# INTERNATIONAL STANDARD

# ISO
# 17401

# Space systems — Spacecraft interface requirements document for launch vehicle services

*Systèmes spatiaux — Document d'exigences d'interface du véhicule spatial vis-à-vis du service de lancement*

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## Introduction

This International Standard gives guidelines for writing an interface requirements document (IRD) for launch vehicle (LV) services. The application of this International Standard is intended to facilitate the technical exchanges between spacecraft (SC) and launch vehicle agencies. By reducing the amount of work necessary for requesting launch services, this International Standard will minimize spacecraft contractor's and spacecraft manufacturer's costs.

In some cases, drawings are explicitly requested in order to provide comprehensive information. Explicit international system units are specified for all items. The corresponding scale may be adjusted if not appropriate.

SC organizations may include additional topics if required. Some sections of the IRD may refer to specificities that are not applicable to the launch services of interest, in which case they should be ignored.

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# Space systems — Spacecraft interface requirements document for launch vehicle services

## 1 Scope

This International Standard provides spacecraft (SC) organizations with the general format for presenting the interface requirement document (IRD) for launch vehicle services. The IRD provides a list of the major technical requirements spacecraft agencies provide to launch vehicle (LV) agencies when submitting an application for launch services.

The IRD addresses the definition of the SC mission, the mechanical and electrical interfaces, the overall environment requirements (mechanical, thermal, cleanliness, radio-electrical), the SC development and test programme and, finally, launch range facilities and support requirements.

This International Standard is applicable to all existing commercial LV and related launch facilities so as to permit SC contractors to prepare a single interface requirement document for a given SC mission, independently of the LV contractor to be selected.

The IRD, as defined in this International Standard, includes the basic SC input data needed by LV agencies to prepare the interface control document defined in the ISO 15863.

## 2 Terms, definitions and abbreviated terms

### 2.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

**2.1.1**
**usable volume**
volume available to the payload within the LV fairing or carrying structure that the static envelope of the SC may not exceed in order to ensure that there is no physical contact between the SC and the LV in a dynamic environment

**2.1.2**
**spacecraft adapter**
**SC adapter**
structure that mates the SC to the LV and includes the separation system for SC/LV separation

NOTE   The SC adapter is a part of the LV and does not separate with the SC.

### 2.2 Abbreviated terms

EIRP   equivalent isotropic radiated power

EMC   electromagnetic compatibility

IRD   interface requirement document

LV   launch vehicle

RF   radio frequency

SC      spacecraft

Y/N     yes/no response

# 3 Spacecraft mission description

## 3.1 Mission description

The IRD shall describe the following items:

— purpose of the mission;

— orbital characteristics;

— in orbit view of SC, with drawing

## 3.2 SC description (optional)

The IRD may describe the following items:

— SC platform

— SC payload

# 4 Mechanical interfaces

## 4.1 Mechanical configuration

The IRD shall provide the following information:

— SC mechanical drawing (launch configuration);

— SC coordinate system, with drawing;

— maximum height above interface plane, in metres;

— SC maximum diameter, in metres;

— SC/LV interface diameter, in metres;

## 4.2 SC fundamental frequencies

The IRD shall provide the fundamental natural frequencies (specify boundary conditions):

— axial frequencies, in hertz;

— lateral frequencies, in hertz.

## 4.3 Usable volume

The IRD shall provide the following information:

— static envelope, with drawing;

— SC protrusions below interface plane, with dimensioned drawings;

— SC volumetric displacement, in cubic metres;

— SC free air volume, in cubic metres;

— special clearance requirements, with drawing.

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## 4.4 Spacecraft (or SC adapter) mechanical interface

The IRD shall provide the following information:

a) mechanical interface, with drawing;

b) diameter, in metres;

c) attachments at SC interface;

d) material;

e) Young's modulus, in newtons per square metre;

f) coating:

1) surfaces in contact,

2) other surfaces;

g) roughness, in metres;

h) flatness/perpendicularity;

i) stiffness (for clampband mating system):

1) applicable length (height), in metres,

2) section area, in square metres,

3) inertia (with respect to centre of gravity of section), in metres to the power of 4 ($m^4$);

j) stiffness (except for clampband mating systems):

1) radial direction, in newtons per metre,

2) tangent direction, in newtons per metre.

NOTE   This section of the IRD applies to the lower adapter interface ring for a SC provided adapter.

## 4.5 Connectors and microswitches (SC side of the interface)

The IRD shall provide the following information:

a) manufacturer and part number;

b) quantity;

c) location and mechanical interface, with drawing:

1) angular position, in degrees,

2) radial position, in metres,

3) height from separation plane, in metres;

d) push-on and push-off loads, in newtons;

e) energy released, in joules;

f) keying index.

## 4.6 Purges and fluid connection interface

The IRD shall provide the following information:

a) definition;

b) location and mechanical interface, with drawing:

   1) angular position, in degrees,

   2) radial position, in metres,

   3) height from separation plane, in metres.

## 4.7 Encapsulated spacecraft access

For each access requirement to payload, the IRD shall specify the following items:

a) location in SC coordinates, in metres, with drawing:

   1) $X_S$,

   2) $Y_S$,

   3) $Z_S$;

b) minimum size of access door, length and height in metres;

c) purpose.

NOTE   The symbols $X_S$, $Y_S$, $Z_S$ are the generic coordinates of any point in SC axes (or in axes parallel to the SC axes).

## 5 Electrical interfaces

### 5.1 Umbilical wiring diagram

Drawings for SC to LV and SC to ground facilities wiring shall be provided.

### 5.2 Umbilical connectors

The IRD shall provide the following information:

— number of connectors required;

— LV supplied (Y/N, to specify);

— manufacturer;

— part number;

— number of pins needed for user;

— polarizing key orientation;

— insert key location, with drawing;

— location, with drawing;

— backshell shielding requirement;

— harness shielding requirement.

### 5.3 Umbilical wiring links (for each connector pin)

The IRD shall provide the following information:

— pin number;

— function(s);

— wire type;

— twisting and shielding characteristics;

— maximum voltage, in volts;

— maximum voltage at lift-off, in volts;

— maximum current, in amperes;

— maximum current at lift-off, in amperes;

— maximum one way resistance, in ohms;

— maximum voltage drop, in volts;

— line start point;

— line end point;

— maximum voltage at separation (if applicable), in volts;

— maximum current at separation (if applicable), in amperes;

— signal type;

— signal frequency, in hertz.

### 5.4 Electrical commands dedicated to spacecraft

#### 5.4.1 Pyrotechnic commands

The IRD shall provide the following information:

— number of commands required;

— electrical circuit drawing, with drawing;

— command identification;

— number of initiators per command;

— time of command initiation;

— minimum time interval between commands, in seconds;

— pulse width, in seconds;

— voltage, in volts;

— minimum all fire current, in amperes;

— maximum no fire current, in amperes;

— output isolation, in ohms;

— wire gage;

— wire type;

— wire length from LV-SC interface to pyrotechnic devices, in metres;

— circuit connectors to pyrotechnic devices;

— initiator characteristics.