

Air cargo equipment — Restraint straps —

Part 1: Design criteria and testing methods

ICS 49.120

National foreword

This British Standard reproduces verbatim ISO 16049-1:2001 and implements it as the UK national standard.

The UK participation in its preparation was entrusted to Technical Committee ACE/57, Aircraft cargo systems and ground equipment, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this committee can be obtained on request to its secretary.

Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the BSI Standards Catalogue under the section entitled “International Standards Correspondence Index”, or by using the “Find” facility of the BSI Standards Electronic Catalogue.

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This British Standard, having been prepared under the direction of the Engineering Sector Policy and Strategy Committee, was published under the authority of the Standards Policy and Strategy Committee on 24 September 2001

Summary of pages

This document comprises a front cover, an inside front cover, the ISO title page, pages ii to iv, pages 1 to 17 and a back cover,

The BSI copyright date displayed in this document indicates when the document was last issued.

Amendments issued since publication

Amd. No.	Date	Comments

© BSI 24 September 2001

ISBN 0 580 38496 9

Air cargo equipment — Restraint straps —
Part 1:
Design criteria and testing methods

Équipement pour le fret aérien — Sangles d'arrimage —
Partie 1: Critères de conception et méthodes d'essai



Reference number
ISO 16049-1:2001(E)

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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 3.

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 part of ISO 16049 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 16049-1 was prepared by Technical Committee ISO/TC 20, *Aircraft and space vehicles*, Subcommittee SC 9, *Air cargo and ground equipment*.

ISO 16049 consists of the following parts, under the general title *Air cargo equipment — Restraint straps*:

- *Part 1: Design criteria and testing methods*
- *Part 2: Utilization guidelines and lashing calculations*

Air cargo equipment — Restraint straps —

Part 1: Design criteria and testing methods

1 Scope

1.1 This part of ISO 16049 specifies the design criteria and testing methods applicable to air cargo restraint straps to be used for tie-down of unitized or non-unitized cargo on board civil transport aircraft. It aims at identifying the design criteria and testing methods adequate to guarantee the ultimate load and operational dependability of cargo restraint strap assemblies with a typical 22 250 N (5 000 lbf) rated ultimate tension load capability, as used by the airline industry in order to restrain, on board civil transport aircraft during flight:

- cargo loaded and tied down on to airworthiness certified air cargo pallets, themselves restrained into aircraft lower deck or main deck cargo systems meeting the requirements of ISO 8097 (NAS 3610), or
- non-unitized individual pieces of cargo, or pieces of cargo placed on to an unrestrained (“floating”) pallet into either lower deck or main deck containerized cargo compartments of an aircraft.

1.2 The same restraint strap assemblies can also be used in other applications such as:

- non-containerized (bulk loaded) baggage and cargo compartments,
- to ensure cargo restraint inside an airworthiness certified air cargo container.

NOTE The ultimate loads permissible on the attachment points available in most aircraft bulk compartments and inside most air cargo containers are significantly lower than 22 250 N (5 000 lbf). This results in the restraint arrangements ultimate load capability being dictated by the weakest element, i.e. the attachment points. Typical 22 250 N ultimate load restraint straps will therefore be in excess of the requirements for such applications.

1.3 This part of ISO 16049 describes the design criteria for individual restraint strap assemblies, but does not intend specifying in any manner the way they are to be used aboard aircraft to ensure proper restraint throughout the certified flight envelope. It is important that tie-down arrangements meet all the applicable requirements of the Airworthiness Authorities approved Weight and Balance Manual for the aircraft type or sub-type concerned, particularly as regards, but not necessarily limited to, ultimate load factors to be taken into account to determine the number of straps to be used in each direction of restraint, maximum angles to be observed with the direction of restraint, minimum spacing of attachment points, etc.

1.4 When restraint strap assemblies are attached to the edge rails of a certified air cargo pallet meeting the requirements of ISO 8097, operating instructions should duly take into account the restraint net attachment point locations on the pallet edge rail and other requirements defined by the appropriate ISO 8097 configuration drawing(s).

1.5 The use of reliable and guaranteed restraint strap assemblies does not alone ensure flight safety: it also requires straps to be used and tie-down to be performed in accordance with operating instructions established by the aircraft manufacturer, by competent, suitably trained, personnel as defined in 4.18 of ISO 9002:1994.

1.6 Subject to proper operating instructions in accordance with 1.3 and 1.4, using unit restraint strap assemblies manufactured to an adequate design and a tested ultimate load capability is nevertheless deemed necessary in order to ensure flight safety. Although restraint straps are not formally subject to airworthiness certification, they serve an equivalent purpose and must be designed, fabricated, tested and used with equivalent precautions: this part of ISO 16049 is intended to allow manufacturer's self-certification under an approved ISO 9000 series, or equivalent, quality control programme.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 16049. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 16049 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 1833:1977, *Textiles — Binary fibre mixtures — Quantitative chemical analysis*.

ISO 2076:1999, *Textiles — Man-made fibres — Generic names*.

ISO 4117:1993, *Air and air/land cargo pallets — Specification and testing*.

ISO 4171:1993, *Air cargo equipment — Interline pallets*.

ISO 7166:1985, *Aircraft — Rail and stud configuration for passenger equipment and cargo restraint*.

ISO 8097:—¹⁾, *Aircraft — Minimum airworthiness requirements and test conditions for certified air cargo unit load devices*.

ISO/TR 8647:1990, *Environmental degradation of textiles used in air cargo restraint equipment*.

ISO 9788:1990, *Air cargo equipment — Cast components of double stud fitting assembly with a load capacity of 22 250 N (5 000 lbf), for aircraft cargo restraint*.

ISO 12118:1995, *Air cargo equipment — Identification of double-stud tie-down fittings having an omnidirectional rated load capacity of 22 250 N (5 000 lbf) or above*.

ISO 16049-2:—²⁾, *Air cargo equipment — Restraint straps — Part 2: Utilization guidelines and lashing calculations*.

Federal Aviation Regulations (FAR) and Joint Airworthiness Regulations (JAR) Parts 25, *Airworthiness Standards: transport category airplanes*.³⁾

3 Terms and definitions

For the purposes of this part of ISO 16049, the following terms and definitions apply.

3.1

restraint strap assembly

elementary tie-down unit consisting of flat woven textile webbing (one fixed length end and one adjustable end), one tensioning device and two end fittings, used for restraint of cargo on board civil transport aircraft

3.2

tie-down

fact of restraining cargo movements in relation to an aircraft's structure, throughout the range of relative accelerations resulting from the permissible flight envelope, by means of an appropriate use of a number of elementary tie-down devices against each direction of restraint

1) To be published. (Revision of ISO 8097:1995)

2) To be published.

3) FAR Part 25 constitutes the USA Government transport aircraft airworthiness regulations and can be obtained from US Government Printing Office, Mail Stop SSOP, Washington DC, 20402-9328, USA. JAR Part 25 constitutes the European Governments transport aircraft airworthiness regulations and can be obtained from JAA Headquarters, Saturnusstraat 8-10, P.O. Box 3000, NL 2130 KA Hoofddorp, Netherlands.