INTERNATIONAL STANDARD

ISO 8058

Second edition
1999-04-01

Air cargo — Insulated containers — Thermal efficiency requirements

Fret aérien — Conteneurs isothermes — Caractéristiques de rendement thermique

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 8058 was prepared by Technical Committee 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 8058:1985), which has been technically revised.

Annex A of this International Standard is for information only.

International Organization for Standardization
Case postale 56 • CH-1211 Genève 20 • Switzerland
Internet iso@iso.ch

Printed in Switzerland

Introduction

This International Standard specifies thermal efficiency requirements for air cargo insulated containers of all sizes.

This International Standard does not in any way cancel or reduce the status of the specifications which determine airworthiness, industry, ground handling or any other characteristics of the units.

In preparing this International Standard for compatibility and guidance purposes, the requirements of ISO 1496-2:1996, *Series 1 freight containers — Specification and testing — Part 2: Thermal containers,* have been taken into account as far as procedures for measuring the thermal efficiency are concerned.

Air cargo — Insulated containers — Thermal efficiency requirements

1 Scope

This International Standard specifies the minimum operational requirements for thermal efficiency to ensure that perishable cargoes in insulated standard airborne containers are kept in prime condition during the ground handling and air transportation cycle for a maximum period of 36 h.

It is applicable to all insulated air cargo containers irrespective of their size and designation. It does not provide details concerning refrigerated or heated containers and/or the methods and equipment used to obtain the required thermal effect, such as cryogenic, gaseous or liquid fluids, or mechanical compressors/heaters.

NOTES

1 The term "perishable cargo" refers, for example, to dairy produce, fruit, vegetables, flowers, frozen foods, meat, fish, etc., requiring maintenance of specific temperature ranges during door-to-door transportation involving air transport.

2 It should be noted that throughout this document environmental (atmospheric) temperatures are expressed in commercial values of degrees Celsius/Fahrenheit (°C/°F) and technical (scientific) temperatures are expressed in the International Standard measure, kelvin (K). A temperature conversion table is given for convenience in annex A.

2 Normative reference

The following standard contains provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the edition indicated was 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 edition of the standard indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 11242:1996, *Aircraft — Pressure equalization requirements for cargo containers.*

3 Design considerations

3.1 In the design of the container, careful consideration shall be given to the contribution of conduction, convection, radiation and air leakage to the overall thermal efficiency of the unit. At the same time, an optimum balance between insulation, structure, cost and weight shall be a constant design goal.

3.2 The overall temperature range for perishable commodities may be anywhere between + 20 °C (+ 68 °F) and – 25 °C (– 13 °F) during the transport cycle.

3.2.1 During this period of door-to-door transportation, the container may be subjected to outside ambient temperature with extremes of + 45 °C (+ 113 °F) and – 50 °C (– 58 °F) and a relative humidity of up to 100 %.

3.2.2 For design purposes, the container shall perform its protective function within an outside temperature variation, ΔT, within the range of temperature exposure extremes stated in 3.2.1, of 53 °C (95 °F) so as to allow for temperature drops and rises occurring between origin and destination in the air transport cycle.

3.3 Although no specific test is specified in clause 6 for thermal radiation, consideration should be given to commonly encountered environments wherein radiant energy exchange can be minimized.

3.4 The container shall be free of sharp corners and/or crevices which might collect dirt, spillage or odours. No pockets shall exist in the cargo loading space that cannot be reached by conventional cleaning methods.

3.5 The construction shall be such that spillage collects during the transport cycle but runs off during flushing and/or washing. Adequate provision shall be made to ensure that cleaning water can satisfactorily drain from the inside of the container.

3.6 Materials used for the container structure, the interior surfaces and the insulation shall absorb neither moisture nor odours and shall not be functionally affected by daily washing.

3.6.1 Methods of washing shall include flushing using a pressure hose at 689 kPa (100 lbf/in^2), 343 K temperature and strong detergents. Washing may also be carried out by steam cleaning at 383 K.

3.6.2 When washed, the container shall not require the use of odour-neutralizing chemicals.

3.6.3 The container shall withstand freezing temperatures while wet immediately following washing. All valves, seals, doors and controls shall remain operative.

3.6.4 Material used on the inside of the container, thus potentially coming in contact with foods and/or pharmaceutical goods, shall be neutral to these cargoes and shall meet applicable sanitary standards.

4 Pressurization

4.1 General conditions

Containers shall be closed at differing terminal altitudes. The critical condition shall be at sea level. Operationally, the container could be subjected to either internal positive or negative pressure. Careful attention to the design of equalization devices (if any) and all seals is important in the control of air leakage heat transfer.

4.2 Pressure equalization

Further to 4.1, if the design of door seals is not adequate to relieve pressure, a pressure equalization device should be installed for two-way equalization. This pressure relief device should be set to operate at 3,45 kPa to 6,89 kPa (0,5 lbf/in^2 to 1 lbf/in^2) pressure differentials.

4.3 Blow-out panel

To compensate for the unique exposure to rapid decompression of a container transported by air, a blow-out panel, or equivalent device, conforming to ISO 11242:1996, 6.3, shall be provided. It shall be installed in such a manner that it will not damage aircraft structure or systems or cause injury in the event of its operation.

NOTE The decompression parameter is based on an event lasting 1 s, involving an ambient pressure change from 81 kPa (11,8 lbf/in^2) to 15 kPa (2,14 lbf/in^2).

5 Airtightness tests

5.1 The container shall be subjected to tests to determine the air leakage rate. These shall be carried out after completion of the applicable operational or limit load tests (if any) required in other specifications related to the specific container involved.

5.2 The temperature inside and outside the container shall be stabilized within 3 K of each other and shall both be within the range of 288 K to 298 K. The container shall be empty and in its normal operational condition with the access doors closed in the normal manner. Any drain openings shall be closed.

5.3 Air shall be introduced through an accurate metering device and a suitable manometer shall be connected to the container by a leakproof connection. The manometer shall not be part of the air supply system. The flow-measuring device shall be accurate to ± 3 % of the measured flow rate, and the manometer on the container shall be accurate to ± 5 %.

5.4 Air shall be admitted to the container to raise its internal pressure to 0,25 kPa ± 0,01 kPa (0,036 lbf/in^2 ± 0,001 5 lbf/in^2) and the air supply regulated to maintain this pressure.

5.4.1 The air leakage rate, expressed in standard atmospheric conditions, should be no more than the values given in table 1, i.e. 40 % of the internal volume per hour. If the measured air leakage is equal to or less than the values given in table 1, the heat transfer results determined in the thermal test (see clause 6) shall be reported without correction for air leakage.

5.4.2 If the measured air leakage exceeds the values in Table 1, but is no more than the values given in table 2, then the U values measured in the thermal test shall be increased by the correction values given in table 3.

5.5 The air pressure shall be increased to between 3,45 kPa and 6,89 kPa (0,5 lbf/in^2 to 1 lbf/in^2) internal pressure. The pressure relief device, or door seal expulsion, shall operate within the positive differential range of 3,45 kPa to 6,89 kPa (0,5 lbf/in^2 to 1 lbf/in^2).

5.6 Upon completion of the tests described in 5.2 to 5.5, there shall be no permanent deformation and the container shall be fully operational. Closures, seals and pressure equalization device shall be intact and functional.

Table 1

Size of container	m^3	4,53	5,09	7,08	10,05	8,49 to 12,74	17,69	16,99	32,16
	ft^3	160	180	250	355	300 to 450	625	600	1136
Typical units		LD-3	LD-1	LD-5	LD-9	Igloos	96 × 125	10 ft	20 ft
Air leakage rate	m^3/h	1,8	2	2,8	4	3,4 to 5	7,1	6,8	12,8
	ft^3/h	64	72	100	142	120 to 180	250	240	455

Table 2

Size of container	m^3	4,53	5,09	7,08	10,05	8,49 to 12,74	17,69	16,99	32,16
	ft^3	160	180	250 355		300 to 450	625	600	1136
Typical units		LD-3	LD-1	LD-5	LD-9	Igloos	96 × 125	10 ft	20 ft
Air leakage rate	m^3/h	3,6	4	5,6	8	6,8 to 10	14,2	13,6	25,6
	ft^3/h	128	144	200	284	240 to 360	500	480	910

Table 3

Size of container	m^3	4,53	5,09	7,08	10,05	8,49 to 12,74	17,69	16,99	32,16
	ft^3	160	180	250	355	300 to 450	625	600	1136
Typical units		LD-3	LD-1	LD-5	LD-9	Igloos	96 × 125	10 ft	20 ft
Correction	W/K	0,15	0,16	0,24	0,32	0,28 to 0,44	0,6	0,56	1,24

6 Thermal test

6.1 The test is performed to establish the overall heat transfer rate, U, (see 6.5) and thermal transmission factor, K, (see 6.1.4) of the container. The container shall be tested in the exact configuration intended for use. Any options or component configuration alternatives shall be tested in a separate test and appropriately specified, when applicable, in the container performance data on the marking plate described in clause 7.

6.1.1 The U factor applies to only one type of container, and allows the user to easily determine the thermal transfer rate by multiplying the factor by the temperature differential between inside and outside the container. The K factor allows comparison of the insulation performance of a variety of containers with different sizes and contours.

6.1.2 The heat leakage shall be expressed by the total heat transfer rate, U_θ, which is given by the formula

$$U_\theta = \frac{Q}{\theta_e - \theta_i}$$

where

U_θ is the total heat transfer rate, in watts per kelvin[1)];

Q is the power dissipated or absorbed by the operation of internal heaters and fans or internal cooling units, in watts;

θ_e is the average outside temperature, in kelvin, which shall be the arithmetic mean of the temperatures recorded at the end of each test interval (see 6.4.7) and measured 100 mm from the walls, at least at the 12 points specified in 6.3.2 and shown in figure 1;

θ_i is the average inside temperature, in kelvin; which shall be the arithmetic mean of the temperatures recorded at the end of each test interval (see 6.4.7) and measured 100 mm from the walls, at least at the 12 points specified in 6.3.1 and shown in figure 2.

6.1.3 The mean wall temperature, θ, shall be expressed in kelvin, by convention:

$$\theta = \frac{\theta_e + \theta_i}{2}$$

1) 1 W/K = 0,556 W/°F = 0,860 kcal/(h °C) = 1,895 Btu/(h °F)

Dimensions in millimetres

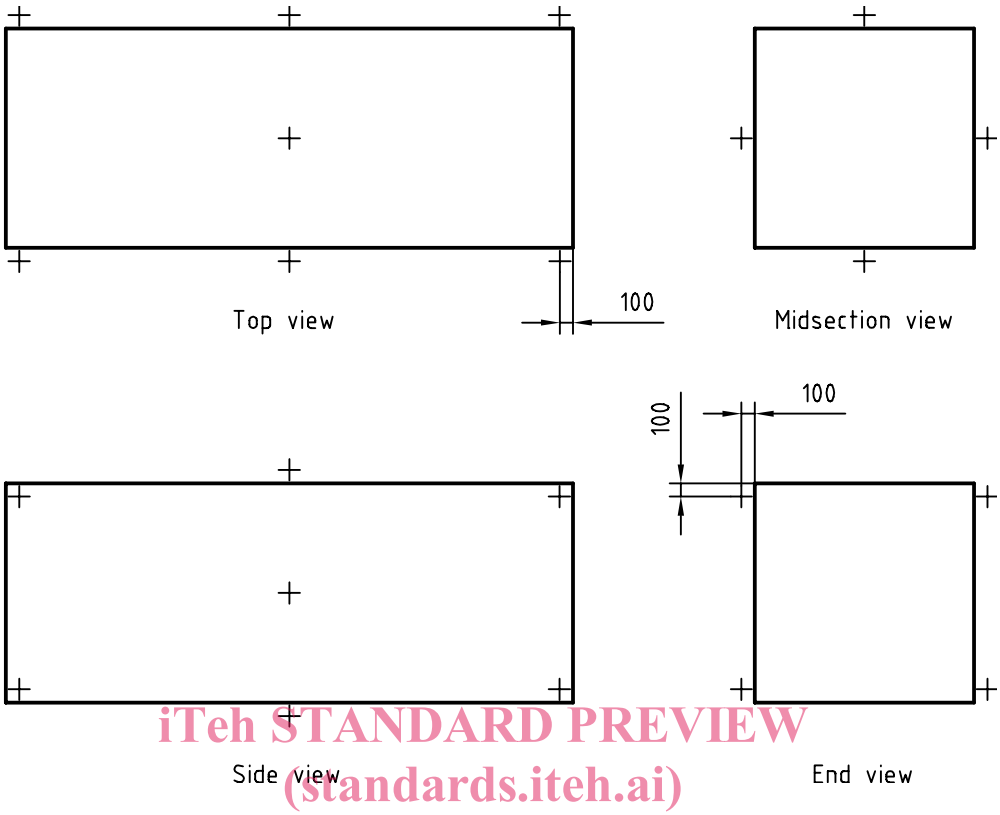

Figure 1 — Outside air temperature measurement points

Dimensions in millimetres

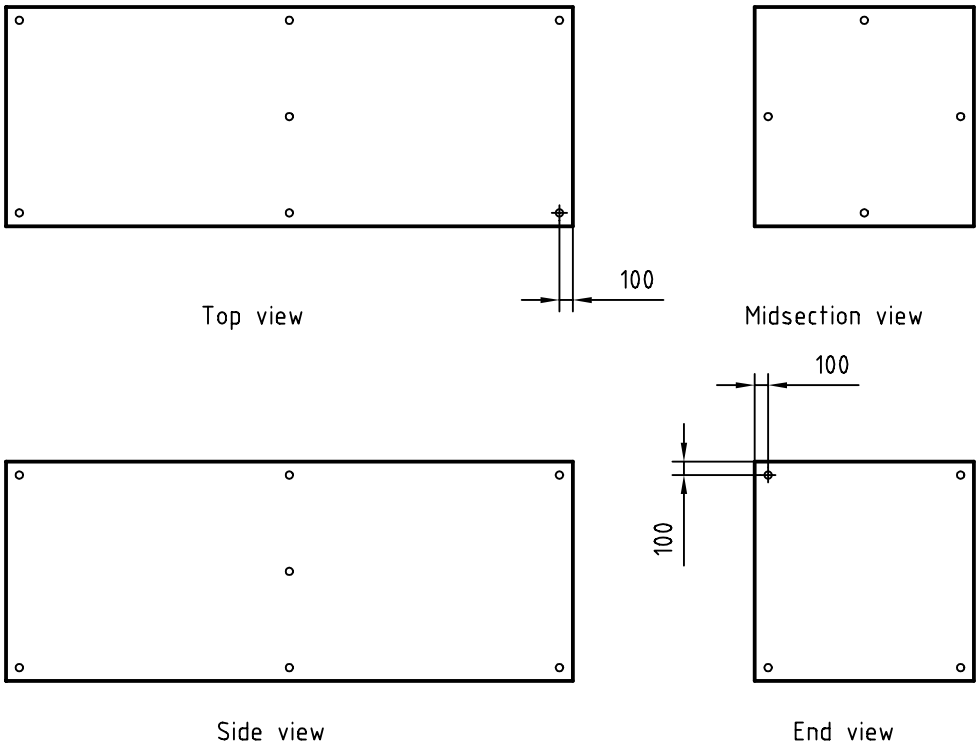

Figure 2 — Inside air temperature measurement points