
**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.

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.

International Standard ISO 14625 was prepared by Technical Committee ISO/TC 20, *Aircraft and space vehicles Space systems and operations*.

Annex A of this International Standard is for information only.

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Introduction

This International Standard is intended to be used during the design of new ground support equipment (GSE) that support space system (launch vehicle or payload) programs or projects. Existing programs and projects may utilize this International Standard to the extent practical in accordance with sound management practices. The edition of this International Standard that was current at the time direction was issued to design, construct, manufacture, or procure the GSE is applicable for the useful life of the hardware. Modifications of existing hardware may be done so the modified hardware complies with the version that is current at the time directions are issued to modify the hardware. When this International Standard is used in procurement, the standard should be reviewed by the program/project office for applicability, and only the sections that apply to the project or program should be included in the procurement documentation.

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

1 Scope

This International Standard specifies the general characteristics, performance, design, test, 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 International Standard does not specify how to design GSE, but establishes the minimum requirements to provide simple, robust, safe, reliable, maintainable and cost-effective GSE.

This International Standard is applicable to the design 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 International Standard are optional for hardware used only at the manufacturing, development, or test sites prior to arrival at the launch, landing, or retrieval sites or at the mission control site. However, if such GSE is temporarily used at a launch, landing, or retrieval site, for whatever reason, this GSE shall comply with all the safety-related requirements of this International Standard, as a minimum.

NOTE — In the event of conflict between the documents referenced herein and the contents of this International Standard, the contents of this International Standard supersede, except where otherwise noted. The applicable contract or purchase/procurement order takes precedence over the contents of this International Standard in the event of conflicting requirements. Nothing in this International Standard supersedes applicable laws and regulations unless a specific exemption has been obtained.

2 Normative references

The following normative documents contain provisions that, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 448:1981, *Gas cylinders for industrial use — Marking for identification of content.*

ISO 898-7:1992, *Mechanical properties of fasteners — Part 7: Torsional test and minimum torques for bolts and screws with nominal diameter 1 mm to 10 mm.*

ISO 1000:1992, *SI units and recommendations for the use of their multiples and of certain other units.*

ISO 1949:1987, *Aircraft — Electrical connectors — Design requirements.*

ISO 1966:1973, *Crimped joints for aircraft electrical cables.*

ISO 2635:1979, *Aircraft — Conductors for general purpose aircraft electrical cables and aerospace applications — Dimensions and characteristics.*

ISO 2964:1985, *Aerospace — Tubing — Outside diameters and thicknesses — Metric dimensions.*

ISO 3010:1988, *Bases for design of structures — Seismic actions on structures.*

- ISO 6346:1995, *Freight containers — Coding, identification and marking.*
- IEC 60034 (all parts), *Rotating electrical machines.*
- IEC 60038:1983, *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 of 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 60326 (all parts), *Printed boards.*
- IEC 60364 (all parts), *Electrical installations of buildings.*
- IEC 60364-5-54:1980, *Electrical installations of buildings — Part 5: Selection and erection of electrical equipment — Chapter 54: Earthing arrangements and protective conductors.*
- IEC 60794 (all parts), *Optical fiber cables.*
- IEC 60874 (all parts), *Connectors for optical fibers and cables.*
- IEC 60884 (all parts), *Plugs and socket-outlets for household and similar purposes.*
- IEC 60947 (all parts), *Low-voltage switchgear and control gear.*
- IEC 61000 (all parts), *Electromagnetic compatibility (EMC).*
- IEC 61024 (all parts), *Protection of structures against lightning.*
- IEC 61086 (all parts), *Specification for coatings for loaded printed wire boards (conformal coatings).*
- ISO/IEC Guide 25:1990, *General requirements for the competence of calibration and testing laboratories.*

3 Definitions, symbols and abbreviated terms

3.1 Definitions

For the purposes of this International Standard, the following definitions apply.

3.1.1

cognizant authority

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

EXAMPLES ISO, IEC, etc.

3.1.2 commercial-off-the-shelf COTS

equipment, including hardware and associated software/procedures, that is commercially available from current industry inventory

3.1.3 critical weld

weld whose single failure during any operating condition could 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

EXAMPLES sling, cable, shackle, beam, etc.

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

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3.1.7 safety factor

ratio of ultimate strength, breaking strength, or yield strength to the material design limit stress

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3.1.8 safe working load

assigned load as shown on the identification tag, that is the maximum load the device or equipment shall operationally handle and maintain

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 — Sneak circuits are not the result of hardware failure but are latent conditions inadvertently designed into the hardware or coded into the software and triggered by timing or human error.

3.2 Symbols and abbreviated terms

A-50	aerozine-50
CFC	chlorofluorocarbon
CIL	critical items list
COTS	commercial off-the-shelf
ECS	environmental control system
EE	electrical, electronic and electromechanical
EMC	electromagnetic compatibility

EMI	electromagnetic interference
FMECA	failure mode, effects and criticality analysis
GSE	ground support equipment
ICD	interface control document
LH ₂	liquid hydrogen
LHe	liquid helium
LN ₂	liquid nitrogen
LOX or LO ₂	liquid oxygen
MMH	monomethylhydrazine
NDT	non-destructive test
NH ₃	ammonia
N ₂ H ₄	hydrazine
N ₂ O ₄	nitrogen tetroxide
OMD	operations and maintenance documentation
PCB	polychlorobiphenyl
PHE	propellant handlers ensemble
RF	radio frequency
SCAPE	self-contained atmospheric protective ensemble
SCC	stress corrosion cracking
SI	international system of units
UDMH	unsymmetrical dimethylhydrazine

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4 General

The general design requirements and criteria described in this International Standard are the minimum requirements necessary to meet the needs and expectations of internal customers (e.g. safety, reliability, maintainability, quality, supportability, etc.) in a cost-effective manner. In order to meet customer expectations, GSE may need requirements that are more stringent than those specified herein. In such cases, requirements that exceed the provisions described in this International Standard shall be determined by the responsible design organization in consultation with its customers (e.g. users, operators, etc.).

5 Functional designations

5.1 General

GSE covered by this document shall be classified according to one of the functional designations given in 5.2 to 5.6. Under each functional designation, GSE can be classified by criticality, whereby the GSE

- a) either physically or functionally interfaces with flight hardware/software;
- b) is classified as safety critical; and/or
- c) generates data used in determining flight worthiness/certification.