

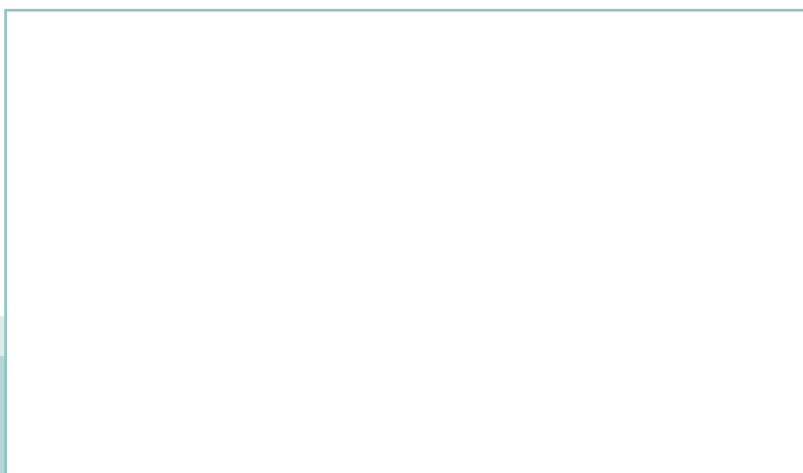
SVENSK STANDARD

SS-ISO 16049-1:2013

Fastställt/Approved: 2013-03-15
Publicerad/Published: 2013-03-18
Utgåva/Edition: 1
Språk/Language: engelska/English
ICS: 49.120

Utrustning för flygfrakt – Spännband – Del 1: Utförandekriterier och provningsmetoder (ISO 16049-1:2013, IDT)

Air cargo equipment – Restraint straps – Part 1: Design criteria and testing methods (ISO 16049-1:2013, IDT)



Standarder får världen att fungera

SIS (Swedish Standards Institute) är en fristående ideell förening med medlemmar från både privat och offentlig sektor. Vi är en del av det europeiska och globala nätverk som utarbetar internationella standarder. Standarder är dokumenterad kunskap utvecklad av framstående aktörer inom industri, näringsliv och samhälle och befrämjar handel över gränser, bidrar till att processer och produkter blir säkrare samt effektiviserar din verksamhet.

Delta och påverka

Som medlem i SIS har du möjlighet att påverka framtida standarder inom ditt område på nationell, europeisk och global nivå. Du får samtidigt tillgång till tidig information om utvecklingen inom din bransch.

Ta del av det färdiga arbetet

Vi erbjuder våra kunder allt som rör standarder och deras tillämpning. Hos oss kan du köpa alla publikationer du behöver – allt från enskilda standarder, tekniska rapporter och standardpaket till handböcker och onlinetjänster. Genom vår webbtjänst e-nav får du tillgång till ett lättnavigerat bibliotek där alla standarder som är aktuella för ditt företag finns tillgängliga. Standarder och handböcker är källor till kunskap. Vi säljer dem.

Utveckla din kompetens och lyckas bättre i ditt arbete

Hos SIS kan du gå öppna eller företagsinterna utbildningar kring innehåll och tillämpning av standarder. Genom vår närhet till den internationella utvecklingen och ISO får du rätt kunskap i rätt tid, direkt från källan. Med vår kunskap om standarders möjligheter hjälper vi våra kunder att skapa verklig nytta och lönsamhet i sina verksamheter.

Vill du veta mer om SIS eller hur standarder kan effektivisera din verksamhet är du välkommen in på www.sis.se eller ta kontakt med oss på tel 08-555 523 00.



Standards make the world go round

SIS (Swedish Standards Institute) is an independent non-profit organisation with members from both the private and public sectors. We are part of the European and global network that draws up international standards. Standards consist of documented knowledge developed by prominent actors within the industry, business world and society. They promote cross-border trade, they help to make processes and products safer and they streamline your organisation.

Take part and have influence

As a member of SIS you will have the possibility to participate in standardization activities on national, European and global level. The membership in SIS will give you the opportunity to influence future standards and gain access to early stage information about developments within your field.

Get to know the finished work

We offer our customers everything in connection with standards and their application. You can purchase all the publications you need from us - everything from individual standards, technical reports and standard packages through to manuals and online services. Our web service e-nav gives you access to an easy-to-navigate library where all standards that are relevant to your company are available. Standards and manuals are sources of knowledge. We sell them.

Increase understanding and improve perception

With SIS you can undergo either shared or in-house training in the content and application of standards. Thanks to our proximity to international development and ISO you receive the right knowledge at the right time, direct from the source. With our knowledge about the potential of standards, we assist our customers in creating tangible benefit and profitability in their organisations.

If you want to know more about SIS, or how standards can streamline your organisation, please visit www.sis.se or contact us on phone +46 (0)8-555 523 00



Den internationella standarden ISO 16049-1:2013 gäller som svensk standard. Detta dokument innehåller den officiella engelska versionen av ISO 16049-1:2013.

The International Standard ISO 16049-1:2013 has the status of a Swedish Standard. This document contains the official version of ISO 16049-1:2013.

© Copyright/Upphovsrätten till denna produkt tillhör SIS, Swedish Standards Institute, Stockholm, Sverige. Användningen av denna produkt regleras av slutanvändarlicensen som återfinns i denna produkt, se standardens sista sidor.

© Copyright SIS, Swedish Standards Institute, Stockholm, Sweden. All rights reserved. The use of this product is governed by the end-user licence for this product. You will find the licence in the end of this document.

Upplysningar om sakinnehållet i standarden lämnas av SIS, Swedish Standards Institute, telefon 08-555 520 00. Standarder kan beställas hos SIS Förlag AB som även lämnar allmänna upplysningar om svensk och utländsk standard.

Information about the content of the standard is available from the Swedish Standards Institute (SIS), telephone +46 8 555 520 00. Standards may be ordered from SIS Förlag AB, who can also provide general information about Swedish and foreign standards.

Denna standard är framtagen av kommittén för Markutrustningar för flygplatser, SIS/TK 259.

Har du synpunkter på innehållet i den här standarden, vill du delta i ett kommande revideringsarbete eller vara med och ta fram andra standarder inom området? Gå in på www.sis.se - där hittar du mer information.

Contents

Page

Foreword	iv
Introduction	v
1 Scope	1
2 Normative references	1
3 Terms and definitions	2
4 Design criteria	6
4.1 General.....	6
4.2 Ultimate load.....	6
4.3 Elongation.....	7
4.4 Flammability.....	8
4.5 Environmental degradation.....	8
4.6 Dimensions.....	8
4.7 Tensioning device.....	8
4.8 End fittings.....	9
4.9 Webbing and sewing.....	10
4.10 Detailed design.....	10
5 Testing methods	11
5.1 Tests.....	11
5.2 Objective.....	11
5.3 Test specimens.....	11
5.4 Testing apparatus.....	11
5.5 Ultimate load test.....	12
5.6 Elongation test.....	13
5.7 Cyclic load test.....	13
5.8 Flammability test.....	14
5.9 Webbing elongation test (optional).....	14
5.10 Webbing abrasion test (optional).....	14
5.11 Test record.....	15
6 Quality control	15
7 Markings	16
8 Options	17
9 Manufacturer's instructions	18
10 Operating instructions	18
Bibliography	19

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. 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. 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.

The committee responsible for this document is ISO/TC 20, *Aircraft and space vehicles*, Subcommittee SC 9, *Air cargo and ground equipment*.

This second edition cancels and replaces the first edition (ISO 16049-1:2001), which has been technically revised.

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*

Introduction

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.

Throughout this part of ISO 16049, the minimum essential criteria are identified by use of the key word “shall”. Recommended criteria are identified by use of the key word “should” and, while not mandatory, are considered to be of primary importance in providing safe restraint straps. Deviation from recommended criteria should only occur after careful consideration, extensive testing, and thorough service evaluation have shown alternative methods to be satisfactory.

The requirements of this part of ISO 16049 are expressed in the applicable SI units, with approximate inch-pound units conversion between brackets for convenience in those countries using that system.

Air cargo equipment — Restraint straps —

Part 1: Design criteria and testing methods

1 Scope

This part of ISO 16049 specifies the design criteria and testing methods adequate to guarantee the ultimate load and operational dependability of cargo restraint strap assemblies with a typical rated ultimate tension load capability of 22 250 N (5 000 lbf), as used by the airline industry in order to restrain on board civil transport aircraft during flight:

- a) cargo loaded and tied down onto airworthiness approved air cargo pallets, themselves restrained into aircraft lower deck, main deck or upper deck cargo systems and meeting the requirements of ISO 8097 (NAS 3610) or ISO/PAS 21100, or
- b) non-unitized individual pieces of cargo, or pieces of cargo placed onto an unrestrained (“floating”) pallet into either lower deck, main deck or upper deck containerized cargo compartments of an aircraft.

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

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

NOTE The ultimate loads allowable 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 arrangement’s 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.

Compliance with this part of ISO 16049 provides one means of cargo restraint straps airworthiness approval by Civil Aviation Authorities under TSO / ETSO C-172, in addition to the other requirements therein.

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 4117, *Air and air/land cargo pallets — Specification and testing*

ISO 4171, *Air cargo equipment — Interline pallets*

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

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

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

ISO 9788, *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 10254, *Air cargo and ground equipment — Vocabulary*

1) Endorsement of NAS 3610.

ISO 12118, *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, *Air cargo equipment — Restraint straps — Part 2: Utilization guidelines and lashing conditions*

ISO/PAS 21100, *Air cargo unit load devices — Performance requirements and testing parameters*

European Aviation Safety Agency CS-25, *Certification Specifications for Large Aeroplanes*²⁾

Japanese Airworthiness Standard Part 3 (Civil Aeronautics Law Article 10 § 4)³⁾

USA Code of Federal Regulations Title 14 CFR Part 25 — *Airworthiness Standards: Transport Category Airplanes*⁴⁾

European Technical Standard Order (ETSO) C-172, *Cargo Restraint Strap Assemblies*

Federal Aviation Administration Technical Standard Order (TSO) C-172, *Cargo Restraint Strap Assemblies*³⁾

NOTE Also see informative references in Bibliography.

3 Terms and definitions

For the purpose of this document, the terms and definitions given in ISO 10254 and the following 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 allowable flight envelope, by means of an appropriate use of a number of elementary tie-down devices against each direction of restraint

3.3

flat woven textile webbing

conventional or shuttleless woven narrow fabric made of continuous textile fibres, generally with multiple plies, and the prime function of which is load bearing

Note 1 to entry: A characteristic of webbing is its tight woven fabric selvedge.

3.4

tensioning device

mechanical device inducing a tensile force in the load restraint assembly

EXAMPLE Ratchets, winches, over-centre buckles; see examples in [Figure 1](#), C1 and C6.

2) EASA CS-25 constitutes the European governments transport aircraft airworthiness approval Regulations, and it, as well as ETSO C-172, can be obtained from European Aviation Safety Agency (EASA), Otto Platz 1, Postfach 101253, D-50452 Cologne, Germany, or its web site at www.easa.europa.eu.

3) Japanese Airworthiness Standard Part 3 (ISBN 4-89279-661-1) can be obtained from the Civil Aviation Bureau (CAB) of the Ministry of Land, Infrastructure and Transport, Tokyo, Japan, web site www.mlit.jp/en.

4) 14 CFR Part 25 constitutes the USA government transport aircraft airworthiness approval Regulations, and it, as well as TSO C-172, can be obtained from US Government Printing Office, Mail Stop SSOP, Washington DC 20402-9328, or its website at www.gpoaccess.gov/ecfr.

3.5**tension retaining device**

metallic part connecting the webbing by clamping action and retaining the force induced in the tensioning device by hand

EXAMPLE Cam buckles, sliding bar buckles; see example in [Figure 1](#), F.

3.6**end fitting**

metallic device connecting the webbing or the tensioning device to the attachment point on the aircraft structure, the pallet edge rail or the load

Note 1 to entry: See examples in Figure 1, D1 to D6.

Note 2 to entry: The end fittings most commonly used on air cargo restraint straps include:

- a) retainer equipped flat hook (see example in Figure 1, D1);
- b) air cargo tie-down double stud (male) fitting conforming to ISO 9788 and ISO 12118, connected directly (sewn to the webbing; see example in Figure 1, D3) or by an intermediate ring;
- c) piece of aircraft restraint (female) rail conforming to ISO 7166.

3.7**tension force indicator**

device that indicates the tensile force applied to the restraint strap assembly by means of the tensioning device and movement of the load acting on the load restraint device

3.8**length of restraint strap assembly****3.8.1****fixed length**

l_{GF}

length of a fixed end, measured from the force bearing point of the end fitting to the outer turning radius of the connection of the webbing to the tensioning device

Note 1 to entry: See [Figure 2](#).

Note 2 to entry: This length can be zero, i.e. the end fitting directly attached to the tensioning device.

3.8.2**adjustable length**

l_{GL}

length of an adjustable end, measured from the free end of the webbing to the force bearing point of the end fitting

Note 1 to entry: See [Figure 2](#).