INTERNATIONAL STANDARD

ISO 21785

First edition
2020-02

Air cargo unit load devices — Load distribution model

Unités de charge de fret aérien — Modèle de répartition des charges

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO 21785:2020
https://standards.iteh.ai/catalog/standards/sist/312bcc18-092c-4b11-849b-1edcb4824260/iso-21785-2020

Reference number
ISO 21785:2020(E)

© ISO 2020

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO 21785:2020
https://standards.iteh.ai/catalog/standards/sist/312bcc18-092c-4b11-849b-1edcb4824260/iso-21785-2020

COPYRIGHT PROTECTED DOCUMENT

© ISO 2020

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

© ISO 2020 – All rights reserved

Contents

Page

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO 21785:2020
https://standards.iteh.ai/catalog/standards/sist/312bcc18-092c-4b11-849b-1edcb4824260/iso-21785-2020

© ISO 2020 – All rights reserved

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.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

This document was prepared by Technical Committee ISO/TC 20, *Aircraft and space vehicles*, Subcommittee SC 9, *Air cargo and ground equipment*.

ISO 21785:2020
https://standards.iteh.ai/catalog/standards/sist/312bcc18-092c-4b11-849b-

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.

© ISO 2020 – All rights reserved

Introduction

This document specifies a reference model for load distribution on air cargo unit load device (ULD) bases, to reflect in a standardized manner maximum allowable centre of gravity (C.G.) eccentricity limitations.

The civil aviation requirements referred to in this document are those concerning certification of transport aircraft and appliances to be installed aboard them, and constitute the set of design and operation requirements internationally agreed in application of International Civil Aviation Organization (ICAO) Annex 8, Airworthiness of aircraft, to the Convention on International Civil Aviation.

Throughout this document, 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 air cargo unit load devices. Deviation from recommended criteria should only occur after careful consideration and thorough service evaluation have shown alternate methods to provide an equivalent level of safety.

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO 21785:2020
https://standards.iteh.ai/catalog/standards/sist/312bcc18-092c-4b11-849b-1edcb4824260/iso-21785-2020

© ISO 2020 – All rights reserved

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO 21785:2020
https://standards.iteh.ai/catalog/standards/sist/312bcc18-092c-4b11-849b-1edcb4824260/iso-21785-2020

Air cargo unit load devices — Load distribution model

1 Scope

This document defines the industry agreed model for load distribution on air cargo unit load devices (ULD) bases to apply the maximum allowable centre of gravity (C.G.) eccentricity.

Its purpose is to establish a common reference load distribution algorithm for:

a) comparable and repeatable ULD testing methods, or equivalent numeric simulations;

b) aircraft structure and cargo systems design assumptions, consistent with existing airframers practices; and

c) definition of operators unit load devices utilization rules and cargo build-up training programs.

It applies to all types of unit load devices intended for use on board civil transport aircraft and airworthiness approved in accordance with the performance requirements and testing parameters of either ISO 21100 or, as applicable, ISO 8097.

It also applies to non-airworthiness approved (non-certified) containers as defined in ISO 4118, the utilisation of which is controlled by the provisions of the aircraft type's Weight and Balance Manual and other airframe manufacturer's documents.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

2 Normative references

ISO 21785:2020

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

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

ISO 21100, *Air cargo unit load devices — Performance requirements and test parameters*

3 Terms and definitions

For the purposes of this document, the terms and definitions of ISO 10254 and the following apply:

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

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

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

3.1
eccentricity
offset
<centre of gravity> plan view distance between the overall centre of gravity (C.G.) of the unit load device and its contents and the geometric centre of its base, expressed in percentage of the base length and width

3.2
homogeneous cargo
cargo of homogeneous density and of such a nature that the whole weight of each piece is evenly distributed over the whole of that piece's footprint area

4 Load distribution model

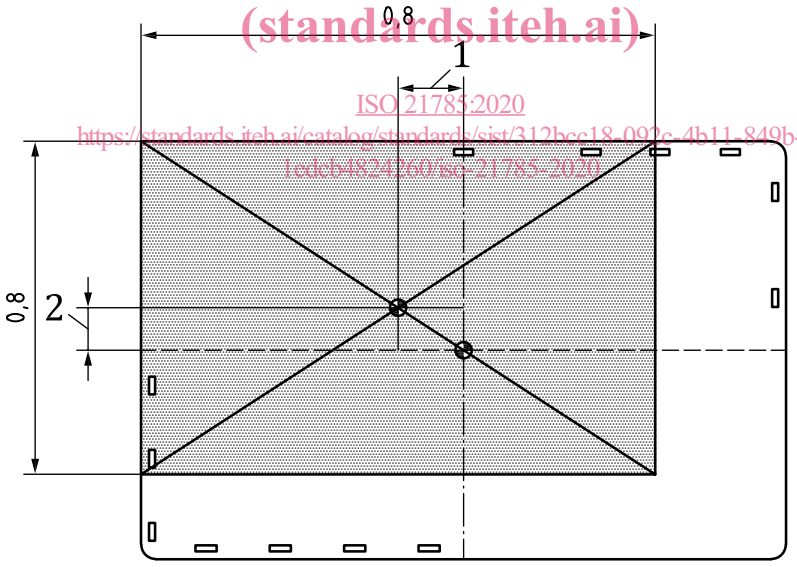
4.1 Principle

4.1.1 Airworthiness approval of each type and size of unit load device includes maximum load centre of gravity (C.G.) eccentricity (offset) allowances at unit maximum gross mass, that are part of its testing and approval (see ISO 21100 or ISO 8097, as applicable, for unit load device configurations and ultimate load criteria).

4.1.2 C.G. eccentricity is expressed and measured in percentage (%) of the ULD's base length or width from the geometric centre of the base. The maximum eccentricity shall be demonstrated under maximum gross mass in accordance with ISO 21100 or ISO 8097, therefore allowed by ULD approval, is ±10 % of base length and width, or ±5 % of length and ±10 % of width for sizes G, H, J, and R ULDs.

4.1.3 The load distribution on a pallet's surface or a container base corresponding to the certified maximum C.G. eccentricity allowances shall be defined as homogeneous cargo with maximum gross mass occupying a correspondingly reduced area of the base surface. See example (for 10 % simultaneous longitudinal and lateral C.G. offset) in Figure 1:

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO 21785:2020
https://standards.iteh.ai/catalog/standards/sist/312bcc18-092c-4b11-849b-1cdcb4824240/iso-21785-2020



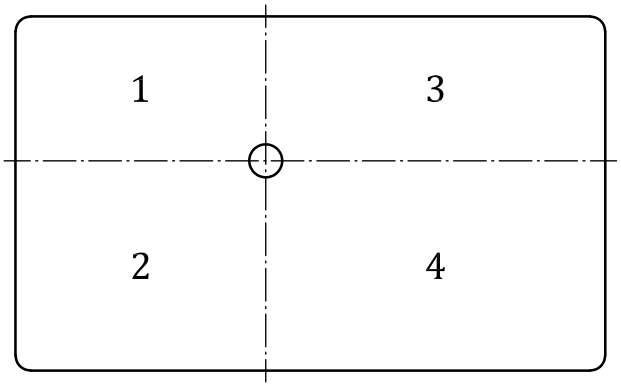
Key

1 10 % of length
2 10 % of width
load footprint

Figure 1 — Load distribution principle

© ISO 2020 – All rights reserved

4.1.4 This load distribution principle defines four quadrants on a pallet's surface or a container base, centred on the load's C.G. as shown in Figure 2.



Key

1 right forward quadrant
2 left forward quadrant
3 right aft quadrant
4 left aft quadrant

Figure 2 — Load distribution quadrants

iTeh STANDARD PREVIEW
(standards.iteh.ai)

Both for design and operational utilization, each of the quadrants, and particularly most critical quadrant '1', shall be separately considered in conjunction with the cargo loading system (CLS) regarding:

ISO 21785:2020
https://standards.iteh.ai/catalog/standards/sist/312bcc18-092c-4b11-849b-1a1de4834260/iso-21785-2020

a) aircraft area load and linear (running) load limitations; and

b) load restraint by tie-down on pallet edge tracks.

NOTE When load restraint is ensured by a compatible approved pallet net, this is certified according to the same load C.G. eccentricity criteria as the pallet.

4.1.5 A maximum allowable area load $\frac{m_{MGW}}{S \times 0,64}$ (or : $\frac{m_{MGW}}{S \times 0,72}$ in the case of sizes G, H, J, or R), where S is the ULD base plate area and m_{MGW} the maximum gross mass of the unit load device and its contents, can be derived from the reference load distribution model of 4.1.3. This maximum allowable distributed area load should not be confused with the maximum ULD base area load defined in the relevant ISO 21100 or ISO 8097 ULD configuration sheet, that is intended to specify the minimum load spreading requirements for the base, and protect aircraft conveyor systems and structure against excessive local loading. Accordingly, if the maximum allowable distributed area load, based on the applicable MGW for the intended aircraft position, is:

a) lower than or equal to the maximum ULD base area load: the ULD's maximum certified eccentricity limits are fully applicable;

b) higher than the maximum ULD base area load (which may be the case for, particularly, sizes A and M in certain aircraft main deck applications): the maximum ULD load C.G. eccentricity shall be operationally limited for the MGW concerned, so that the resulting maximum allowable distributed area load does not exceed the maximum ULD base area load.

© ISO 2020 – All rights reserved