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Space systems — Ground support equipment for use at launch, landing or retrieval sites — General requirements

Systèmes spatiaux — Équipements de soutien au sol utilisés sur les sites de lancement, d'atterrissage ou de récupération — Exigences générales

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

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

This third edition cancels and replaces the second edition (ISO 14625:2007), which has been technically revised.

The main changes are as follows:

— requirements related to GSE checkout and maintenance have been added.

Any feedback or questions on this document should be directed to the user’s national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

This document is intended to be used when designing new ground support equipment (GSE) that support space system (launch vehicle or payload) programmes or projects. Existing programmes and projects can use this document as far as is practical in accordance with sound management and engineering practices.

This document is applicable at the time the decision is taken to design, construct, manufacture or procure a given GSE that remains applicable for the useful life of the hardware. However, if modifications are made to existing hardware, the edition of this document available at the time the modification is applicable.

When this document is used in procurement, it is advisable that it be reviewed by the programme/project office for applicability, and that only the clauses that apply to the project or programme be included in the procurement documentation.

This document can also be used as a template for the development of specific programme or project GSE specifications or standards.

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Space systems — Ground support equipment for use at launch, landing or retrieval sites — General requirements

1 Scope

This document specifies the general characteristics, performance, design, test, checkout, maintenance, safety, reliability, maintainability and quality requirements for ground support equipment (GSE) and systems intended for use at launch, landing or retrieval-site installations, or other locations that are the responsibility of the launch, landing and retrieval site. This document does not specify how to design, checkout and maintain GSE, but establishes the minimum requirements to provide simple, robust, safe, reliable, maintainable and cost-effective GSE.

This document is applicable to the design, checkout and maintenance of non-flight hardware and software used to support the operations of transporting, receiving, handling, assembly, inspection, test, checkout, service, launch and recovery of space vehicles and payloads at the launch, landing or retrieval sites. As such, the requirements of this document are optional for hardware used only at the manufacturing, development or test sites prior to arrival at the launch, landing or retrieval sites. However, if such GSE is dual use equipment to be also at a launch, landing or retrieval site, for whatever reason, all the safety-related requirements of this document apply to the GSE.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 898-7, *Mechanical properties of fasteners — Part 7: Torsional test and minimum torques for bolts and screws with nominal diameters 1 mm to 10 mm*

ISO 1949, *Aircraft — Electrical connectors — Design requirements*

ISO 1966, *Crimped joints for aircraft electrical cables*

ISO 2635, *Aircraft — Conductors for general purpose aircraft electrical cables and aerospace applications — Dimensions and characteristics*

ISO 2964, *Aerospace — Tubing — Outside diameters and thicknesses — Metric dimensions*

ISO 4301 (all parts), *Cranes — Classification*

ISO 6346, *Freight containers — Coding, identification and marking*

ISO 14620-1, *Space systems — Safety requirements — Part 1: System safety*

ISO 14621 (all parts), *Space systems — Electrical, electronic and electromechanical (EEE) parts*

ISO 14623, *Space systems - Pressure vessels and pressurized structures — Design and operation*

ISO 14624 (all parts), *Space systems — Safety and compatibility of materials*

ISO 14952 (all parts), *Space systems — Surface cleanliness of fluid systems*

ISO 15389, *Space systems — Flight-to-ground umbilicals*

ISO 15859 (all parts), *Space systems — Fluid characteristics, sampling and test methods*

ISO 22538 (all parts), *Space systems — Oxygen safety*

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ISO 80000-1, *Quantities and units — Part 1: General*

IEC 60034 (all parts), *Rotating electrical machines*

IEC 60038, *IEC standard voltages*

IEC 60079 (all parts), *Electrical apparatus for explosive gas atmospheres*

IEC 60096 (all parts), *Radio-frequency cables*

IEC 60169 (all parts), *Radio-frequency connectors*

IEC 60189 (all parts), *Low-frequency cables and wires with PVC insulation and PVC sheath*

IEC 60227 (all parts), *Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V*

IEC 60245 (all parts), *Rubber insulated cables — Rated voltages up to and including 450/750 V*

IEC 60297 (all parts), *Dimensions of mechanical structures of the 482,6 mm (19 in) series*

IEC 60309 (all parts), *Plugs, socket-outlets and couplers for industrial purposes*

IEC 60364 (all parts), *Electrical installations of buildings*

IEC 60794 (all parts), *Optical fibre cables*

IEC 60874 (all parts), *Connectors for optical fibres and cables*

IEC 60884 (all parts), *Plugs and socket-outlets for household and similar purposes*

IEC 60947 (all parts), *Low-voltage switchgear and controlgear*

IEC 61000 (all parts), *Electromagnetic compatibility (EMC)*

IEC 61086 (all parts), *Coatings for loaded printed wire boards (conformal coatings)*

IEC 62305 (all parts), *Protection against lightning*

IEC 62326 (all parts), *Printed boards*

3 Terms and definitions, symbols and abbreviated terms

3.1 Terms and definitions

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

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1.1
cognizant authority
organization that is recognized as having expertise in one or more technical disciplines

EXAMPLE ISO, IEC.

3.1.2
commercial off-the-shelf
COTS
equipment, including hardware and associated software/procedures, that is commercially available from current industry inventory

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3.1.3
critical weld
weld whose single failure during any operating condition can result in injury to personnel or damage to property or flight hardware

3.1.4
flight hardware lifting device
structural or mechanical items between the crane hook and the flight vehicle interface that are used to lift the flight hardware

EXAMPLE Sling, cable, shackle, beam.

3.1.5
ground support equipment
GSE
non-flight systems, equipment or devices necessary to support the operations of transporting, receiving, handling, assembly, inspection, test, checkout, servicing, launch and recovery of a space system at launch, landing or retrieval sites

3.1.6
safety critical
any condition, event, operation, process, equipment or system with a potential for personnel injury, fatality or damage to, or loss of, equipment or property

3.1.7
safety factor
multiplying factor to be applied to *limit loads* (3.1.11) and/or maximum expected operating pressure (MEOP) or maximum design pressure (MDP)

3.1.8
safe working load
assigned load, as shown on the identification tag, which is the maximum load the device or equipment is permitted to handle and maintain in operation

3.1.9
sneak circuit
unexpected path or logic flow within a system that, under certain conditions, can initiate an undesired function or inhibit a desired function

Note 1 to entry: The path may consist of hardware, software, operator actions, or combinations of these elements. Sneak circuits are not the result of hardware failure but are latent conditions, inadvertently designed into the system, coded into the software program, or triggered by human error.

Note 2 to entry: ISO 26871 defines "sneak circuit" as an undesired function or a function that inhibits a desired function.

3.1.10
space flight vehicle
combination of the launch system elements which leave the ground i.e. the launch vehicle and the space vehicle(s) placed in orbit by the launch vehicle

[SOURCE: ISO 14622:2000 ,2.1]

3.1.11
limit load
maximum expected load, or combination of loads, which a structure or a component in a structural assembly is expected to experience during its service life, in association with the applicable operating environments

Note 1 to entry: Load is a generic term for thermal load, pressure, external mechanical load (force, moment, or enforced displacement) or internal mechanical load (residual stress, pretension, or inertial load).

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