTS) items, their selection, acquisition, integration, qualification and implementation related to a space product or system. This document doesn't cover piece parts and materials, such as electrical, electronic and electromechanical (EEE) parts, thermocouples, rivets, fasteners, connectors, fittings, adhesives, insulation, wiring and plumbing.

INDIAN NATIONAL SPACE PROMOTION AND AUTHORIZATION CENTRE

In a landmark move, Govt. of India has established the Indian National Space Promotion and Authorization Centre (IN-SPACE), signaling a new era in the country's space endeavors. Launched with the vision of nurturing a vibrant space ecosystem, IN-SPACE is set to play a pivotal role in fostering innovation, enabling private sector participation, and streamlining regulatory processes in the Indian space sector.

With the global space industry evolving rapidly, IN-SPACE envisages Indian Space Industry to compete more effectively on the international stage. Non-Government Entity (NGE) can now collaborate with ISRO on joint ventures, research, and technology transfer, accelerating technological innovation and fostering growth in the domestic space industry. This collaborative approach could potentially lead to groundbreaking advancements in satellite technology, Earth observation, communication systems, navigation systems and space transportation.

Moreover, IN-SPACE's streamlined regulatory framework reduces hurdles, making it easier for NGE to navigate the complex licensing and approval processes. This will attract investments, both from domestic and foreign, spurring economic growth and creating job opportunities in high-tech sectors.

Space industry standards play a crucial role in ensuring the safety, reliability, and interoperability of space missions and activities. These standards serve as a foundation for the design, development, and operation of spacecraft, launch systems, and ground infrastructure. By adhering to these standards, space agencies and private companies can ensure compatibility, interoperability and minimize the likelihood of accidents, protect human lives, and safeguard valuable assets. As mandated in the Space Policy 2023, IN-SPACE shall define frameworks for developing space industry standards, based on global benchmarks, as a first step towards this IN-SPACE pursues an action plan towards disseminating standards for utilization by adoption/formulation of internationally accepted best practices.

BUREAU OF INDIAN STANDARDS

The Bureau of Indian Standards (BIS) is the National Standard Body of India established under the BIS Act 2016 for the harmonious development of the activities of standardization, marking and quality certification of goods and for matters connected therewith or incidental thereto and stands as a cornerstone of quality assurance and standardization in India. BIS (erstwhile Indian Standards Institution (ISI) set up in 1947) plays a pivotal role in ensuring that products, services, and systems adhere to predefined benchmarks of quality, safety, and performance.

BIS is mandated with the formulation, recognition, and implementation of national standards across a wide spectrum of sectors, including agriculture, chemicals, electronics, and more. Its standards not only assure product quality but also bolster innovation, competitiveness, and sustainable development. The Bureau operates through a network of regional and branch offices, which aids in the seamless dissemination of standards to industries and consumers alike.

One of BIS's notable contributions is its hallmarking system, which certifies the purity and authenticity of precious metals like gold and silver. This instills confidence in consumers and supports the jewelry trade by assuring the quality of products. Additionally, BIS has been instrumental in the establishment of mandatory certification for various products, such as electronics, cement, and food items, safeguarding public health and safety.

BIS's role is not confined to industries alone; it reaches the masses through consumer centric initiatives. The Bureau educates consumers about their rights and provides channels to report grievances related to substandard products, creating a symbiotic environment where quality-consciousness thrives.

In conclusion, the Bureau of Indian Standards is more than just a standard formulation body; it is a catalyst for excellence. By ensuring quality, safety, and performance, BIS enriches the lives of citizens while propelling Indian industries towards greater heights. With its unwavering commitment to standards, BIS continues to be a beacon of trust in a world driven by quality.

