INTERNATIONAL STANDARD

ISO 10327

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Aircraft — Certified aircraft container for air cargo — Specification and testing

Aéronefs — Conteneurs certifiés pour le fret aérien — Spécification et essais

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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 10327 was prepared by Technical Committee ISO/TC 20, *Aircraft and space vehicles*, Subcommittee SC 9, *Air cargo and ground equipment*.

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Introduction

For the purpose of this International Standard the minimum essential criteria are identified by use of the key word "shall". Other recommended criteria are identified by the key word "should", and while not mandatory, are considered to be of primary importance in providing serviceable, economical, and practical air transport containers. Deviation from recommended criteria should occur only after careful consideration, extensive testing and thorough service evaluation have shown alternative methods to be satisfactory.

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Aircraft — Certified aircraft container for air cargo — Specification and testing

1 Scope

This International Standard specifies the basic requirements for the specification and testing of containers that have the nominal base sizes shown in table 1.

Table 1

Size code of the base in accordance with ISO 8097	Container size	
	mm	in
A	2 235 × 3 175	88 × 125
M	2 438 × 3 175	96 × 125
B	2 235 × 2 743	88 × 108

It provides minimum requirements for a certified aircraft container not exclusively designed for lower deck and wide body aircraft.

2 Normative references

The following standards contain provisions which, 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 4116:1986, *Air cargo equipment — Ground equipment requirements for compatibility with aircraft unit load devices.*

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

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

ISO 8097:1993, *Aircraft — Minimum airworthiness requirements and test conditions for certified air cargo unit load devices.*

ISO 11242:—[1], *Aircraft — Pressure equalization requirements for cargo container.*

IATA, *ULD Technical Manual,* 8th edition.[2]

3 Base

3.1 Construction

The base shall be enclosed on all four sides by an aluminium extrusion. The corners' integrity with the edges shall be a prime concern. The corner radius shall be 50,8 mm (2 in). The base shall not contain rough or sharp edges potentially dangerous to personnel, cargo, airplane or terminal handling equipment. The construction of the base shall be designed for strength and durability, to withstand harsh treatment in service. The base shall be structurally attached to, and an integral part of, the container assembly. The base shall be removable with hand tools and shall be interchangeable.

1) To be published.

2) Available from International Air Transport Association, 2000 Peel Street, Montreal, Canada H3A 2R4 or Route de l'Aéroport 33, Case postale 672, 1215 Geneva 15, Switzerland.

The base shall comply with the performance criteria specified in ISO 4171.

3.2 Strength

The minimum core stiffness shall be 429 $N \cdot m^2/m$ $(3\,800\ lbf \cdot in^2/in)$ width/length of core.

4 Superstructure

4.1 Contours

The contour shall conform with the maximum allowable ULD contour. All dimensions shown are external maximum dimensions and provide minimum acceptable airplane clearance (see figure 1). Any deviation or tolerance shall be to the low side to prevent reduction of clearance.

The maximum allowable ULD contours are shown in the IATA *ULD Technical Manual,* Specification 50/0, Appendix E.

4.2 Fittings and components

4.2.1 Handles and straps

Two flush handles or straps shall be provided for manual movement of the container. Each handle shall provide space suitable for gripping with a gloved hand and shall have a capacity of 445 daN (1 000 lbf) pull in any direction.

4.2.2 Cargo restraint

Securing points shall be provided around the interior walls spaced approximately 500 mm (approximately 20 in) from the base. Each of these points alone shall be capable of reacting an omni-directional load of 2 225 daN (5 000 lbf).

These points shall comply with ISO 7166.

4.2.3 Components

Component parts and panel assemblies shall be replaceable by interchange with new or repaired ones.

4.3 Doors

4.3.1 Doors — Loading access

The door should be designed to make a maximum possible internal cross-section available for loading and shall assure no interference of the door and/or latches, and/or door hardware with ground equipment in accordance with ISO 4116 [stops and guides 102 mm (4 in) high].

4.3.2 Door operation

It shall be possible for one man to open or close the door and any associated net or hardware in no more than one minute.

4.3.3 Door handles, straps and hand holds

Handles, straps or hand holds shall be provided on each door for handling the door, and these devices shall be suitable for gripping with a gloved hand.

They shall be designed so that they can cause no damage to adjacent units.

4.3.4 Door latches and restraint attachments

Door latch and restraint hardware design shall preclude damage to shell or door during door stowage and installation/removal with no special attention.

No tools shall be required to open and close the doors or latches.

4.3.5 Door locking

It shall be possible to lock (discourage entry) and seal the door, so as to give visual indications of unauthorized entry.

4.3.6 Door sealing (water)

Particular design attention should be given to prevention of water intrusion through door-to-container assembly interface areas.

4.4 Pressure equalization

The container design shall comply with the specifications of ISO 11242.

4.4.1 Normal flight conditions

Where closing of the door does not allow for sufficient air circulation between the interior and the exterior of the container, a vent area of 5 cm^2/m^3 $(0{,}02\ in^2/ft^3)$ of container useful volume should be provided. This vent area shall be protected in order to obviate any risk due to cargo load shift likely to be encountered during normal flight conditions.

4.4.2 Emergency conditions

A minimum opening area in case of rapid decompression of 100 cm^2/m^3 $(0{,}45\ in^2/ft^3)$ of container

internal volume shall be provided. It shall be activated within 0,2 seconds after the event at a maximum differential blow-out pressure of 14 kPa (2 lbf/in^2). This opening area will be adequately protected from cargo to ensure its proper functioning in case of an emergency.

4.5 Customs sealing

When customs sealing is required, the container shall meet the appropriate requirements for international and domestic regulations.

5 Design loads

The container shall be used to restrain the maximum design loads given in table 2.

Table 2

Size code in accordance with ISO 8097	Maximum gross weight[1]	
	kg	lb
A[2]	6 804	15 000
A	6 033	13 300
M	6 804	15 000
B	4 536	10 000

1) The term "weight" is used throughout this International Standard instead of the correct technical term "mass" in order to conform to current commercial usage.

2) For main deck only.

6 Destination placard holder

One or more placard holders shall be fitted to the body to accommodate a destination placard of standard size A5 [210 mm × 148 mm (8 1/4 in × 5 7/8 in].

7 Tare weight objectives

The tare weight of the container shall be a minimum consistent with the requirements and within limits of sound design practice.

8 Materials and processes

The materials and processes selected shall give consideration to the extremely hard usage to which the container will be subjected, to provide for maximum service life. All metal parts shall be suitably protected against corrosion. All non-metallic materials which are liquid absorbent shall be sealed or treated to prevent liquid absorbtion.

9 Markings

9.1 Marking required

Each unit load device shall carry at least the following markings:

a) ULD Identification Code[3];

b) Maximum gross weight (MGW), in kilograms and in pounds;

c) Actual tare weight (TARE), in kilograms and in pounds;

d) TSO-Markings[3];

9.2 Size of markings

All markings shall be in characters

a) not less than 101,6 mm (4 in) high for ULD ID Code, and

b) not less than 25,4 mm (1 in) high for the maximum gross weight and tare weight.

All characters shall be of proportionate width and thickness, durable, and in a colour contrasting with that of the container.

9.3 Marking location

The marking shall be shown at the top centre of at least two, preferably three, of the fixed panel sides, in such a manner that good readability is ensured during all phases of handling.

Top contoured units shall have markings on no less than two sides of the unit at a height between 1 143 mm and 1 651 mm (45 in and 65 in) above the base. The markings should be on the slope of the contour for readability when several units are butted together.

3) In accordance with the IATA *ULD Technical Manual*, Specification 40/1.

9.4 Use of containers for hanging loads

9.4.1 General requirements

Containers may, as an option, be equipped with ancillary devices and/or attachments designed to support items of load in a hanging position, for example garments on hangers.

Depending on design, such devices can consist of either cargo hanging bars or frames directly attached to the container structure (with or without additional posts to prevent container deflection, as required), or a separate structure to be installed in the container to bring the hanging load to bear onto the container base.

In either case, it must be noted that load distribution on the base undersurface and ease of movement of the loaded container on aircraft or ground equipment conveyor systems will be much improved if the container is equipped with a stiff (for example forkliftable) type of base. A base core stiffness significantly exceeding the minimum of 429 $N \cdot m^2/m$ (3 800 $lbf \cdot in^2/in$) width/length of core is recommended.

9.4.2 Loading requirements

The load path from hanging loads into the container and the supporting aircraft structure can be significantly different from that of loads resting on the base, as taken into account by container airworthiness certification. As a result, particularly in the event of major download gusts during flight, parts of the aircraft structure or conveyor equipment could be damaged by uneven load distribution.

In order to protect the aircraft structure:

a) Unless specific allowances are provided by the aircraft manufacturer to carry hanging loads at certain container positions, the maximum allowed hanging load shall not exceed 50 % of the container's certified maximum gross weight if the container is equipped with a thin (for example aluminium plate) base.

   The above requirements apply to the use of general purpose containers, but certain container types specially designed for carrying hanging loads may allow up to 100 % of certified maximum gross weight.

b) In addition, elements used to hang the loads from the supporting structure shall be designed to break away under a down load equivalent to twice the maximum allowed hanging load.

Notwithstanding the above minimum requirements, care should be taken that the maximum allowable area loads defined in the aircraft type's Weight and Balance Manual are not exceeded as a result of uneven or concentrated load distribution. If they are, guidance and approval from the aircraft manufacturer should be obtained prior to using the container with hanging loads.

9.4.3 Additional marking requirements

In addition to the mandatory container marking requirements given in 9.1, the container shall be marked, in the immediate vicinity of its maximum gross weight marking and in the same character size, with the following marking:

MAXIMUM HANGING LOAD XXXX KG (XXXX LB)

10 Test No. 1: Horizontal load test, operational loads

10.1 General

This test shall be carried out to prove the ability of the container to withstand maximum operational horizontal loads that may be experienced during handling and transportation.

10.2 Procedure

Secure the container under test to the aircraft restraint system or a system equivalent to each of those shown in ISO 8097, appropriate to the base configuration.

Apply horizontally to one side of the container a test load evenly distributed equal to the maximum gross weight, less tare.

Repeat the test with the test load applied to the side perpendicular to the previous one.

Should their structure not be identical, test the opposite sides in the same manner.

10.3 Requirements

The deflection of the intersection of the top and side panel shall not exceed 38,1 mm (1,5 in) out of the maximum allowable contour (see figure 1).

Upon completion of the test, the container shall show neither detrimental permanent deformation, nor abnormality which will render it unsuitable for use,

and the dimensional requirements affecting handling, securing and interchange shall be satisfied.

11 Test No. 2: Upward load test, operational loads

11.1 General

This test shall be carried out to prove the ability of the container to withstand the maximum operational upward loads that may be experienced during handling and transportation.

11.2 Procedure

Secure the container under test to the aircraft restraint system equivalent to each of those shown in ISO 8097, appropriate to the base configuration.

Apply upwards to the container a test load evenly distributed equal to the maximum gross weight, less tare.

11.3 Requirements

Upon completion of the test, the container shall show neither permanent deformation, nor abnormality which will render it unsuitable for use, and those dimensional requirements affecting handling, securing and interchange shall be satisfied.

12 Test No. 3: Base strength

12.1 General

This test shall be carried out to prove the ability of the container base to withstand the maximum operational loads that may be experienced during handling and transportation.

12.2 Procedure

12.2.1 All containers

Rest the container under test on the aircraft loading system or its equivalent, consisting of four rows of rollers approximately equally spaced over a minimum width of 1 930 mm (76 in) measured between centres, with each row composed of 38,1 mm (1,5 in) diameter rollers 76,2 mm (3 in) long uncrowned with edge radius $R = 1{,}5$ mm (0,06 in), spaced on 254 mm (10 in) centres. The container travels perpendicular to the roller axis.

Load the container floor uniformly to 5 749 daN/m^2 (1 200 lbf/ft^2). The load shall be applied to an area 1 524 mm (5 ft) wide centred in the container, and the load shall equal but not exceed three times the container maximum payload.

12.2.2 Additional test for containers 2 438 mm to 2 997 mm (96 in to 118 in) high

Place the container on a roller system compatible with the minimum requirements of ISO 4116, and in such a way that the industrial truck can easily drive into the container.

Manoeuvre, over an area extending at least 457 mm (1,5 ft) inside the container, an industrial truck loaded to an axle weight of not less than 5 380 daN (12 000 lbf) (including the weight of the truck) or 2 668 daN (6 000 lbf) per wheel, applied to a contact area not greater than 141 cm^2 (22 in^2), and assuming a wheel width of not less than 178 mm (7 in) and wheel centres of 762 mm (30 in).

12.3 Requirements

Upon completion of the test(s), the container shall show neither detrimental permanent deformation, nor abnormality which will render it unsuitable for use, and the dimensional requirements affecting handling, securing and interchange shall be satisfied.

The doors shall open and close with no prevalent binding, and the locks shall engage and disengage.

13 Test No. 4: Cyclic test and bridging and cresting

13.1 General

This test shall be carried out to prove the ability of the container base and structure to withstand the maximum operational loads that may be experienced during handling.

13.2 Procedure

Uniformly load the container to its maximum gross weight. The height of the centre of gravity shall be 50 % of the height shown in ISO 8097. The maximum weight of a single load shall not exceed 25 daN (56 lbf) and shall have a maximum base of 1 000 cm^2 (155 in^2). Cycle the container 300 times over the system defined in figure 2, at a speed of 0,305 m/s (1 ft/s).

Each cycle shall be equal to at least the distance between A and C (or C and A). The test shall be such that the container bumps twice per cycle at the above-mentioned speed against the end stops.

Twenty cycles shall include a stepped junction of 180 mm (7 in) in area I (see figure 2).

13.3 Requirements

Upon completion of the test, the container shall show neither permanent deformation, cracks, missing parts, nor abnormality which will render it unsuitable for use, and those dimensional requirements affecting handling, securing and interchange shall be satisfied.

14 Test No. 5: Resistance to racking

14.1 General

This test shall be carried out to prove the ability of the container to withstand the maximum operational racking loads that may be experienced during handling and transportation.

14.2 Procedure

Restrain the container loaded to maximum gross weight at the base along one side against sideways movement.

Subject the top edge of the opposite side of the container to horizontal uniformly distributed forces along its length sufficient to reduce to zero the pressure between the bottom of the container and the aircraft system on the side opposite to that which is restrained against sideways movement.

14.3 Requirements

Upon completion of the test, the container shall show neither permanent deformation, nor abnormality which will render it unsuitable for use, and those dimensional requirements affecting handling, securing and interchange shall be satisfied.

15 Test No. 6: Hanging load test (optional)

15.1 General

This test shall be carried out to prove the ability of a container with provisions for hanging loads in the roof to withstand the maximum operational roof loads that may be experienced during handling and transportation of hanging loads.

15.2 Procedure

Secure the container under test to the aircraft restraint system or a system equivalent to each of those shown in ISO 8097, appropriate to the base configuration.

Evenly load the provisions for hanging loads to 200 % of the maximum required roof load (see table 3).

Table 3 — Hanging loads

Values in decanewtons

Roof size	Load	
	Lower deck (LD) 1 625 mm (64 in) high	Main deck (MD) 2 438 mm (96 in) high, and over
A	1 500	2 200
B	1 300	2 000
M	1 600	2 400
NOTE — The location of the centre of gravity shall be in accordance with ISO 8097.		

Repeat the test for one side and the side perpendicular to this with the test load applied at an angle of 15° to the vertical. Should their structure not be identical, test the opposite sides in the same manner.

15.3 Requirements

The deflection of the intersection of the top and side panel shall not exceed 38,1 mm (1,5 in) (see figure 1).

Upon completion of the test, the container shall show neither detrimental permanent deformation, nor abnormality which will render it unsuitable for use, and the dimensional requirements affecting handling, securing and interchange shall be satisfied.

16 Test No. 7: Local indentation (performance)

16.1 Roller test

Apply a 890 daN (2 000 lbf) load by a steel roller, 51 mm (2 in) long by 25,4 mm (1 in) diameter (see figure 3).

Apply a 890 daN (2 000 lbf) load parallel to the base over an area of 5,1 mm (0,2 in) long by 7,6 mm (0,3 in) wide on the vertical face of the edge, as shown in figure 3.

16.2 Ball test

Subject the base surface or a representative portion thereof to a load of 400 daN (900 lbf) on a 25,4 mm (1 in) diameter steel ball.

16.3 Requirements

After test 16.1, the maximum indentation (permanent set) allowed at any location of the base shall be 0,25 mm (0,01 in).

After test 16.2, there shall not be permanent indentation in excess of 0,5 mm (0,02 in).

17 Test No. 8: Water tightness test

17.1 General

This test shall be carried out last, and is to demonstrate the ability of the container to withstand inclement weather.

17.2 Procedure

Apply a stream of water on all joints and seams of the container from a nozzle of 12,7 mm (0,5 in) inside diameter at a pressure of about 1 bar [corresponding to a height of about 10 m (33 ft) of water on the upstream side of the nozzle]. Hold the nozzle at a distance of 1,52 m (5 ft) from the container under test, and the traverse speed of the stream shall be 101,6 mm/s (4 in/s).

Procedures involving the use of several nozzles are acceptable providing that each joint or seam is subjected to a water loading no less than that which would be given by a single nozzle.

17.3 Requirements

Upon completion of the test, the container shall be free from penetration of water.

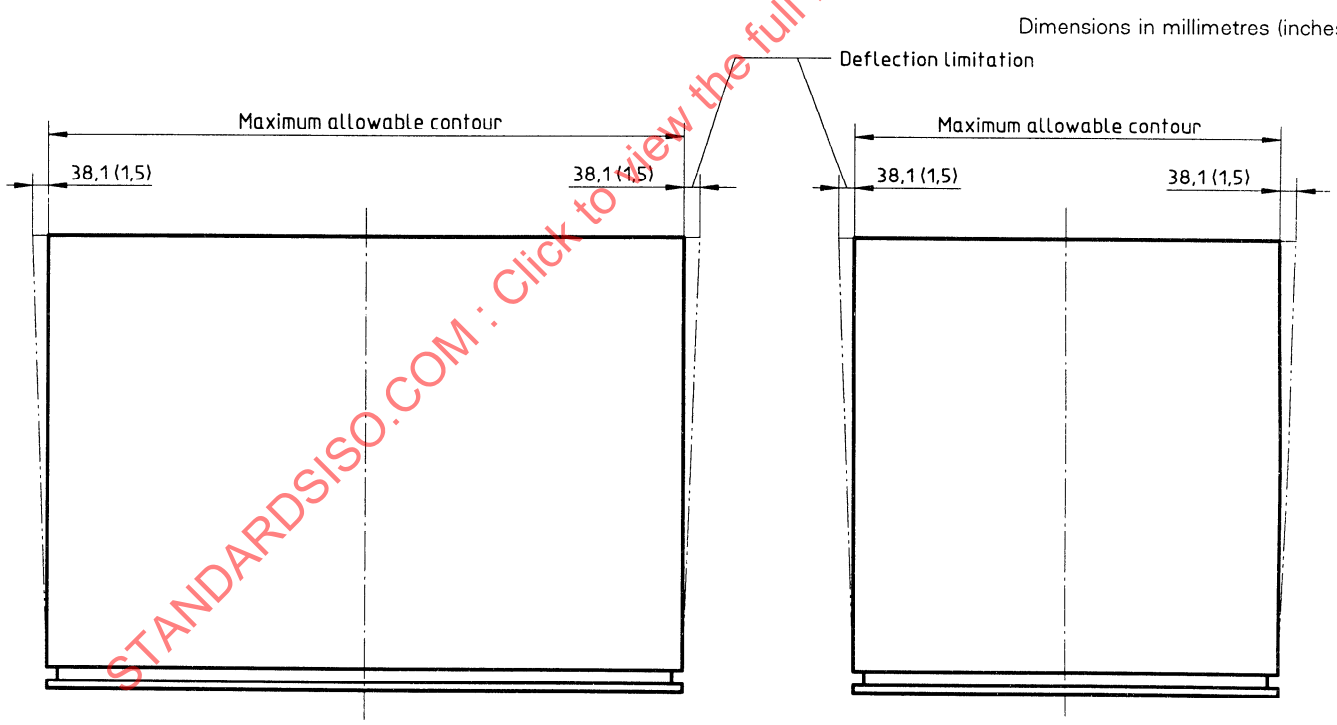

Figure 1 — Deflection limits out of the maximum ULD contour

Dimensions in millimetres