INTERNATIONAL STANDARD ISO 1496/II

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Series 1 freight containers — Specification and testing — Part II : Thermal containers

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FOREWORD

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Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 1496/II was developed by Technical Committee ISO/TC 104, *Freight containers*, and was circulated to the member bodies in July 1975.

It has been approved by the member bodies of the following countries :

Australia	Hungary	Poland
Belgium	India	Romania
Brazil	Iran	South Africa, Rep. of
Bulgaria	Ireland	Spain
Canada	Israel	Sweden
Cuba	Japan	Switzerland
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Denmark	Mexico	United Kingdom
Finland	Netherlands	U.S.A.
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Germany	Norway	Yugoslavia

The member body of the following country expressed disapproval of the document on technical grounds :

Austria

Printed in Switzerland

Series 1 freight containers — Specification and testing — Part II : Thermal containers

0 INTRODUCTION

Grouping of container types for specification purposes

Part I	
General cargo	00 to 09, 50 to 53, 56 to 59
Part II	
Thermal	20 to 49
Part III	
Tank	70 to 79
Part IV	
Bulk	80 to 84
Part V	
Platform (container)	60
Part VI	
Platform based	54 and 55, 61 to 69
Part VII	
Air mode	90 to 99

NOTE — Container groupings for Part I and Parts III to VII will be set forth in detail in the relevant documents.

1 SCOPE AND FIELD OF APPLICATION

1.1 This International Standard sets out basic requirements for the specification and testing of ISO series 1 Part II freight containers which are suitable for international exchange and for conveyance by road, rail and sea, including interchange between these forms of transport.

1.2 The container types covered by this International Standard are as follows :

Code	Type	*K* max. W/(m^2.°C)	Temperatures			
			°C		°F	
			inside	outside	inside	outside
20	Insulated	0,4*	–	–	–	–
21	Insulated	0,7*	–	–	–	–
22	Heated	0,4	16	– 20	60	– 4
23 to 29	Spare numbers for insulated or heated containers					
30	Refrigerated expandable refrigerant.	0,4	– 18	38	0	100
31	Mechanically refrigerated.	0,4	– 18	38	0	100
32	Refrigerated and heated.	0,4	– 18/16	38/ – 20	0/60	100/– 4
33 to 39	Spare numbers for refrigerated, mechanically refrigerated and refrigerated and heated containers.					
40	Refrigerated and/or heated, with removable equipment, appliance located externally.	0,4	**	**	**	**
41	Refrigerated and/or heated with removable equipment, appliance located internally.	0,4	**	**	**	**
42	Refrigerated and/or heated, with removable equipment, appliance located externally.	0,7	**	**	**	**
43 to 49	Spare numbers for refrigerated and/or heated containers with removable equipment.					

* 0,4 W/m^2.°C = 0,0704 Btu/h·ft^2.°F
0,7 W/m^2.°C = 0,1232 Btu/h·ft^2.°F

** This category does not have specified temperature limits. The actual performance is dependent on the capability of the equipment attached in any transport mode.

1.3 The marking requirements for these containers are to be in accordance with the principles embodied in ISO 790 and ISO 2716 for the marking and identification of series 1 containers.[1)]

If containers are fitted for the carriage of hanging cargo, the load bearing capability of the handling equipment shall be clearly marked on the inside of the container.

2 REFERENCES

ISO 668, *Freight containers – External dimensions and ratings.*

ISO 790, *Marking of series 1 freight containers.*[1)]

ISO 1161, *Series 1 freight containers – Corner fittings – Specification.*

ISO 2716, *Identification marking code for freight containers.*[1)]

3 DEFINITIONS

The following definitions apply to thermal freight containers :

3.1 thermal container : Freight container built with insulating walls, doors, floor and roof which retard the rate of heat transmission between the inside and the outside of the container.

3.2 insulated container : Thermal container without the use of devices for cooling and/or heating.

3.3 refrigerated container (expendable refrigerant) : Thermal container using a means of cooling such as :

- ice, or
- dry ice, with or without sublimation control, or
- liquefied gases, with or without evaporation control.

It is implicit in this definition that such a container requires no external power supply or fuel supply.

3.4 mechanically refrigerated container : Thermal container served by refrigerating appliance (mechanical) compressor unit, absorption unit, etc.).

3.5 heated container : Thermal container served by heat-producing appliance.

3.6 refrigerated and heated container : Thermal container served by refrigerating appliance (mechanical or expendable refrigerant) and heat-producing appliance.

3.7 removable equipment : Refrigerating and/or heating appliance which is designed primarily for attaching to or detaching from the container when transferring between different modes of transportation.

3.8 located internally : Totally within the external dimensional envelope of the container as defined in ISO 668.

3.9 located externally : Partially or totally outside the external dimensional envelope of the container as defined in ISO 668.

It is implicit in this definition that an appliance located externally must be removable or retractable to facilitate transport in certain modes.

3.10 battens : Members protruding from the inside walls of the container to hold the freight away from the walls to provide an air passage. They may be integral with the walls, or added during cargo loading.

3.11 bulkhead : A partition providing a plenum chamber and/or air passage for either return or supply air. It may be an integral part of the appliance or a separate member.

3.12 ceiling air duct : A passage or passages located in proximity to the ceiling to direct air flow.

3.13 floor air duct : A passage or passages located beneath the freight support surface to direct air flow.

4 DIMENSIONS AND RATINGS

4.1 External dimensions

The overall external dimensions and tolerances of the freight containers covered by this International Standard are those established in ISO 668. No part of the container shall project beyond these overall external dimensions.

4.2 Internal dimensions

Internal dimensions of containers shall be as large as possible. They shall be measured from inner faces of battens, bulkheads, ceiling air ducts, floor air ducts, etc., where fitted. The minimum internal width shall be 2 200 mm (86 5/8 in) for container types 20, 21, 22, 30, 31, 32, 40, 41 and 42.

4.3 Ratings

The value of the rating R, being the maximum operating gross weight of the container, are those given in ISO 668.

$$R = P + T$$

where P is the maximum operating payload and T is the tare weight.

1) For containers having particular characteristics which prevent the application of the general specification for marking, reference should be made to ISO 790. A combination and revision of ISO 790 and ISO 2716 is under study by TC 104/WG 3.

5 DESIGN REQUIREMENTS

5.1 General

All containers shall be capable of fulfilling the following requirements.

The strength requirements for containers are given in diagrammatic form in annex A (these requirements are applicable to all containers except where otherwise stated). They apply to containers as complete units, except as envisaged in 6.1.

The strength requirements for corner fittings (see also 5.2) are given in ISO 1161.

The containers shall be capable of withstanding all the test requirements detailed in clause 6.

As the effects of loads encountered under any dynamic operating condition should only approach, but not exceed, the effects of the corresponding test loads, it is implicit that the capabilities of containers indicated in annex A and demonstrated by the structural tests described in clause 6 shall not be exceeded in any mode of operation.

5.2 Corner fittings

Series 1 containers 1AA, 1A, 1BB, 1B, 1CC, 1C and 1D shall be equipped with top and bottom corner fittings. Containers 1E and 1F shall be equipped with the top corner fittings, with the bottom corner fittings being optional. The requirements and positioning of the corner fittings are given in ISO 1161. The upper faces of the top corner fittings shall protrude above all other parts of the top of the container by a minimum of 6 mm (1/4 in) (see 5.3.3).

5.3 Base structure

5.3.1 All containers equipped with bottom corner fittings shall be capable of being supported by their bottom corner fittings only.

Containers 1AA, 1A, 1BB, 1B, 1CC and 1C shall also be capable of being supported on load transferring areas in their base structures only.

Consequently, these containers shall have end transverse members and sufficient intermediate load transferring areas (or a flat underside) of sufficient strength to permit vertical load transfer. These requirements are specified in annex B.

The maximum load to be transferred at the load transfer zones (shown in figure 23) shall not exceed the value R multiplied by a dynamic factor of 2,0.

For containers 1AA, 1A, 1BB, 1B, 1CC and 1C the lower faces of the load transferring areas in their bases, including their end transverse members, shall lie in a plane located :

$$12{,}5 \begin{smallmatrix} +5 \\ -1{,}5 \end{smallmatrix} \text{ mm} \left(1/2 \begin{smallmatrix} +3/16 \\ -1/16 \end{smallmatrix} \text{ in} \right)$$

above the base plane of the containers (bottom faces of lower corner fittings).

5.3.2 For containers 1D, 1E and 1F the level of the underside of the base structure is not specified, except in so far as it is implied in 5.3.3.

5.3.3 For series 1 containers under dynamic conditions, or the static equivalent thereof, with the container having a load uniformly distributed over the floor in such a way that the combined weight of the container and test load is equal to 1,8 R, no part of the base of the container shall deflect more than 6 mm (1/4 in) below the base plane (bottom faces of the lower corner fittings).

5.3.4 The base structure shall be designed to withstand all forces, particularly lateral forces, induced by the cargo in service. This is particularly important where provisions are made for securement of cargo to the base structure of the container.

5.4 End structure

For containers 1AA, 1A, 1BB, 1B, 1CC and 1C, the sideways deflection of the top of the container with respect to the bottom of the container at the time it is under full transverse rigidity test conditions shall not cause the sum of the changes in length of the two diagonals to exceed 60 mm (2 3/8 in).

5.5 Side structure

For containers 1AA, 1A, 1BB, 1B, 1CC and 1C, the longitudinal deflection of the top of the container with respect to the bottom of the container at the time it is under full longitudinal rigidity test conditions shall not exceed 25 mm (1 in).

5.6 Walls

Where openings are provided in end or side walls, the ability of these walls to withstand tests Nos. 5 and 6 shall not be impaired.

5.7 Door opening

Each container shall be provided with a door opening at least at one end, except in the case of 1E and 1F containers, where the opening may be provided in a side wall.

Containers designated 1AA, 1A, 1BB, 1B, 1CC, 1C and 1 D shall have a door opening as large as possible, preferably having dimensions equal to those of the internal cross-section of the containers.

5.8 Sanitary requirements

Attention is drawn to the need for the proper choice of materials for the container and refrigeration/heating appliances to prevent adverse effects on cargoes. Any relevant national or international requirements should also be considered.

The interior surface and the container structure shall be so constructed as to facilitate cleaning and the surface and the

insulation shall not be functionally affected by cleaning methods, such as wet steam cleaning and detergents normally used.

No pockets shall exist inside the container that cannot be reached by conventional cleaning methods.

Adequate provision should be made to ensure that cleaning water can drain satisfactorily from the inside of the container.

OPTIONAL REQUIREMENTS

5.9 Fork lift pockets

Fork lift pockets may be provided as optional features for handling 1CC, 1C, 1D, 1E and 1F containers in the loaded or unloaded condition. The dimensional requirements for such pockets are specified in annex C.

Fork pockets, when provided, shall pass completely through the base structure of the container, so that lifting devices may be inserted from either side.

It is not necessary for the base of the fork lift pockets to be the full width of the container, but it should be provided in the vicinity of each end.

5.10 Provision for handling at the base by means of grappler arms or similar devices

Provision for handling 1AA, 1A, 1BB, 1CC, 1C and 1D containers by means of grappler arms or similar devices may be provided as optional features. The dimensional requirements for such provisions are specified in annex D.

5.11 Gooseneck tunnels

Gooseneck tunnels may be provided as optional features in containers 1AA and 1A. The dimensional requirements are specified in annex E and, in addition, all other parts of the base structure shall be as specified in 5.3.

NOTES – The requirements of 5.2, 5.9 and 5.10 do not preclude the provision of additional facilities for lifting, either from the top or at the bottom of the containers.

5.12 Drains

Cargo space drains, if required to operate when carrying cargo, should be protected by fittings which open automatically above normal internal operating pressure. If required for cleaning of the interior of the container, they shall be provided with manual closures.

Consideration should be given to Customs and health requirements.

5.13 Water connections

For appliances requiring water connections the inlet and outlet interfaces shall conform to annex F.

Water-cooled appliances should incorporate the possibility to drain the unit in order to prevent freezing of the water.

The water inlet and outlet connections shall be so located at the machinery end of the container that, to an observer facing that end, they appear in the lower right-hand quarter.

5.14 Air inlets and outlets

Where series 1AA, 1CC and 1C containers are designed for ducted air systems and for use with externally located removable equipment, the air inlet and outlet openings shall conform to G.1, G.2 and G.3, respectively, of annex G.

NOTE – The requirements of 5.2, 5.9 and 5.10 do not preclude the provision of additional facilities for lifting, either from the top or at the bottom of the container.

6 TESTING

6.1 General

Unless otherwise stated, containers complying with the design requirements specified in clause 5 shall, in addition, be capable of withstanding the tests specified in 6.2 to 6.17 inclusive, as applicable.

The refrigeration and/or heating equipment (for example components, framework, panelling, battens, ductwork, bulkheads) need not necessarily be in place when the container is tested except where specified for a particular test. But where any of the main parts or frameworks of the refrigeration and/or heating equipment is not in position for any test, the ability of that part or framework to withstand the appropriate proportion of any relevant cargo loading and/or the forces or accelerations to which the container and equipment may be subjected in the service for which it was designed shall be established independently. Where parts of the refrigeration and/or heating equipment which contribute to the strength or integrity of the container in service are not in position for testing, substitute framework and/or panelling may be employed during testing provided such substitute components are secured in the same manner as the equipment itself and do not provide greater strength than the equipment would have provided.

The test for weatherproofness (test No. 13) shall be made after tests Nos. 1 to 12, with the tests No. 14 (airtightness) and No. 15 (thermal) being made last.

6.1.1 The symbol R denotes the maximum operating gross weight of the container and the symbol P denotes the maximum operating payload of the container to be tested, that is, the tare weight T subtracted from the maximum operating gross weight R :

$$P = R - T$$

6.1.2 The test load within the container shall be uniformly distributed.

6.1.3 The test loads specified in all of the following tests are the minimum requirements.

6.1.4 The dimensional requirements to which reference is made in the requirements sub-clause after each test are those specified in :

a) the dimensional and design requirement clauses of this International Standard;

b) ISO 668;

c) ISO 1161.

6.2 Test No. 1 – Stacking

6.2.1 *General*

This test shall be carried out to prove the ability of a container to support five other fully loaded containers of the same length and rating under the acceleration conditions encountered in ships' cell structures, taking into account relative eccentricities between containers due to clearance.

6.2.2 *Procedure*

The container under test shall be placed on four level pads, one under each bottom corner fitting or equivalent corner structure. The pads shall be centralized under the fittings and be substantially of the same plan dimensions as the fittings. The container shall have had a load uniformly distributed over the floor in such a way that the combined weight of the container and the test load is equal to 1,8 R.

The container under test shall be subjected to a vertical force equivalent to a load of 2,25 R on each of the top corner fittings simultaneously or 4,5 R on each pair of end fittings in such a manner that the planes of application of the forces and the supports of the container remain horizontal and unchanged during the test. The forces shall be applied through a corner fitting or a pad of the same plan area as a corner fitting. Each pad shall be offset in the same direction by 25,4 mm (1 in) laterally and 38 mm (1 1/2 in) longitudinally.

6.2.3 *Requirements*

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

6.3 Test No. 2 – Lifting from the top corner fittings

6.3.1 *General*

This test shall be carried out to prove the ability of 1AA, 1A, 1BB, 1B, 1CC and 1C containers to withstand being lifted from the top corner fittings with the lifting forces applied vertically, and the ability of 1D, 1E and 1F containers to withstand being lifted from the top corner fittings with the lifting forces applied at any angle between the vertical and 30° to the vertical, these being the only recognized methods of lifting these containers by the top corner fittings.

This test shall also be regarded as proving the ability of the floor and base structure to withstand the forces arising from acceleration of the payload in lifting operations.

6.3.2 *Procedure*

The container under test shall have a load uniformly distributed over the floor in such a way that the combined weight of the container and test load is equal to 2 R, and it shall be carefully lifted from all four top corners in such a way that no significant acceleration or deceleration forces are applied.

For 1AA, 1A, 1BB, 1B, 1CC and 1C containers the lifting forces shall be applied vertically.

For 1D, 1E and 1F containers, lifting shall be by means of slings, the angle of each leg being at 30° from the vertical.

After lifting, the container shall be suspended for 5 min and then lowered to the ground.

6.3.3 *Requirements*

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

6.4 Test No. 3 – Lifting from the bottom corner fittings

6.4.1 *General*

This test shall be carried out to prove the ability of containers to withstand being lifted from bottom corner fittings by means of lifting devices bearing on the bottom corner fittings only and attached to a single transverse central spreader beam, above the container.

This test shall be carried out on 1AA, 1A, 1BB, 1B, 1CC, 1C and 1D containers. It shall also be carried out on 1E and 1F containers if they are equipped with bottom corner fittings.

6.4.2 *Procedure*

The container under test shall have a load uniformly distributed over the floor in such a way that the combined weight of container and test load is equal to 2 R, and it shall be carefully lifted from the side apertures of all four bottom corner fittings in such a way that no significant acceleration or deceleration forces are applied.

Lifting forces shall be applied at :

30° to the horizontal for 1AA and 1A containers;

37° to the horizontal for 1BB and 1B containers;

45° to the horizontal for 1CC and 1C containers;

60° to the horizontal for 1D, 1E and 1F containers.

In each case the line of action of the lifting force and the outer face of the corner fitting shall be no farther apart

than 38 mm (1 1/2 in). The lifting shall be carried out in such a manner that the lifting devices bear on the bottom corner fittings only.

The container shall be suspended for 5 min and then lowered to the ground.

6.4.3 *Requirements*

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

6.5 Test No. 4 — Restraint (longitudinal)

6.5.1 *General*

This test shall be carried out to prove the ability of containers to withstand longitudinal external restraint under dynamic conditions of railway operations, which implies accelerations of 2 *g*.

6.5.2 *Procedure*

The container under test shall have a load uniformly distributed over the floor in such a way that the combined weight of container and test load is equal to *R*, and it shall be secured to rigid anchor points through the bottom apertures of the bottom corner fittings at one end of the container.

1AA, 1A, 1BB, 1CC, 1C and 1D containers and also 1E and 1F containers with bottom corner fittings shall be restrained longitudinally; 1E and 1F containers shall subsequently be restrained laterally.

A force equivalent to a load of 2 *R* shall be applied horizontally to the container through the bottom apertures of the other corner fittings, first towards and then away from the anchor points.

6.5.3 *Requirements*

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

6.6 Test No. 5 — Strength of end walls

6.6.1 *General*

This test shall be carried out to prove the ability of containers to withstand forces under the dynamic conditions referred to in 6.5.1.

6.6.2 *Procedure*

The container shall have each end tested when one end is blind and the other equipped with doors. In case of symmetrical construction, one end only need be tested. 1AA, 1A, 1BB, 1B, 1CC, 1C and 1D containers shall be subjected to an internal load of 0,4 *P*; 1E and 1F containers shall be subjected to 0,6 *P*. The internal load shall be uniformly distributed over the wall under test and arranged to allow free deflection of the wall.

NOTE — The test procedure covers both the end and side wall strength of the 1E and 1F containers.

6.6.3 *Requirements*

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

6.7 Test No. 6 — Strength of side walls

6.7.1 *General*

This test shall be carried out to prove the ability of containers to withstand the forces resulting from ship motions.

6.7.2 *Procedure*

Each side wall of 1AA, 1A, 1BB, 1B, 1CC, 1C and 1D containers (or one only in the case of symmetrical construction) shall be subjected to an internal uniformly-distributed force of 0,6 *P*, applied separately and arranged to allow free deflection of the side wall and its longitudinal members.

6.7.3 *Requirements*

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

6.8 Test No. 7 — Strength of the roof

6.8.1 *General*

a) This test shall be carried out to prove the ability of the roof of a container to withstand the loads imposed by persons working on it.

b) If the roof is intended to carry a hanging cargo a test shall be carried out to prove the ability of the container to carry a minimum total hanging load of 1 490 kg/m (1 000 lb/ft) of usable inside container length. A vertical acceleration of 2 *g* shall be taken into account.

6.8.2 *Procedure*

a) A load of 300 kg (660 lb) shall be uniformly distributed over an area of 600 mm × 300 mm (24 in × 12 in) located at the weakest area of the roof of the container.

b) A load of twice the service load or twice 1 490 kg/m (1 000 lb/ft), whichever is greater, shall be attached to the roof in a manner simulating normal service loadings, while the container is supported by its four corner fittings only.

6.8.3 *Requirements*

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

6.9 Test No. 8 — Floor strength

6.9.1 *General*

This test shall be carried out to prove the ability of a container floor to withstand the concentrated dynamic loads imposed during loading operations by trucks or similar devices.

The test applies to 1AA, 1A, 1BB, 1B, 1CC, 1C and 1D containers.

6.9.2 *Procedure*

The test shall be performed using a test vehicle equipped with tyres, and loaded to 5 460 kg (12 000 lb) per axle [i.e. 2 730 kg (6 000 lb) on each of two wheels]. It is to be so arranged that all points of contact between each wheel and a flat continuous surface lie within a rectangular envelope measuring 185 mm (7 1/4 in) in a direction parallel to the axle of the wheel, by 100 mm (4 in), and that each wheel makes physical contact over an area within this envelope of not more than 142 cm^2 (22 in^2). The wheel width is to be nominally 180 mm (7 in) and the wheel centres are to be nominally 760 mm (30 in). The test vehicle shall be manœuvred over the entire floor area of the container. The test shall be made with the container resting on four level supports under its four bottom corner fittings with its base structure free to deflect.

6.9.3 *Requirements*

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

6.10 Test No. 9 — Rigidity (transverse)

6.10.1 *General*

This test shall be carried out to prove the ability of 1AA, 1A, 1BB, 1B, 1CC and 1C containers to withstand the racking forces resulting from ship motions.

6.10.2 *Procedure*

The container under test, in tare condition (*T*), shall be placed on four level supports, one under each corner fitting, and shall be restrained against lateral and vertical movement by means of anchor devices acting through the bottom apertures of the bottom corner fittings. Lateral restraint shall be provided only at a bottom corner fitting diagonally opposite to and in the same end frame as a top corner fitting to which force is applied. When testing the two end frames separately, vertical restraint shall only be applied at the end frame under test.

Forces of 150 kN (15 000 kgf) (15 tf) shall be applied either separately or simultaneously to each of the top corner fittings on one side of the container in lines parallel both to the base and to the planes of the ends of the container. The forces shall be applied first towards and then away from the top corner fittings.

In the case of a container with identical ends, only one end need be tested. Where an end is not essentially symmetrical about its own vertical centre line, both sides of that end shall be tested.

6.10.3 *Requirements*

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

6.11 Test No. 10 — Rigidity (longitudinal)

6.11.1 *General*

This test shall be carried out to prove the ability of 1AA, 1A, 1BB, 1B, 1CC and 1C containers to withstand the longitudinal racking forces resulting from ship motions.

6.11.2 *Procedure*

The container under test, in tare condition (*T*), shall be placed on four level supports, one under each corner fitting, and shall be restrained against longitudinally and vertical movement by means of anchor devices acting through the bottom apertures of the bottom corner fittings. Longitudinal restraint shall be provided only at a bottom corner fitting diagonally opposite to and in the same side frame as a top corner fitting to which force is applied.

Forces of 75 kN (7 500 kgf) (7,5 tf) shall be applied either separately or simultaneously to each of the top corner fittings on one end of the container in lines parallel both to the base of the container and to the planes of the sides of the container. The forces shall be applied first towards and then away from the top corner fitting. In the case of a container with identical sides, only one side need be tested. Where a side is not essentially symmetrical about its own vertical centre line, both ends of that side shall be tested.

6.11.3 *Requirements*

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

6.12 Test No. 11 — Lifting from fork lift pockets (where fitted)

6.12.1 *General*

This test applies to containers 1CC, 1C, 1D, 1E and 1F, where fitted with fork lift pockets.

6.12.2 *Procedure*

The container under test shall have a load uniformly distributed over the floor in such a way that the combined weight of the container and test load is equal to 1,25 *R*, and it shall be supported on two horizontal bars, each 200 mm (8 in) wide projecting 1 828 ± 3 mm (72 ± 1/8 in) into the fork pocket, measured from the outside face of the side of the container. The bars shall be centred within the pockets.

The container shall be supported for 5 min and then lowered to the ground.

6.12.3 *Requirements*

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

6.13 Test No. 12 — Lifting from the base at grappler arm positions (where fitted)

6.13.1 *General*

This test shall be carried out on all containers with provisions for being lifted by grappler arms or similar devices with lifting positions as detailed in annex D.

6.13.2 *Procedure*

The container under test shall have a load uniformly distributed over the floor in such a way that the combined weight of the container and test load is equal to 1,25 *R*, and it shall be supported at the four positions where provision has been made for the equipment in 6.13.1, over an area of 32 mm × 254 mm (1.25 × 10 in), centrally located at each of the four positions, clear of the safety lips.

The container shall be supported for 5 min and then lowered to the ground.

6.13.3 *Requirements*

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

6.14 Test No. 13 — Weatherproofness

6.14.1 *General*

This test shall be carried out on door seals, exterior gasketed joints and other openings which are fitted with closing devices.

6.14.2 *Procedure*

A stream of water shall be applied to the area being tested from a nozzle of 12,5 mm (0.51 in) inside diameter, at a pressure of about 1 bar [corresponding to a head of about 10 m (33 ft) of water], on the upstream side of the nozzle. The nozzle shall be held at a distance of 1,5 m (5 ft) from the container under test, and the stream shall be traversed at a speed of 100 mm/s (4 in/s).

Procedures involving the use of several nozzles are acceptable provided that each area being tested is subjected to a water loading not less than that which would be given by a single nozzle.

6.14.3 *Requirements*

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

6.15 Test No. 14 — Airtightness test

6.15.1 *General*

This test shall be carried out after all structural tests have been completed and prior to the thermal test (test No. 15). The temperatures inside and outside the container shall be stabilized within 3 °C (5,4 °F) of each other and shall both be within the range of 15 °C to 25 °C (59 °F to 77 °F).

6.15.2 *Procedure*

The container shall be in its normal operating condition and shall be closed in the normal manner. The refrigeration and/or heating equipment shall be in place, except that, where the container is designed for use with removable equipment and the container has closures at the interface(s), the equipment shall not be in position and the closures shall be shut. All drain openings shall be closed. An air supply through a metering device and a suitable manometer shall be connected to the container by a leak-proof 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 %.

Air shall be admitted to the container to raise the internal pressure to 250 ± 10 Pa (25 ± 1 mm H_2O) (1 ± 3/64 in H_2O) and the air supply regulated to maintain this pressure. Once steady test conditions have been established, the air flow required to maintain this pressure shall be recorded.

6.15.3 *Requirements*

The air leakage rate, expressed in standard atmospheric conditions, should be no more than the values given in table 1[1]. If the measured air leakage is equal to or less than the values given in table 1, the heat transfer results determined under test No. 15 shall be reported without correction for air leakage.

TABLE 1

Size of container		1AA 1A (40 ft)	1BB 1B (30 ft)	1CC 1C (20 ft)	1D (10 ft)
Air leakage rate	m^3/h	30	23	16	9
	ft^3/h	1 059	812	565	318

If the measured air leakage exceeds these values but is no more than the values given in table 2, then the measured U values of test No. 15 shall be increased by the amounts given in table 3[1].

TABLE 2

Size of container		1AA 1A (40 ft)	1BB 1B (30 ft)	1CC 1C (20 ft)	1D (10 ft)
Air leakage rate	m^3/h	60	46	32	18
	ft^3/h	2 119	1 624	1 130	636

TABLE 3

Size of container		1AA 1A (40 ft)	1BB 1B (30 ft)	1CC 1C (20 ft)	1D (10 ft)
Correction value	W/°C	2,40	1,85	1,29	0,72
	Btu/(h·°F)	4.58	3.51	2.44	1.37

Containers that have air leakage rates greater than those shown in table 2 shall not be rated under this International Standard.

For those series 1CC and 1C containers covered by the exclusion clause in 6.15.2 which, in addition, have air inlet and outlet openings ias envisaged in 5.14, the maximum permitted air leakage rate expressed in standard atmospheric conditions shall be less than 8 m^3/h (283 ft^3/h).

6.16 Test No. 15 — Thermal test

6.16.1 *General*

6.16.1.1 This test shall be carried out to establish the coefficient of heat transfer for the container. It shall be carried out after successful completion of the airtightness test. It shall be performed with the refrigeration and/or heating equipment in place, except that, where the container is designed for use with removable equipment and the container has closures at the interface(s), the equipment shall not be in position but the closures shall be shut.

6.16.1.2 The test shall be performed under steady state conditions using either the internal heating or internal cooling method. All instruments and devices shall be selected and calibrated as follows :

Temperature-measuring devices	± 0,5 °C(± 0.9 °F)
Power-measuring system	± 2 % of the quantity measured
Flow meter system	± 3 %

6.16.1.3 The heat leakage shall be expressed by the total heat transfer rate (U_θ), which is defined by the formula

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

The coefficient of heat transfer (K) is such that

$K = U_\theta / S$, expressed in watts per square metre per degree Celsius;

where

U_θ is the total heat transfer rate, expressed in watts per degree Celsius[2];

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

1) **Rationale.** The air leakage values given in the first table are those amounts which, when related to actual operating conditions of one millimetre water gauge air pressure in the container, will result in additional heat gain due to air leakage of less than 5 % of the maximum heat gain allowed for that type of container and based on an outside condition of 38 °C (100 °F), 50 % relative humidity and an inside condition of − 18 °C (0 °F). When the air leakage exceeds the amounts given in table 1, the correction value given in table 3 compensates for the heat gain due to air leakage in excess of that quoted in table 1, assuming that the total air leakage does not exceed that quoted in table 2.

2) 1 W/°C = 0,556 W/°F = 0,860 kcal/(h·°C) = 1,895 Btu/(h·°F)

θ_e is the average outside temperature, which shall be the arithmetic mean of the temperatures recorded at the end of each test interval (see 6.16.2 g)) and measured 100 mm (4 in) from the walls, at least at the following twelve points, as shown in annex H :

a) the eight outside corners of the container;

b) the centres of the side walls, underside and roof;

θ_i is the average inside temperature, which shall be the arithmetic mean of the temperatures recorded at the end of each test interval (see 6.16.2 g)) and measured 100 mm (4 in) from the walls at least at the following twelve points as shown in annex H :

a) the eight outside corners of the container;

b) the centres of the side walls, floor and ceiling;

θ is the mean wall temperature; by convention, $\theta = \frac{\theta_e + \theta_i}{2}$;

S is the mean surface area of the container in square metres, which is the geometric mean of the inside surface area S_i and the outside surface area S_e; by convention,

$S = \sqrt{S_i \times S_e}$.

If areas are corrugated, the projected area shall be used.

6.16.2 *Procedure*

Test data for determining the heat leakage of the container must be taken for a continuous period of not less than 8 h during which the following conditions must be satisfied :

a) The test shall be performed with a mean wall temperature chosen between 20 °C and 32 °C (68 °F and 90 °F) and a temperature difference between inside and outside of not less than 20 °C (36 °F).

b) Maximum difference between the warmest and the coldest inside points at any one time, 3 °C (5.4 °F).

c) Maximum difference between the warmest and coldest outside points at any one time, 3 °C (5.4 °F).

d) Maximum difference between any two average inside air temperatures, θ_i at different times, 1,5 °C (2.7 °F).

e) Maximum difference between any two average outside air temperatures, θ_e at different times, 1,5 °C (2.7 °F).

f) Maximum percentage difference between the lowest and the highest power dissipation $\left(\frac{\text{watt-h}}{\text{h}}\right)$ values is not to exceed 3 % of the lowest figure.

g) Sets of readings shall be recorded at intervals of not more than 30 min.

h) All temperature-measuring instruments placed inside and outside the container shall be protected against radiation.

No air temperature used shall cause damage to any material.

No test method used shall result in frost build-up which could affect the test results in any way.

6.16.3 *Requirements*

The overall coefficient of heat transfer K calculated from the average of the 17 or more sets of readings — see formula below — taken during the continuous period of not less than 8 h, where U_θ includes the correction factor from test No. 14 where applicable, shall not exceed the value for the class of container under test.

$$K = \frac{\sum_1^n U_\theta}{n} \times \frac{1}{S} \text{ where } n \geqslant 17$$

NOTE — Because the above test may be carried out under conditions different from those at which the unit may operate and because the refrigeration and/or heating equipment will not be running during the test, care should be taken when using the value of K obtained from this test for calculation of performance under service conditions.

6.17 Test No. 16 — Performance test of thermal appliances

6.17.1 *General*

Where temperature limits are given in 1.2 a test shall be performed on the container in its normal operating condition in accordance with 6.17.2.

Where no temperature limits are given in 1.2 for the type of container under test, the ability of the test container and its refrigeration unit to meet stated operating conditions shall be demonstrated by test in a manner as close as practicable to 6.17.2.

6.17.2 *Procedure for refrigerated unit*

The container shall be placed in a room or chamber where the temperature is held constant at the outside temperature for the type of container under test.

The refrigeration unit shall be capable of reducing the temperature of the container to the inside temperature for that type and then maintaining this temperature for a period of 8 h. After this time, a heater placed inside the container shall be turned on, having a capacity of at least 25 % of the total heat transfer rate (determined from test No. 15), which is :

Heating capacity = 0,25 ($K \times S$) (θ outside − θ inside);

θ outside = outside temperature for the type of container from 1.2;

θ inside = inside temperature for the type of container from 1.2.

6.17.3 *Requirements for refrigerated unit*

With the heater in operation, the refrigeration equipment shall be capable of maintaining the average internal temperature of the container at the specified inside temperature for a period of at least 4 h.

7 ELECTRICAL ASPECTS OF THERMAL CONTAINERS

7.1 The requirements which follow are only intended to govern those aspects of electrically powered thermal containers which affect interchange. They do not constitute a detailed electrical specification. Reference should be made to appropriate national and international standards and regulations.

7.2 Classification

Electrically powered temperature control equipment for thermal containers shall be designed for operation under one of the following classifications.

a) Type I

b) Type II

c) Type III

The range of supply voltage appropriate to each of these classifications is defined below in 7.4, 7.5 and 7.6.

It should be noted that the voltage ranges specified have been made as wide as practicable in order that containers built in accordance with this International Standard shall be capable of being operated in as many countries as possible, without modification or adjustment, using the electrical supply normally available in each country. It is not expected that standard electric motors and control gear will necessarily satisfy the requirements set out below.

7.3 General requirements

See annex I for "Electrical power supplies for thermal containers".

7.3.1 Equipment shall be designed to operate from 3-phase, 3-wire alternating current supply sources having nominal frequencies of 50 Hz and 60 Hz each with a tolerance of ± 2,5 %.

7.3.2 Equipment shall have a maximum electrical loading, under rated operating conditions, not exceeding 18,75 kVA. The power consumption shall not exceed 15 kW.

7.3.3 Equipment shall operate in the proper direction of rotation when connected to a supply system having standard phase rotation through a plug and socket connector wired as shown in annex J. Standard phase rotation shall be taken to mean a 3-phase a.c. power system in which the line voltages attain their maximum positive values in the sequence A (or R), B (or S), C (or T).

7.3.4 Total starting current shall be as low as possible and shall in any case not exceed 300 A on type I equipment or 150 A on type II equipment. The total starting current shall be taken to mean the sum of the locked rotor (standstill) currents of all motors starting up at the instant of switch-on plus the current taken by non-rotating elements.

It is permissible for the total starting current of an equipment to be limited to the specified value by sequence controls permitting only one of the motors in a multi-motor equipment to start at any one instant.

The starting current shall decay to 125 % of the normal full load operating current in not more than 1,0 s when tested on a main supply.

7.3.5 Equipment shall be provided with means for protecting the temperature control apparatus against electrical overloads. Automatic reset devices may be used provided component temperatures are not allowed to exceed safe levels.

7.3.6 A continuous equipment earthing conductor shall be provided at the plug and through the "powercord" to the equipment. Metallic parts of electrical fittings within the equipment which do not carry electric current shall be connected to this earthing conductor. All parts which are electrically alive at voltages in excess of 42 V shall be shielded against accidental contact. The insulation resistance of the equipment shall be at least 1 MΩ.

7.3.7 A flexible power cable of adequate electrical capacity shall be permanently attached to the refrigeration and/or heating unit at one end and shall have a male plug at the other end. The cable shall have a minimum length equal to the length of the container plus 6 m, or 15 m, whichever is greater.

7.3.8 The plug shall be sealed to the power cable by a suitable means so as to prevent the entry of water under service conditions.

7.3.9 The container or refrigeration equipment shall include a storage space large enough to securely stow the power cable. If a portion of the cable is intended to be stored in the compartment during operation, the storage space shall be ventilated.

7.3.10 Controls shall include an easily accessible and clearly marked ON/OFF switch on the outside of the equipment which prevents operation of the unit when in the OFF position.

The unit shall operate automatically on its own control system when in the ON position.

An indicating light shall be provided, which shall be illuminated whenever the switch is in the ON position.

7.3.11 All electrical motors and other electrical apparatus forming part of the equipment shall be adequately protected against the effects of moisture and humidity to which the container will be subjected under service conditions.

7.3.12 A wiring diagram shall be mounted on an easily accessible door of the appliance. All wires shall be identified by marking or colour coding to correspond with information on the wiring diagram.

7.3.13 The equipment nameplate details shall include the following data as minimum requirement :

Type . . . . . (I, II or III)

Volts . . . . . 3-phase . . . . . Hz

Full load current . . . . . A

Total starting current . . . . . A

7.4 Type I equipment

7.4.1 Type I equipment shall be designed to operate on any electrical power supply when the voltage measured between phases at the receptacle is as follows :

a) 50 Hz : min. 180 V, max. 230 V;

b) 60 Hz : min. 200 V, max. 250 V.

7.4.2 The equipment shall be provided with a male plug of one of the following types.

a) A 60 A 4-pin (3 poles plus earth) male plug with screwed retaining ring as shown in annex K;

b) A 50 A 4-pin (3 poles plus earth) male plug with screwed retaining ring as shown in annex L.

In view of the large variety of plugs in current use, it has been considered unreasonable to require, for the purpose of this International Standard, acceptance of any one plug. The two types included above are those most commonly employed, and it is hoped that other types will be quickly phased out. It is further hoped that the need for interchange of containers will eventually lead to the adoption of a single type as a universal standard for type I equipment.

7.5 Type II equipment

7.5.1 Type II equipment shall be designed to operate on any electrical power supply when the voltage measured between phases at the receptacle is as follows :

a) 50 Hz . min. 360 V, max. 460 V;

b) 60 Hz : min. 400 V, max. 500 V.

7.5.2 The equipment shall be provided with a male plug of one of the following types :

a) A 32 A 4-pin (3 poles plus earth) male plug with bayonet retaining ring as shown in annex M;

b) A 30 A 4-pin (3 poles plus earth) male plug with screwed retaining ring as shown in annex N.

In view of the large variety of plugs in current use, it has been considered unreasonable to require, for the purpose of this International Standard, acceptance of any one plug. The two types included above are those most commonly employed, and it is hoped that other types will be quickly phased out. It is further hoped that the need for interchange of containers will eventually lead to the adoption of a single type as a universal standard for type II equipment.

7.6 Type III dual voltage equipment

7.6.1 Type III equipment shall be designed to operate on both type I electrical power supplies in accordance with 7.4.1 and type II electrical power supplies in accordance with 7.5.1.

7.6.2 The equipment shall be provided with two separate flexible power cables of adequate electrical capacity, one to be used when operating from type I electrical power supplies and the other to be used for type II electrical power supplies. The former shall be fitted with a male plug as described in 7.4.2 and the latter with a male plug as described in 7.5.2.

Both power cables shall be permanently attached to the refrigeration and/or heating unit, and both shall have a minimum length equal to either the container length plus 6 m, or 15 m, whichever is greater.

Type III equipment shall include storage space(s) large enough to securely stow both power cables. If a portion of the cables is intended to be stored in a compartment during operation, the storage space(s) shall be ventilated.

7.6.3 The electrical circuit design shall be such that when the controls are set for one voltage range, the power cable for the other voltage range shall be electrically disconnected at the equipment.

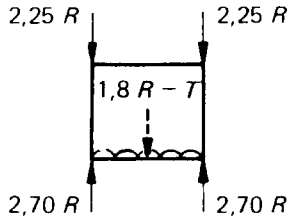
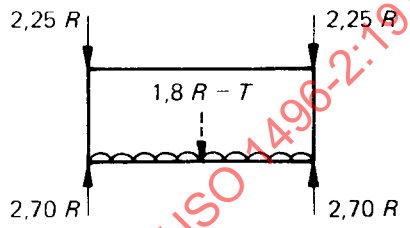
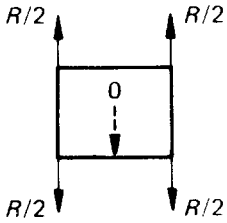
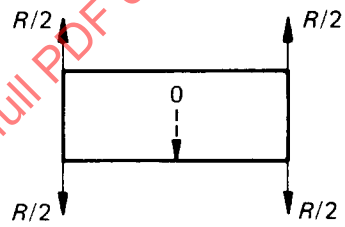
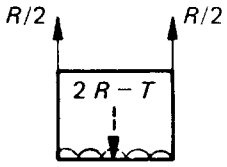
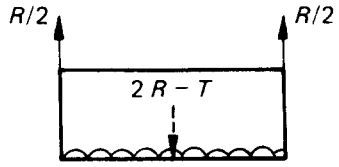
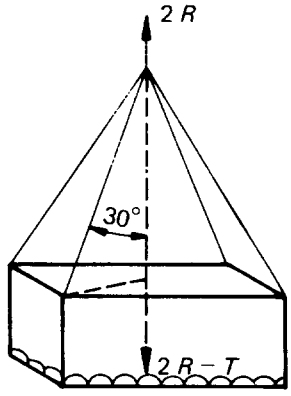
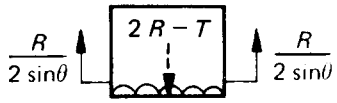
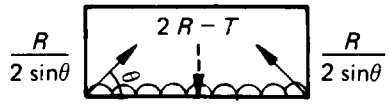
ANNEX A

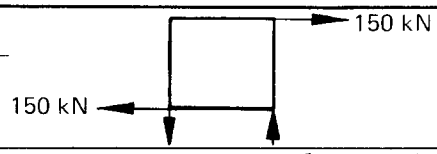
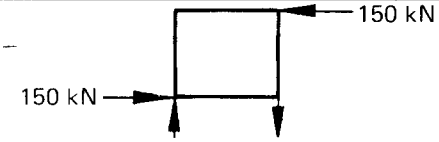
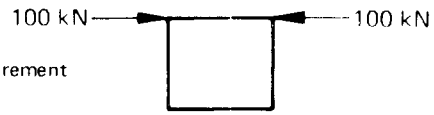
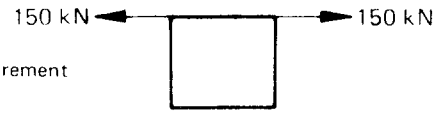
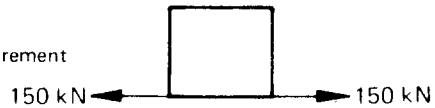
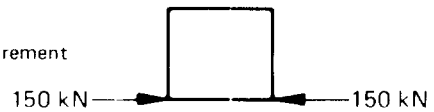
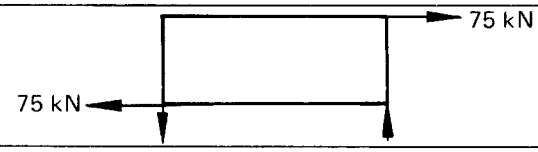
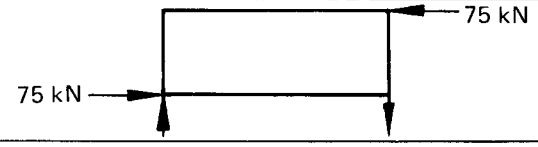
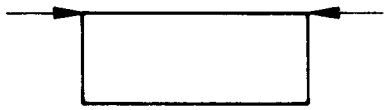
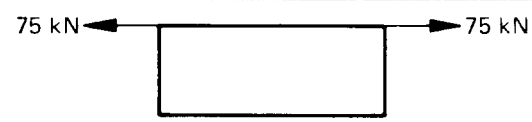
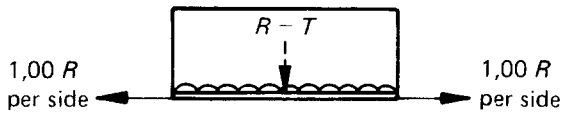
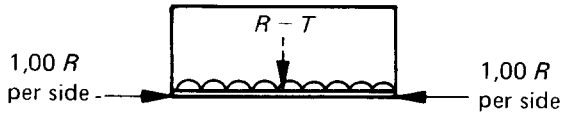
DIAGRAMMATIC REPRESENTATION OF CAPABILITIES APPROPRIATE TO ALL TYPES AND SIZES OF PART II CONTAINERS, EXCEPT WHERE OTHERWISE STATED

NOTES

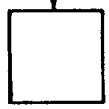
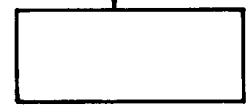
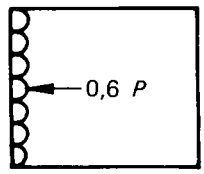
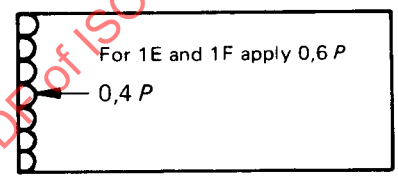
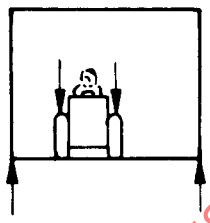
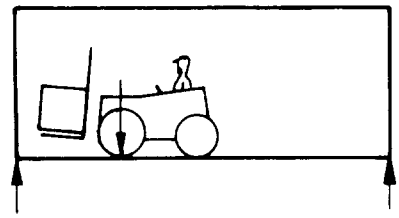
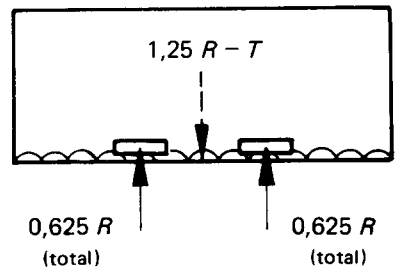
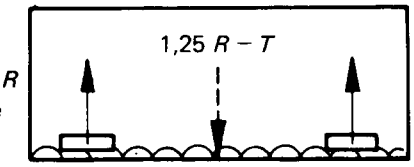
1 The externally applied forces shown below are for one end or one side only. The internal loads are for the whole container.

2 The diagrams in this annex correspond to tests described in sub-clauses 6.2 to 6.13 only where marked.

	End elevations	Side elevations
1	Stacking – Test No. 1 	
	Applies to all sizes	
2	Top lift 	
3	Top lift – Test No. 2 	
	Applicable to 1AA, 1A, 1BB, 1B, 1CC and 1C containers only	
3A	Top lift – Test No. 2 	
	Applicable to 1D, 1E and 1F containers only	
4	Bottom lift – Test No. 3 	
	Applicable to all containers fitted with bottom corner fittings	

	End elevations	Side elevations
5	Rigidity (transverse) – Test No. 9 	Applicable to 1AA, 1A, 1BB, 1B, 1CC and 1C containers only These loads are not applicable to 1D, 1E or 1F containers; lower loads are, however, applicable to 1E and 1F containers (see 15 and 16 below)
6	Rigidity (transverse) – Test No. 9 	
7	Lashing/securement 	
8	Lashing/securement 	
9	Lashing/securement 	
10	Lashing/securement 	
11	Rigidity (longitudinal) – Test No. 10 Applicable to 1AA, 1A, 1BB, 1B, 1CC and 1C containers only 	
12		
13	Lashing/securement (This type of loading is inadmissible except as applied in 3A) 	
14	Lashing/securement 	
15	Restraint (longitudinal) – Test No. 4 Applicable to all sizes. For 1E and 1F containers, same loadings apply across the container as along its length 	
16		

NOTE – 1 kN ≈ 100 kgf (within 2 %)

	End elevations	Side elevations
17	Roof loadings — Test No. 7 300 kg 660 lb  Applies to all sizes (where provided)	300 kg 660 lb 
18	Internal loadings Test No. 6 Side load  0,6 *P* Applies to all sizes	
19		End load Test No. 5  For 1E and 1F apply 0,6 *P* 0,4 *P* Applicable to 1AA, 1A, 1BB, 1B, 1CC, 1C and 1D containers
20	Wheel loadings Test No. 8  2 X 2 730 kg 2 X 6 000 lb Applicable to 1AA, 1A, 1BB, 1B, 1CC, 1C and 1D containers only	
21	Optional features Applicable to 1CC, 1C, 1D, 1E and 1F containers when fitted with fork pockets — Test No. 11	 1,25 *R* − *T* 0,625 *R* (total) 0,625 *R* (total)
22	Applicable to 1AA, 1A, 1BB, 1B, 1CC, 1C and 1D containers when fitted with grappler arm lift positions — Test No. 12	0,312 5 *R* per side  1,25 *R* − *T* 0,312 5 *R* per side

ANNEX B

DETAILS OF REQUIREMENTS FOR LOAD TRANSFERRING AREAS IN BASE STRUCTURES OF CONTAINERS

To comply with 5.3.1, the base structures of containers shall have load transferring areas of 250 mm (10 in) minimum width within the zones shown in figure 23.

1) Containers fitted with intermediate transverse members having a spacing of 1 000 mm (39 3/8 in) or less comply with this requirement.

2) Containers not complying as in 1) shall have at least sufficient load transferring areas at the positions shown in figures 24 to 27 as appropriate.

NOTE – The transfer of load between the underside of the bottom side rails and carrying vehicles is not envisaged.

The transfer of load between side rails and handling equipment should occur only when provisions have been made in accordance with 5.9 and/or 5.10.

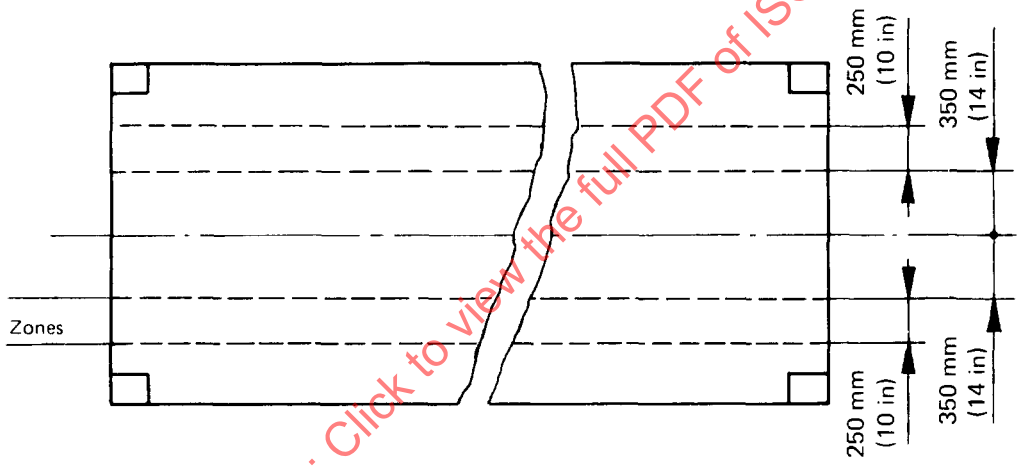


FIGURE 23 – **Load-transfer zones**

NOTE – In figures 24, 25, 26 and 27, the load transferring areas associated with the container base are shown in black. Gooseneck tunnel transfer areas are shown shaded in figure 27.

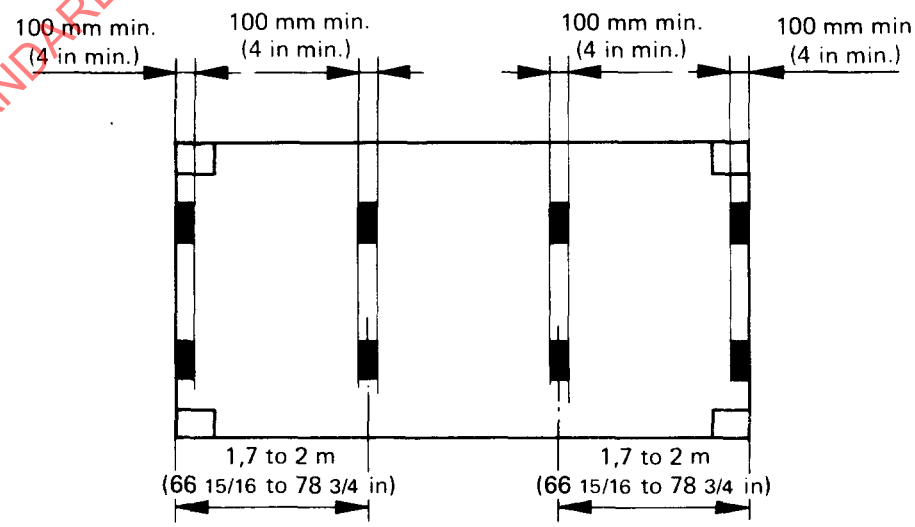


FIGURE 24 – **Load transfer areas for containers 1CC and 1C**

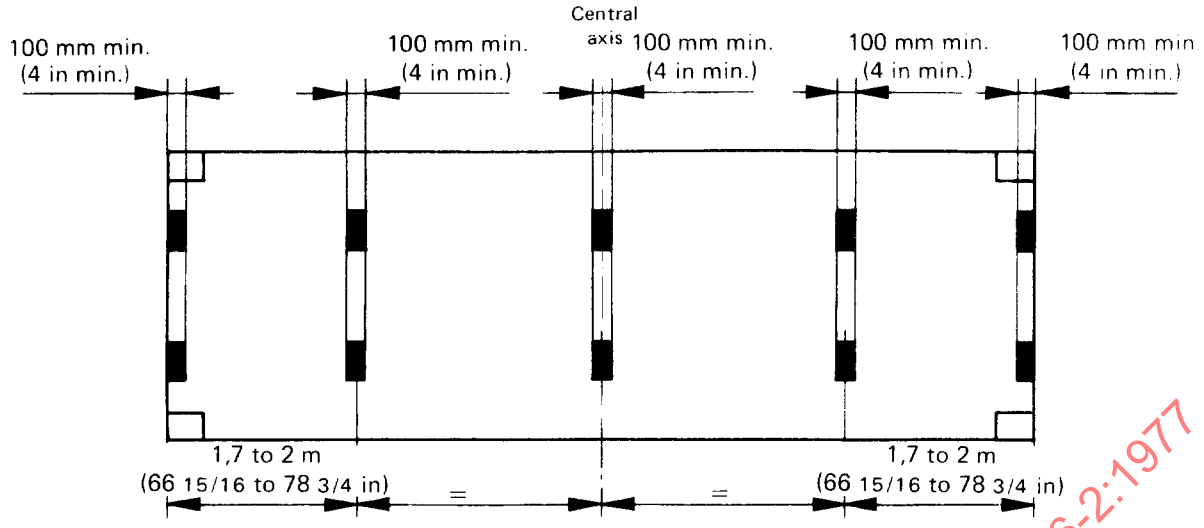


FIGURE 25 – **Load transfer areas for containers 1BB and 1B**

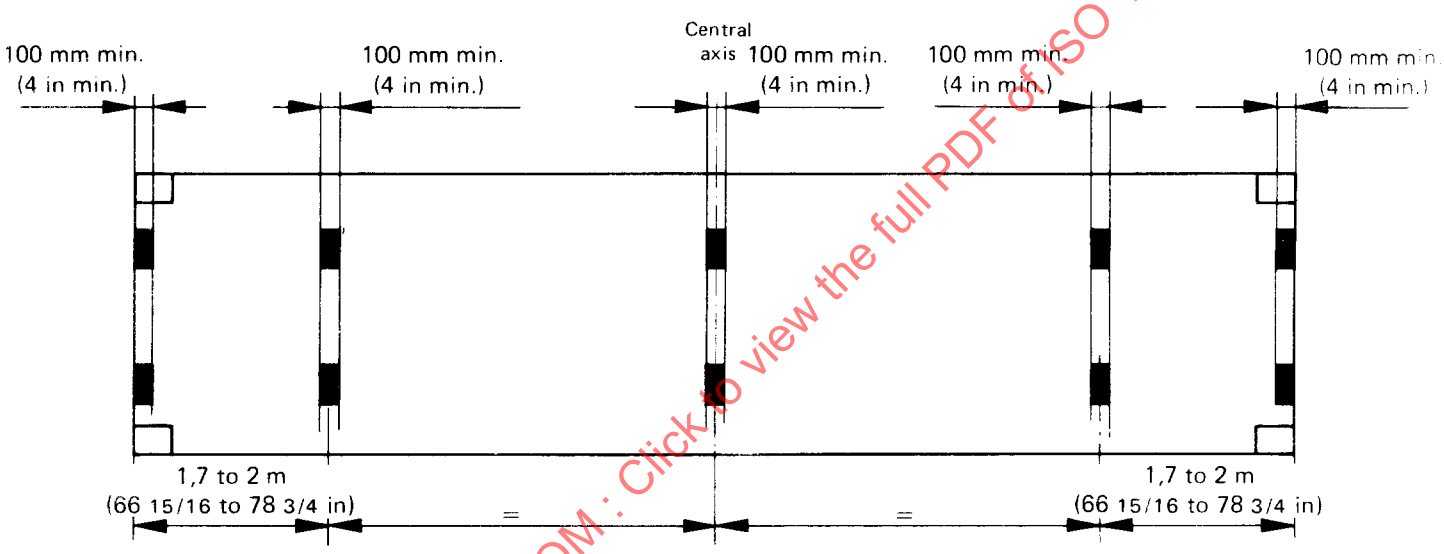


FIGURE 26 – **Load transfer areas for containers 1AA and 1A without gooseneck tunnel**

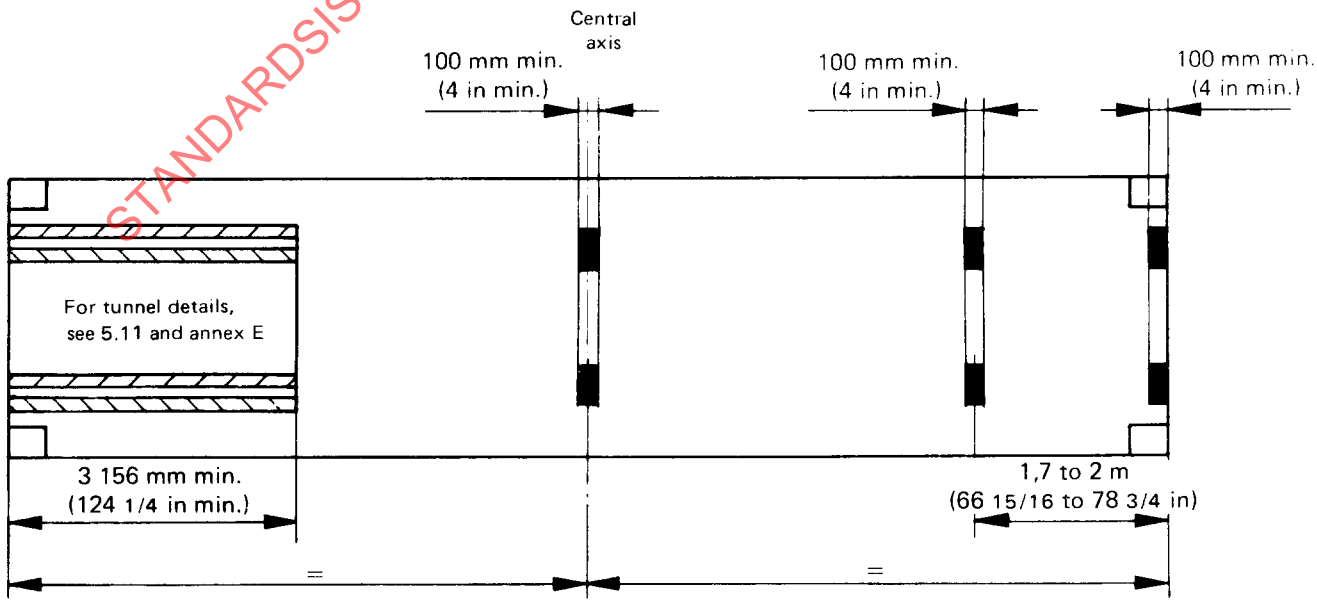
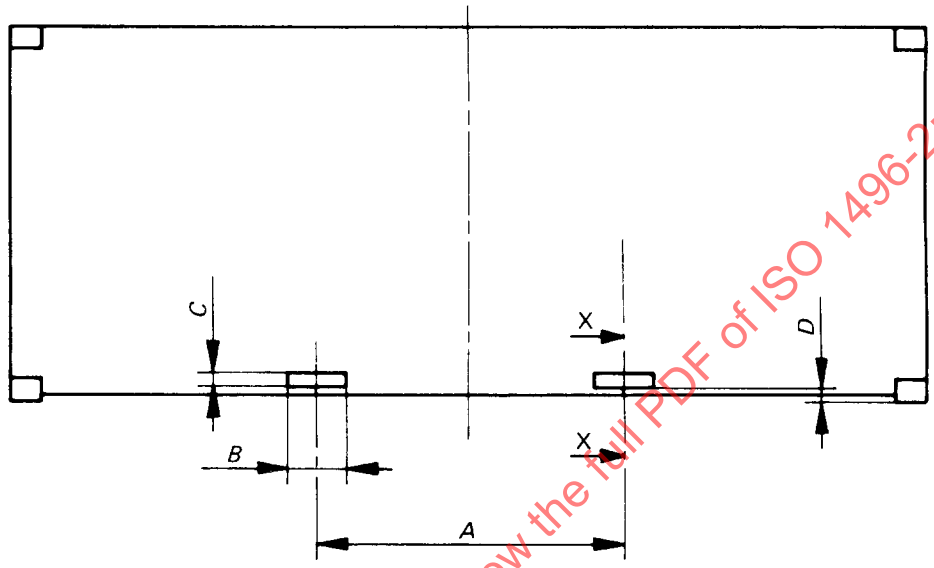


FIGURE 27 – **Load transfer areas for containers 1AA and 1A with gooseneck tunnel**

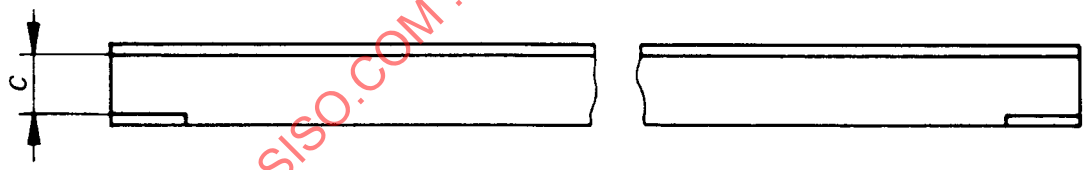
ANNEX C

DIMENSIONS OF FORK LIFT POCKETS

(Where provided) (see 5.9)



Section X-X



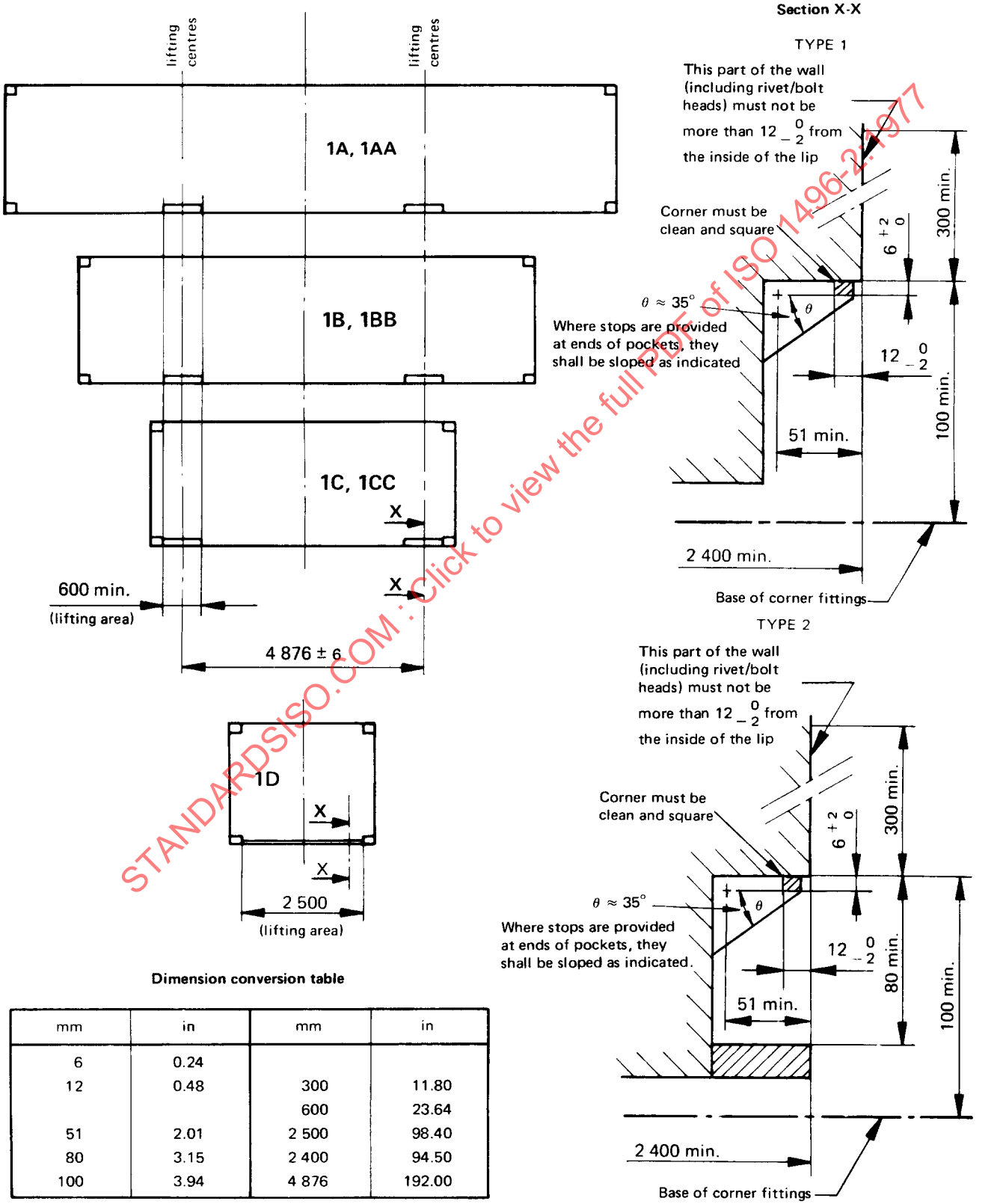
Container	Dimensions							
	mm				in			
	A	*B*	*C*	*D*	*A*	*B*	*C*	*D*
1CC 1C	2 050 ± 50	355 min.	115 min.	20 min.	81 ± 2	14 min.	4 1/2 min.	0.8 min.
1D 1E 1F	900 ± 50	305 min.	102 min.	20 min.	35 1/2 ± 2	12 min.	4 min.	0.8 min.

ANNEX D

DIMENSIONS OF GRAPPLER ARM LIFTING AREAS

(Where provided) (see 5.10)

Dimensions in millimetres



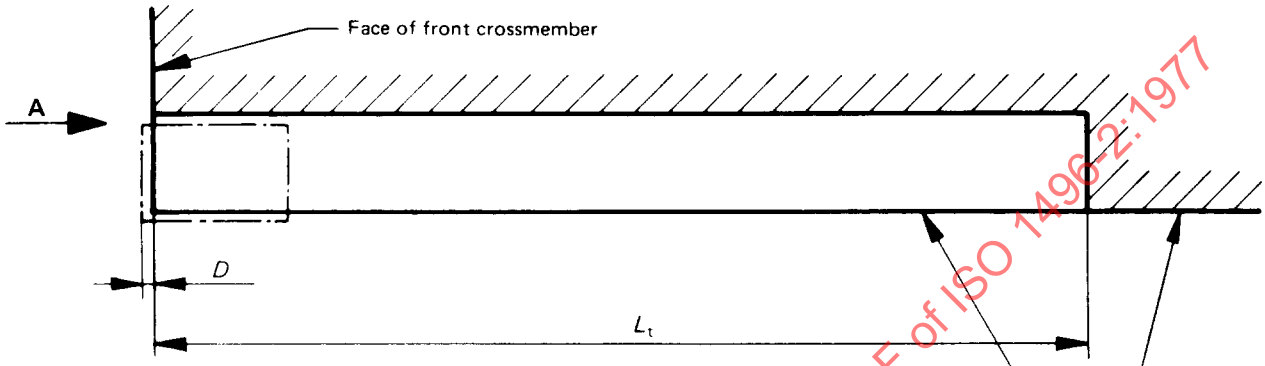
Dimension conversion table

mm	in	mm	in
6	0.24		
12	0.48	300	11.80
		600	23.64
51	2.01	2 500	98.40
80	3.15	2 400	94.50
100	3.94	4 876	192.00

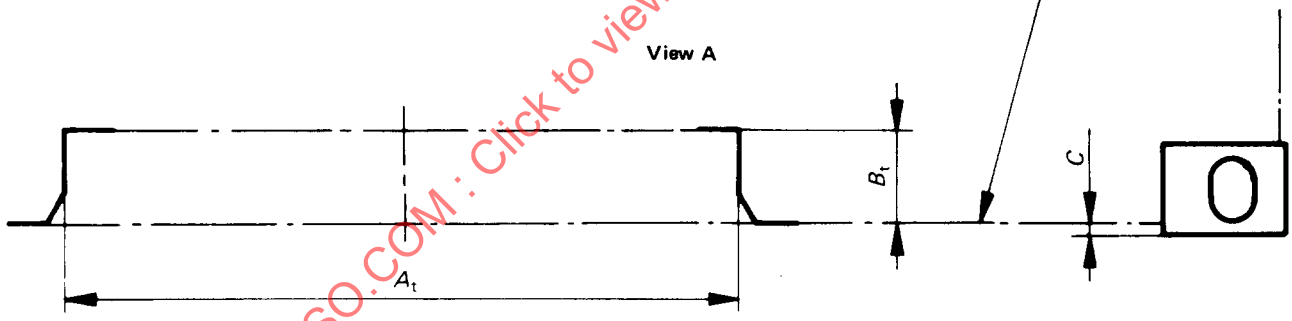
ANNEX E

DIMENSIONS OF GOOSENECK TUNNELS

(Where provided) (see 5.11)



NOTE – The B_t tolerance should be measured in the rear part of the tunnel, on a length of about 600 mm (23 5/8 in).

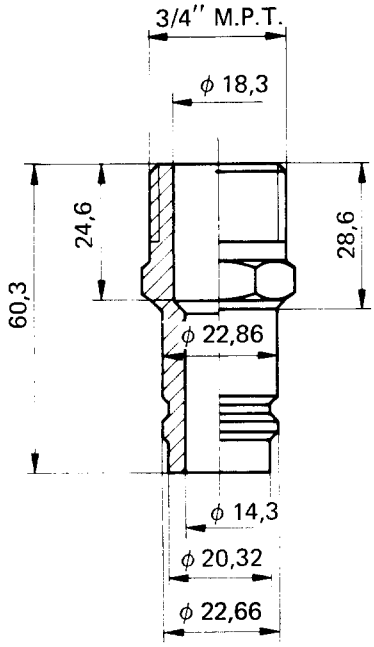


		Dimensions	
		mm	in
Length	L_t	3 150 min.	124 min
	D	$6\ ^{+1}_{-2}$	$1/4\ ^{+3/64}_{-3/32}$
Width	A_t	$1\,029\ ^{+3}_{0}$	$40\ 1/2\ ^{+1/8}_{0}$
Height	B_t	$120\ ^{0}_{-3}$	$4\ 23/32\ ^{0}_{-1/8}$
	C	$12{,}5\ ^{+5}_{-1{,}5}$	$1/2\ ^{+3/16}_{-1/16}$

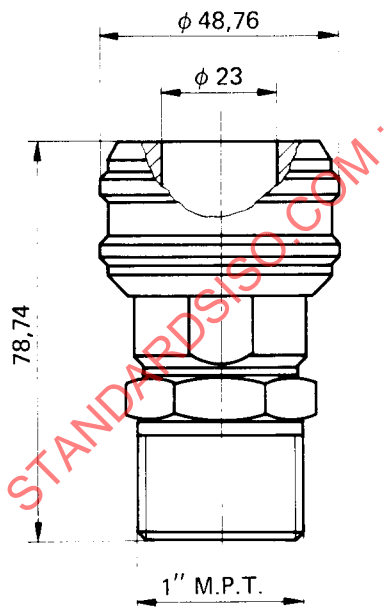
ANNEX F

COOLING WATER CONNECTIONS — INLET SIDE (see 5.13)

Dimensions in millimetres



Plug (container side)



Socket (ship side)

Flow of water

Dimension conversion

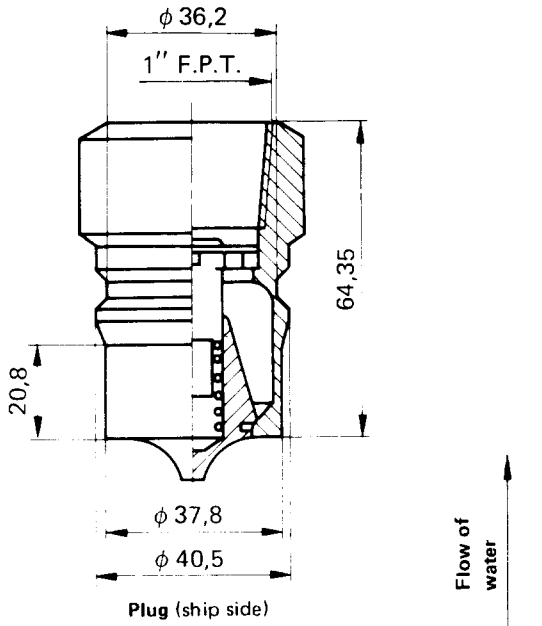
mm	in
18,3	0.72
22,86	0.90
14,3	0.56
20,32	0.80
22,66	0.89
60,3	2.37
24,6	0.97
28,6	1.13
48,76	1.92
23	0.90
78,74	3.10

Pressures	Connected		Disconnected	
	MPa*	lbf/in^2	MPa*	lbf/in^2
Operating pressure	10,5	1 493	2,8	398
Burst pressure	63	8 960	6,3	896

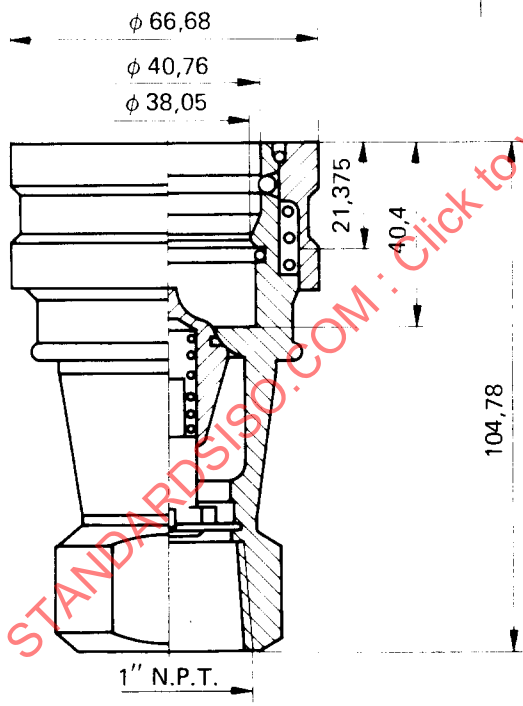
* 1 MPa = 1 MN/m^2 ≈ 10 kgf/cm^2 (within 2 %)

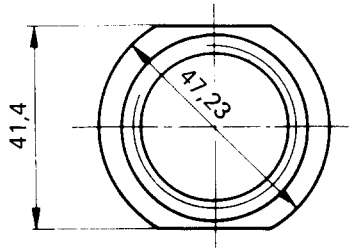
COOLING WATER CONNECTIONS – OUTLET SIDE (see 5.13)

Dimensions in millimetres



Plug (ship side)





Operating pressure 2,8 MPa (398 lbf/in^2)
Burst pressure 6,3 MPa (896 lbf/in^2)

Socket (container side)

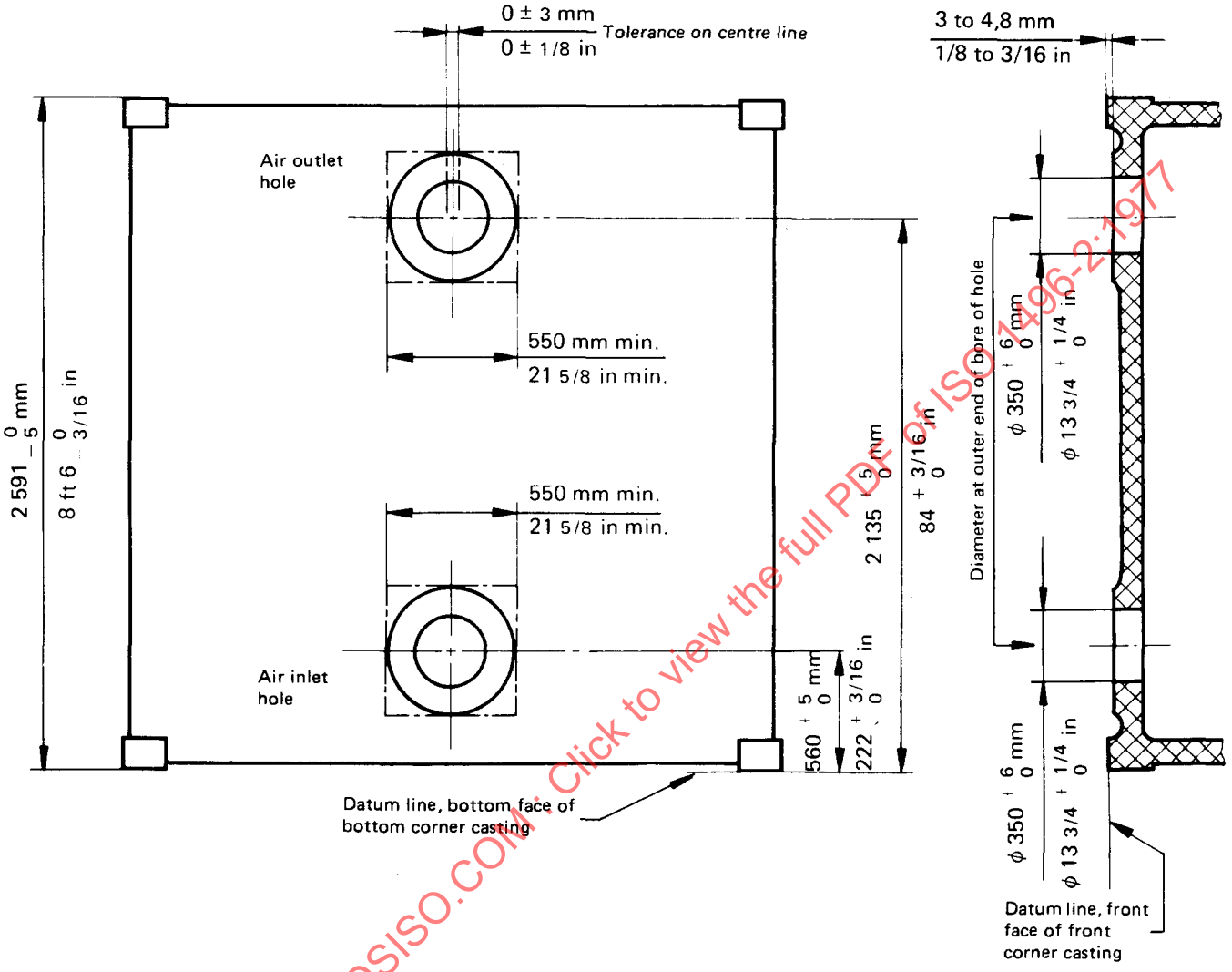
Dimension conversion

mm	in
36,2	1.43
37,8	1.49
40,5	1.59
20,8	0.82
64,35	2.53
41,4	1.63
47,23	1.86
66,68	2.63
40,76	1.60
38,05	1.50
21,375	0.842
40,5	1.59
104,78	4.125

ANNEX G

AIR INLETS AND OUTLETS

G.1 AIR APERTURES IN END WALL OF 1AA THERMAL CONTAINERS (see 5.14)



G.1.1 ***Area about air circulation openings***

G.1.1.1 Bosses 550 mm (21 5/8 in) diameter or square.

G.1.1.2 Face of bosses to be plane to a tolerance of 0,25 mm (0.10 in) and smooth to touch.

G.1.1.3 Faces of bosses to be parallel to a plane determined by front faces of the front corner fittings and recessed 3 to 4,8 mm (1/8 to 3/16 in) from this plane.

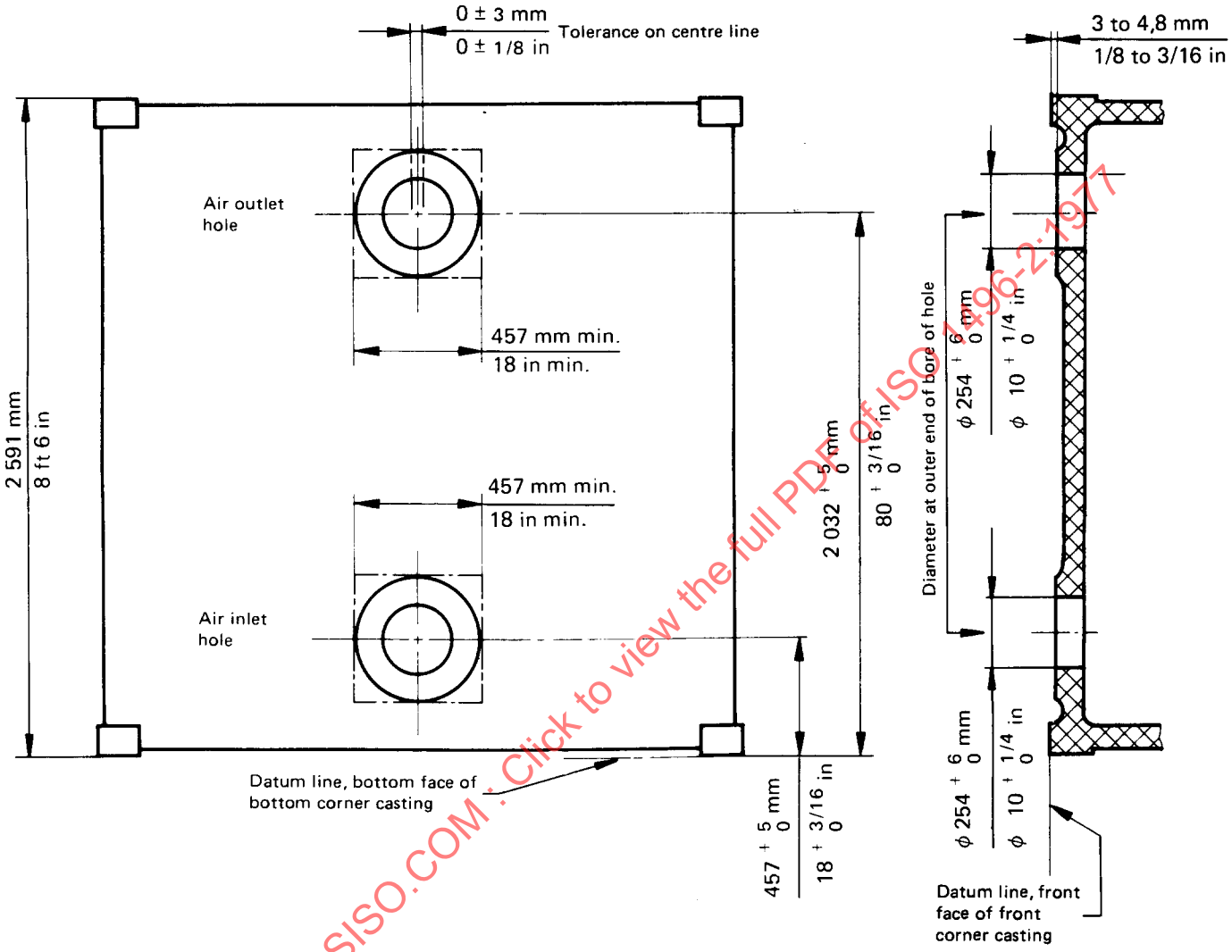
G.1.1.4 Holes may have a mould draw taper but no part of the bore of the hole may have a diameter less than 350 mm (13 3/4 in).

G.1.2 Closures for apertures

G.1.2.1 Closure devices that are captive to the container should be provided for closing off the air circulation openings when the container is not connected to a cold air supply.

G.1.2.2 Closure devices should be capable of being sealed for Customs requirements.

G.2 AIR APERTURES IN END WALL OF 1CC THERMAL CONTAINERS (see 5.14)



G.2.1 Area about air circulation openings

G.2.1.1 Bosses 457 mm (18 in) diameter or square.

G.2.1.2 Face of bosses to be plane to a tolerance of 0,25 mm (0.10 in) and smooth to touch.

G.2.1.3 Faces of bosses to be parallel to a plane determined by front faces of the front corner fittings and recessed 3 to 4,8 mm (1/8 to 3/16 in) from this plane.

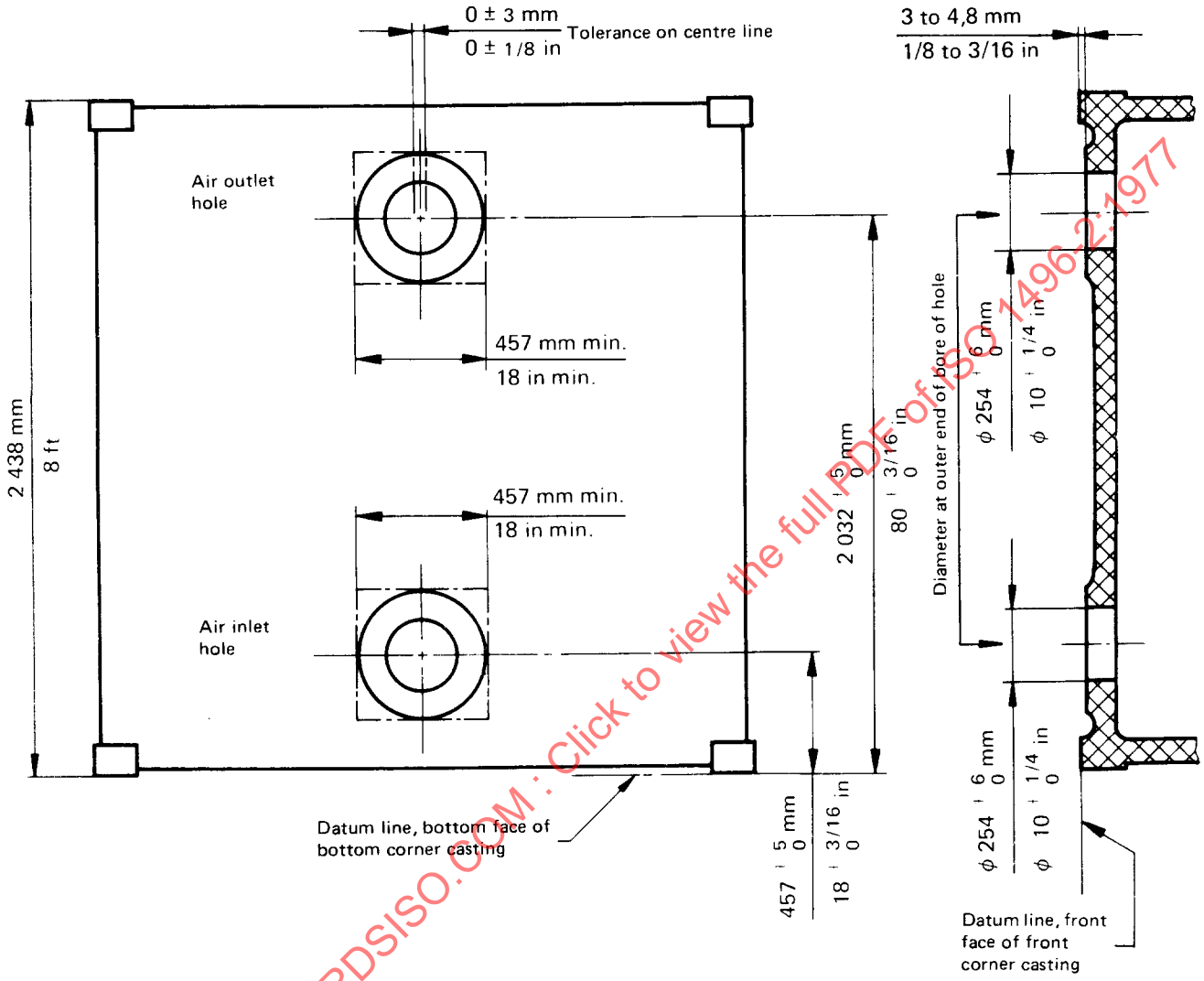
G.2.1.4 Holes may have a mould draw taper but no part of the bore of the hole may have a diameter less than 254 mm (10 in).

G.2.2 Closures for apertures

G.2.2.1 Closure devices that are captive to the container should be provided for closing off the air circulation openings when the container is not connected to a cold air supply.

G.2.2.2 Closure devices should be capable of being sealed for Customs requirements.

G.3 AIR APERTURES IN END WALL OF 1C THERMAL CONTAINERS (see 5.14)



G.3.1 Area about air circulation openings

G.3.1.1 Bosses 457 mm (18 in) diameter or square.

G.3.1.2 Face of bosses to be plane to a tolerance of 0,25 mm (0.10 in) and smooth to touch.

G.3.1.3 Faces of bosses to be parallel to a plane determined by front faces of the front corner fittings and recessed 3 to 4,8 mm (1/8 to 3/16 in) from this plane.

G.3.1.4 Holes may have a mould draw taper but no part of the bore of the hole may have a diameter less than 254 mm (10 in).

G.3.2 Closures for apertures

G.3.2.1 Closure devices that are captive to the container should be provided for closing off the air circulation openings when the container is not connected to a cold air supply.

G.3.2.2 Closure devices should be capable of being sealed for Customs requirements.

ANNEX H

AIR TEMPERATURE MEASUREMENT POINTS (see 6.16.1.3)

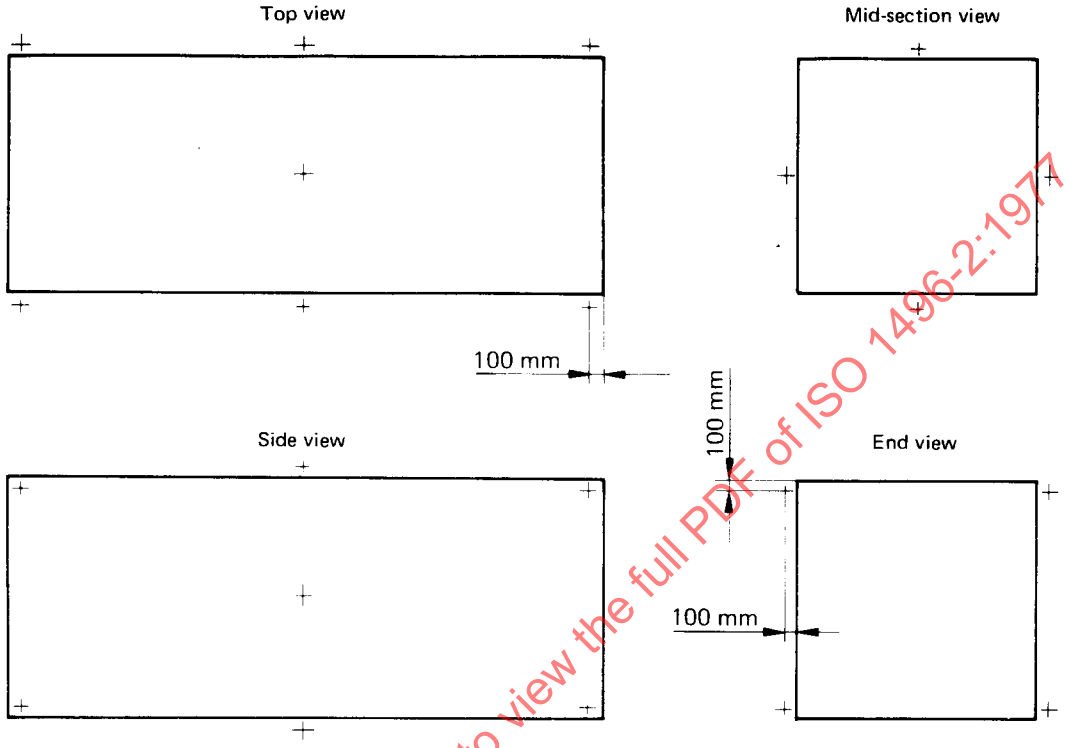


FIGURE 28 – **Outside air temperature measurement points**

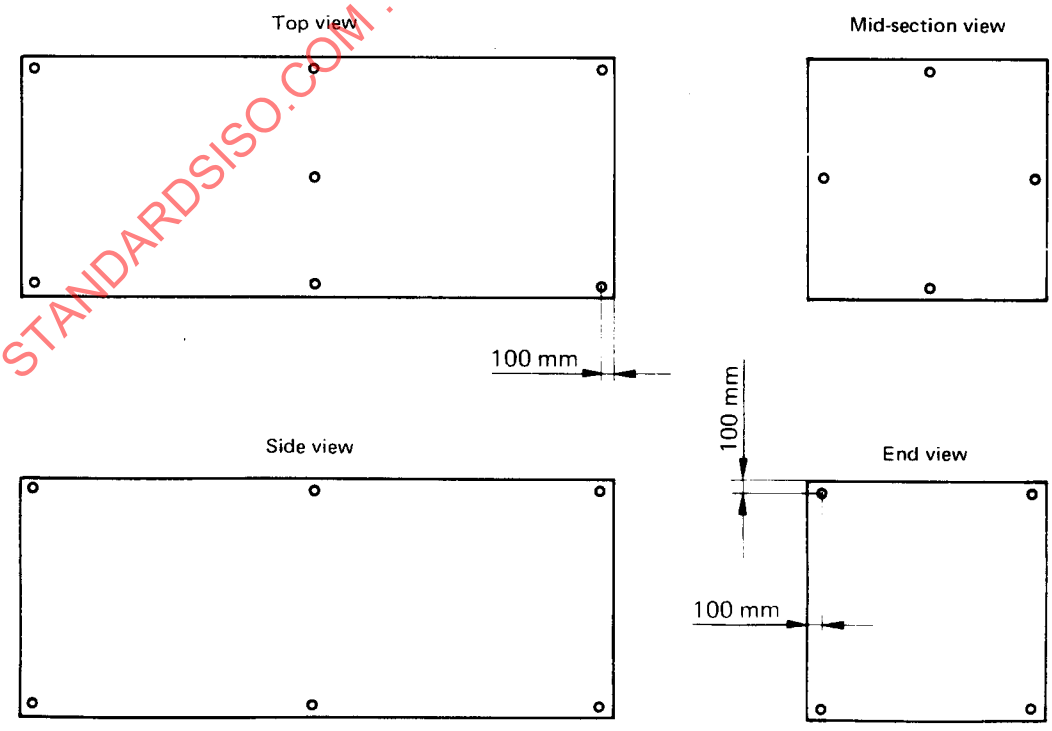


FIGURE 29 – **Inside air temperature measurement points**

ANNEX I

ELECTRICAL POWER SUPPLIES FOR THERMAL CONTAINERS (see 7.3)

This International Standard has been drawn up, so far as the electrical aspects (clause 7) are concerned, on the assumption that the containers will be used in conjunction with electrical power supply installations which meet certain basic requirements. In order to ensure that containers built in accordance with this International Standard can be relied upon to function safely and satisfactorily wherever they are required to operate, the desirable basic requirements for electrical supply installations are set out below.

1) Electrical power supply systems intended for use with thermal containers should be designed and constructed in accordance with appropriate national standards and/or legislation where such exists. Where no such national standards or legislation exist, design and construction should be in accordance with the relevant recommendations of the International Electrotechnical Commission.

2) Power supply systems should be provided with outlet sockets (receptacles) suitable for use with the plugs described in either 7.4.2 or 7.5.2 according to the voltage and frequency of the local electricity supply. These sockets are depicted in annexes K, L, M and N alongside the corresponding plug.

3) Where the voltage of the local electricity supply does not fall within the ranges covered by 7.4.1 and 7.5.1, suitable means of transformation should be employed to change the voltage to an acceptable value.

4) Each power supply outlet socket should be fitted with a suitable isolating switch or circuit breaker, preferably interlocked so that the plug cannot be inserted or withdrawn while the switch or circuit breaker is in the ON position.

5) Each power supply outlet socket should be provided with fuses or, preferably, a linked 3-phase circuit breaker of suitable rating which will give protection against the effects of short circuit but which will not be caused to operate by the starting current of the container machinery up to the limits specified in 7.3.4. Circuit breakers in supplies for type I or type II equipment shall have characteristics which should be in accordance with the following :

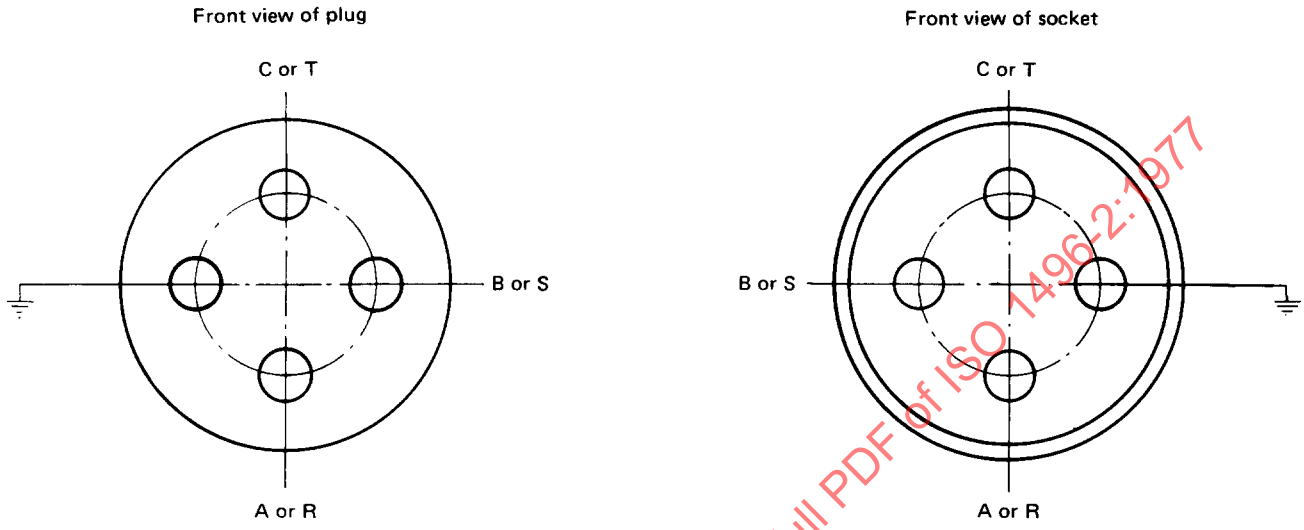
	A	Tripping time
For type I equipment	200	min. 3 s
	360	max. 10 s
	600	max. 0,2 s
For type II equipment	100	min. 3 s
	180	max. 10 s
	300	max. 0,2 s

6) Each power supply outlet socket should be capable of supplying individually a current consistent with the requirements of 7.3.2 and either 7.4.2 or 7.5.2. However, in assessing the load to be supplied by groups of outlet sockets, an appropriate diversity factor may be taken into account.

7) 3-phase power supply systems should be connected for standard phase rotation, as defined in 7.3.3. Outlet sockets should be connected as shown in annex J.

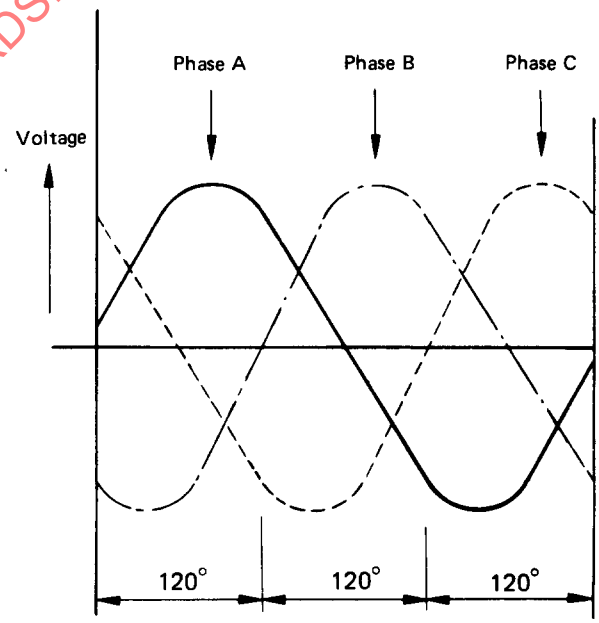
ANNEX J

PHASE CONNECTIONS TO CONTAINER PLUGS AND SOCKETS (see 7.3.3)



Dimensions of plugs and sockets, see annexes K to N

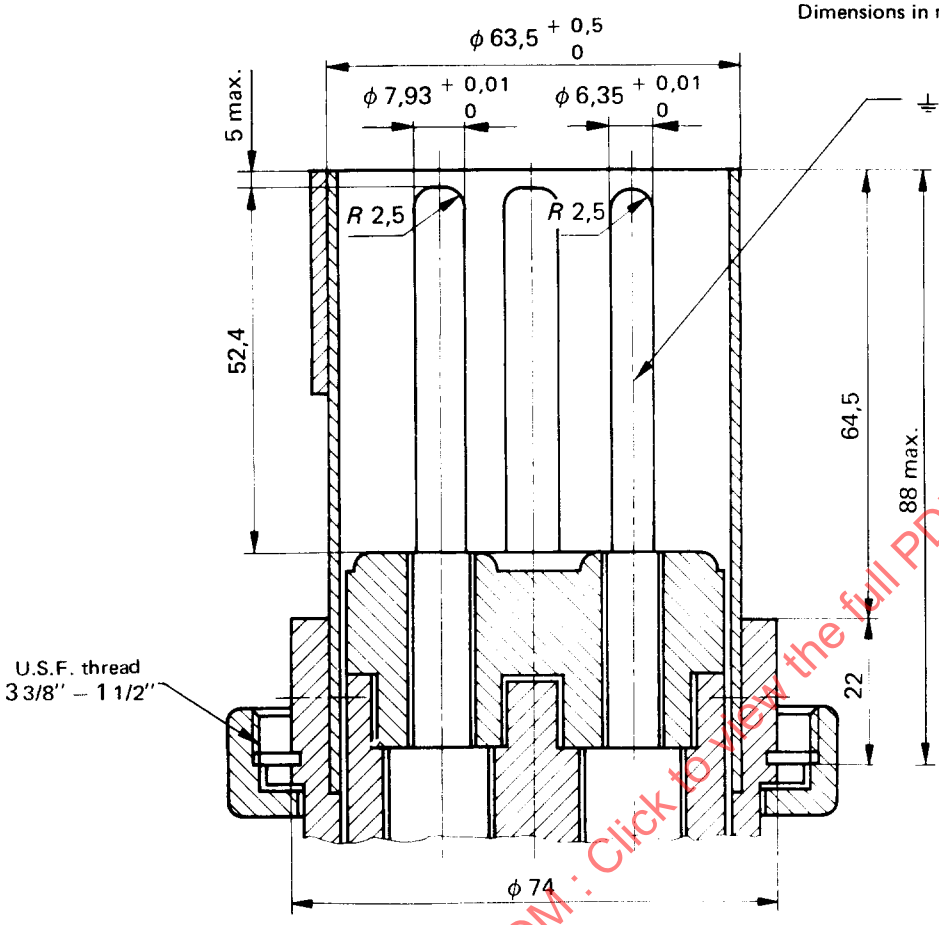
Phase relationship detail

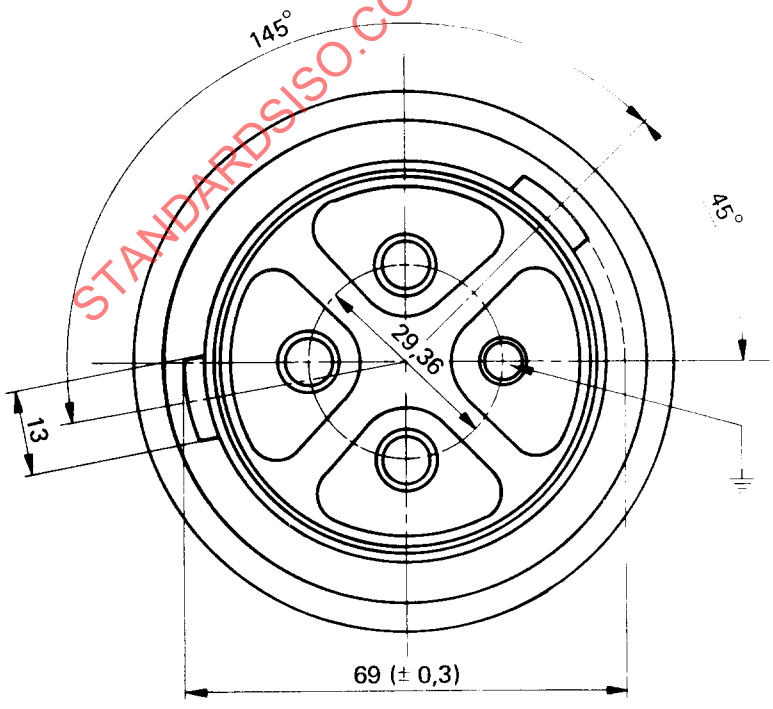


ANNEX K

ELECTRIC PLUG AND SOCKET, 4-PIN, 250 V, 60 A (see 7.4.2 a))

Dimensions in millimetres



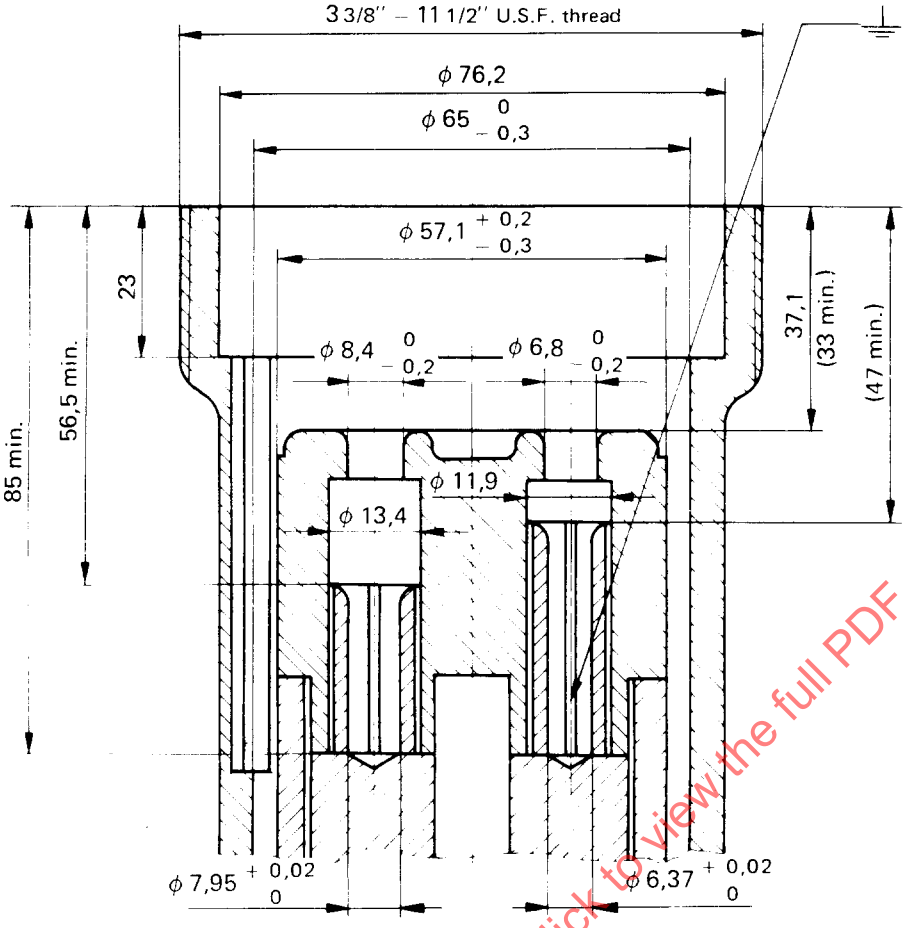


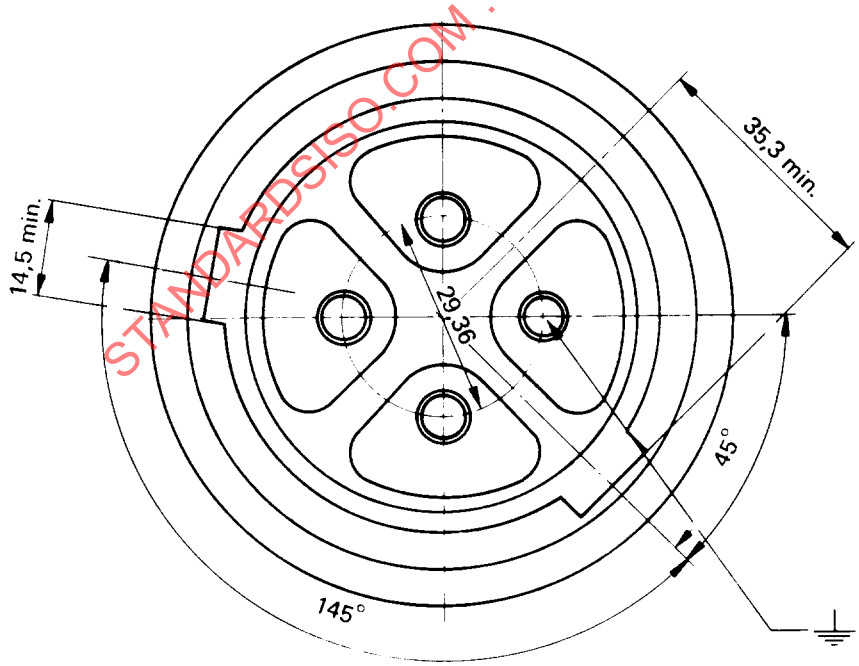
PLUG

Dimension conversion

mm	in
63,5 + 0,5 0	2.5 + 0.02 0
7,93 + 0,01 0	0.312 ± 0
6,35 + 0,01 0	0.25 ± 0
74	2.90
69 (± 0,3)	2.716 ± 0.012
2,5	0.09
29,36	1.155
13	0.51
52,4	2 1/16
64,5	2.54
88	3 15/32
22	0.87
5	0.196

Dimensions in millimetres





SOCKET

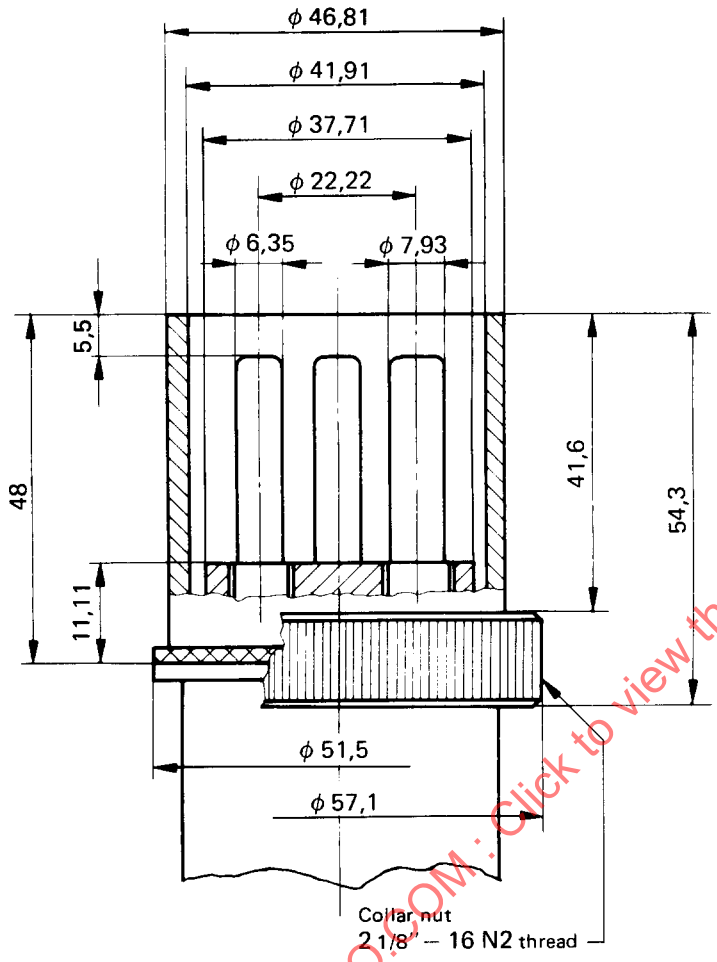
Dimension conversion

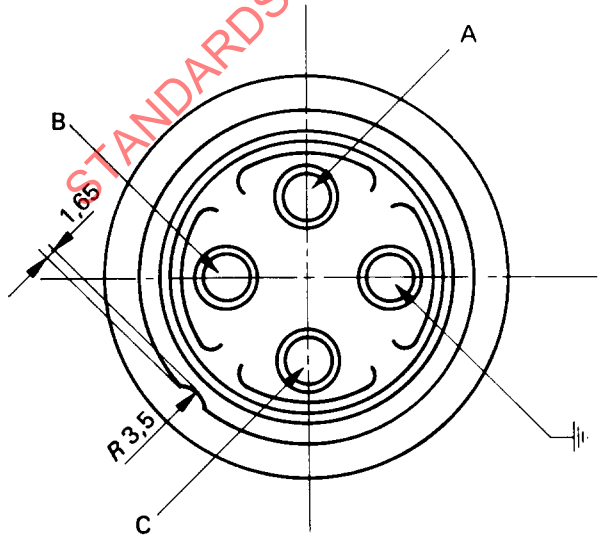
mm	in
76,2	3
65 0 – 0,3	2.56 0 – 0.012
57,1 + 0,2 – 0,3	2.25 + 0.008 – 0.012
8,4 0 – 0,2	0.33 0 – 0.008
6,8 0 – 0,2	0.267 0 – 0.008
11,9	0.468
13,4	0.527
7,95 + 0,02 0	0.312 + 0.008 0
6,37 + 0,02 0	0.25 + 0.008 0
14,5	0.57
35,3	1.39
29,36	1.156
85	3 11/32
56,5	2.22
23	0.91
37,1	1.46
33	1.30
47	1.85

ANNEX L

ELECTRIC PLUG AND SOCKET, 4-PIN, 230 V, 50 A (see 7.4.2b))

Dimensions in millimetres



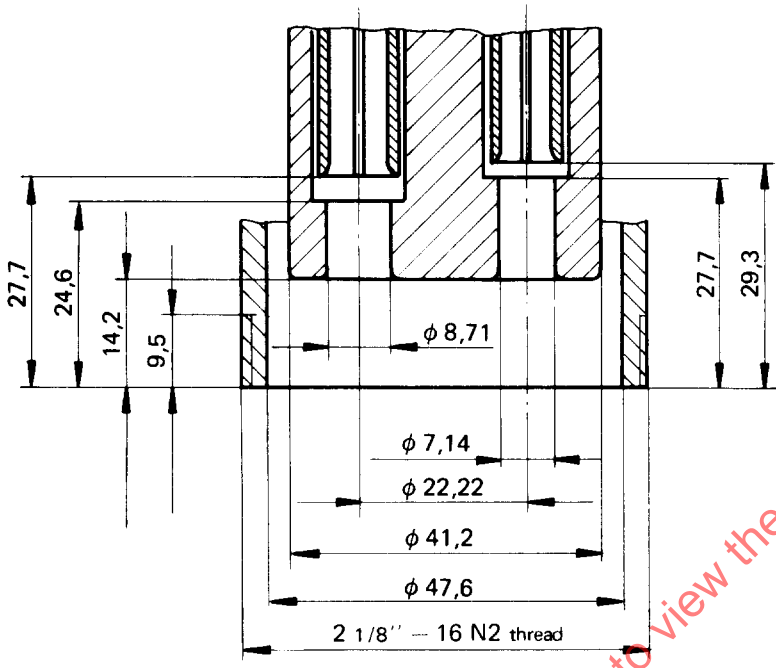


PLUG

Dimension conversion

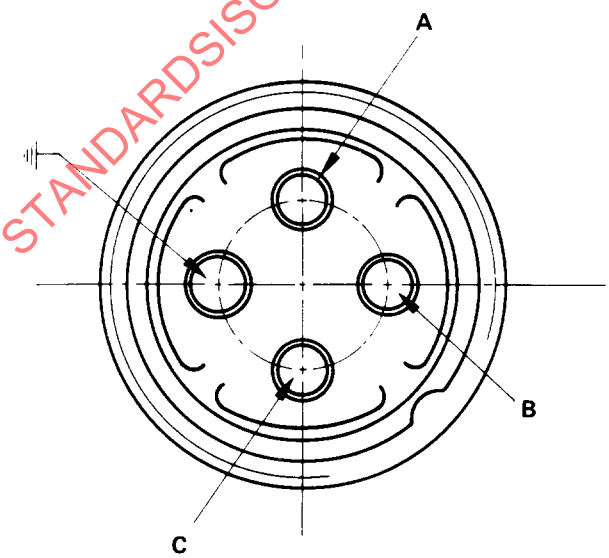
mm	in
46,81	1.843
41,91	1.65
37,71	1.485
22,22	7/8
6,35	0.25
7,93	0.312
51,5	2 1/32
57,1	2 1/4
48	1.891
11,11	0.438
5,5	0.218
41,6	1.640
54,3	2.140
1,65	0.065
3,5	9/64

Dimensions in millimetres



Dimension conversion

mm	in
47,6	1.875
41,2	1.625
22,22	7/8
7,14	0.375
8,71	0.406
27,7	1 3/32
24,6	3 1/32
9,5	3/8
14,2	9/16
27,7	1 3/32
29,3	1 5/32



SOCKET