
**Space systems — Spacecraft-to-launch-
vehicle interface control document**

*Systèmes spatiaux — Document de contrôle des interfaces entre le
véhicule spatial et le lanceur spatial*

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 15863 was prepared by Technical Committee ISO/TC 20, *Aircraft and space vehicles*, Subcommittee SC 14, *Space systems and operations*.

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Introduction

This International Standard defines the basic rules for writing an interface control document (ICD) between spacecraft (SC) and launch vehicle (LV) organizations. The necessity of writing this International Standard was expressed by the communication spacecraft community, which is faced with an increasing number of launch vehicle agencies, with the objective of reducing workload and costs.

The application of this International Standard will permit to control the compatibility of SC with various LV systems reducing thereby the risk of discovering incompatibilities late in the launch-preparation process.

LV and SC organizations may include additional topics if required. Some sections of this International Standard may refer to elements that are not applicable to the LV, SC or launch range characteristics, in which case they should be ignored. For most items, except when specified, the information can be provided in SC or LV drawings and in tabular or narrative format with figures.

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Space systems — Spacecraft-to-launch-vehicle interface control document

1 Scope

The purpose of this International Standard is to provide spacecraft (SC) and launch vehicle (LV) organizations with the general format for presenting the interface control document (ICD) that verifies and controls the compatibility between SC and LV for a dedicated mission. This International Standard addresses the definition of the mission, the compatibility of the SC with the LV environment, including all mechanical, electrical, radio frequency, and electromagnetic aspects related to SC to LV and SC to launch range interfaces, verification analyses and tests for the induced environment, and the necessary facilities and support for launch range operations.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 14303, *Space systems — Launch-vehicle-to-spacecraft interfaces*

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3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 14303 apply.

3.2 Abbreviated terms

EMC	electromagnetic compatibility
EIRP	effective isotropically radiated power
ICD	interface control document
LV	launch vehicle
RF	radio frequency
SC	spacecraft

4 Applicable and reference documentation

4.1 Applicable documents

The list of documents that are contractually binding and require a waiver or a formal agreement for any modification shall be provided. This list shall include the applicable LV user's manual.

4.2 Reference documents

The list of documents that form the necessary database for the LV and the SC contractors in the course of the launch preparation shall be provided. Typically, the list shall include the documentation related to the various analyses and test programs specific to the mission.

4.3 Safety submission sheets

The list of safety submission sheets and corresponding current status shall be provided.

4.4 Waivers

The list of applicable waivers and corresponding current status shall be provided.

In case of conflict between the above-listed documentation and the ICD, the latter shall take precedence.

5 Spacecraft mission characteristics

5.1 General

This chapter of the ICD is optional. It is for reference and information only and does not establish interface definitions or requirements.

5.2 Mission description

The purpose of the SC mission and its orbital characteristics shall be described. An in-orbit view of the SC should be included. General aspects of the mission such as ground network, coverage zones and lifetime may be addressed.

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5.3 Spacecraft description

5.3.1 Spacecraft bus description

The general characteristics of the SC bus including appendages shall be described. The following items may be addressed:

- platform type and heritage (if applicable);
- overall structure;
- fixed and deployable appendages;
- attitude and orbit control system.

5.3.2 Spacecraft payload description

The payload equipment and its purpose shall be described. The following items may be addressed:

- antennas and associated frequency bands;
- transmission characteristics;
- transponder type and number;
- electrical power.

6 Mechanical interfaces

6.1 General

This chapter of the ICD shall provide the specific characteristics and parameters that establish the mechanical interface between the SC and the LV. The information can be provided in SC or LV drawings and in tabular or narrative format with figures.

6.2 Mechanical configuration

The LV and SC reference axes and relative rotational orientation shall be described. Drawings of the SC and adapter assembly within the payload compartment, which show and define the location of all interface components, shall be provided.

6.3 Spacecraft fundamental frequencies

The minimum allowable SC fundamental frequencies in axial and lateral directions shall be specified.

6.4 Usable volume

Drawings that show the allowable usable volume within the payload compartment shall be provided. The usable volume is determined by the physical clearances that are based on the static clearances and dynamic deflections of the fairing and SC. Critical clearance information including detailed views of protrusion areas with associated dimensions shall be provided.

6.5 SC–LV adapter interface (standards.iteh.ai)

6.5.1 General

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All of the characteristics of the physical and geometric interface for both the SC and the LV shall be described.

6.5.2 Payload adapter description (optional)

The following general characteristics of the payload adapter shall be described:

- type;
- material;
- geometrical shape;
- diameter of upper and lower interface rings;
- mass properties of equipped adapter.

6.5.3 Interface ring characteristics

Drawings showing side sections of the LV and SC interface rings with detailed dimensions and tolerances shall be provided. The following characteristics shall be specified:

- a) material;
- b) Young's modulus;

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- c) coating:
 - surfaces in contact,
 - other surfaces;
- d) roughness;
- e) flatness/perpendicularity;
- f) stiffness:
 - applicable length,
 - section area,
 - inertia.

These requirements are also applicable to a bolted interface between the LV and the SC adapter when the SC provides the adapter.

6.5.4 Separation system characteristics

Drawings showing the separation-system actuator mechanism shall be provided. The following characteristics shall be specified:

- number;
- location;
- nominal stroke;
- reduced stroke;
- maximum force;
- energy per unit.

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6.5.5 SC mating system description

6.5.5.1 General

The SC mating and release system shall be described, including system characteristics and material properties as listed below. When the SC contractor provides the adapter, the corresponding separation shock spectrum at the LV-SC interface plane shall be shown (see 10.2.7).

6.5.5.2 Clampband system

The following characteristics shall be specified:

- a) coating:
 - surface in contact with adapter and SC,
 - other surfaces;
- b) roughness;

- c) tension:
 - ground or test configuration,
 - flight configuration.

6.5.5.3 Pyrotechnic bolts

The following characteristics shall be specified:

- number;
- location;
- diameter;
- length;
- mass (of separated hardware);
- pre-load.

6.5.6 Mating-system installation

The orientation of the mating system with respect to the adapter frame shall be defined.

6.6 Connectors and microswitches

The connector interface shall be defined. The following characteristics shall be considered:

- a) supplier and part number; [ISO 15863:2003](https://standards.iteh.ai/catalog/standards/sist/e207d126-b252-4aba-a081-8cf13f737eb6/iso-15863-2003)
- b) quantity; <https://standards.iteh.ai/catalog/standards/sist/e207d126-b252-4aba-a081-8cf13f737eb6/iso-15863-2003>
- c) location and mechanical interface:
 - angular position,
 - radial position,
 - height from separation plane;
- d) push-on and push-off loads;
- e) energy released;
- f) separation force;
- g) keying index.

6.7 Purges and fluid-connection interface

The SC purge and fluid-connection interface shall be defined. The following characteristics shall be considered:

- a) location and mechanical interface:
 - angular position,
 - radial position,
 - height from separation plane;

- b) push-on and push-off loads;
- c) energy released;
- d) separation force.

6.8 Encapsulated SC access

6.8.1 SC-access requirements

SC items to be accessed and purpose of access needed shall be listed and referenced to the SC coordinate system.

6.8.2 Access configuration

Information that shows the location and configuration of the required SC physical access openings in the payload compartment shall be provided, including the following indications:

- payload compartment relevant dimensions;
- location of centre of door (s) referenced to the LV axes;
- dimensions of door(s).

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7 Electrical interface

7.1 Umbilical wiring diagram

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Detailed drawings of the SC-to-LV and SC-to-ground facilities wiring diagram shall be provided.

7.2 Umbilical connectors

Organizations responsible for providing connector elements shall be identified.

Umbilical connectors shall be described for both the LV and the SC sides. The distinction shall be made between SC servicing and SC pyrotechnic functions that are maintained on separate LV-SC connectors. Example figures of connectors shall be included.

Connector characteristics shall be defined as follows:

- supplier;
- part number;
- number of pins available to user;
- polarizing key orientation;
- insert clocking;
- location (see also 6.6);
- backshell shielding requirement;
- harness shielding requirement.