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# International Standard



# 90/2

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INTERNATIONAL ORGANIZATION FOR STANDARDIZATION • МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ • ORGANISATION INTERNATIONALE DE NORMALISATION

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## Light gauge metal containers — Definitions and determination methods for dimensions and capacities — Part 2: General use containers

*Réipients métalliques légers — Définitions et méthodes de détermination des dimensions et des capacités — Partie 2: Réipients à usage général*

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**Descriptors :** containers, metal packaging, cans, definitions, tests, dimensional measurements, determination, dimensions, cross sections, capacity, designation.

## 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.

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. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 90/2 was prepared by Technical Committee ISO/TC 52, *Light gauge metal containers*.

This first edition together with the first editions of ISO 90/1 and ISO 90/3 cancel and replace ISO 90-1977, of which they constitute a technical revision.

Users should note that all International Standards undergo revision from time to time and that any reference made herein to any other International Standard implies its latest edition, unless otherwise stated.

# Light gauge metal containers — Definitions and determination methods for dimensions and capacities — Part 2: General use containers

## 0 Introduction

ISO 90 is a series of three parts which groups definitions, determination methods for dimensions and capacities, and tolerances and designations of light gauge metal containers.

This part of ISO 90 covers general use cans and containers as defined in 2.1 and is applicable to both round and non-round cans.

The two other parts are

Part 1: Open-top cans.

Part 3: Aerosol cans.

**NOTE** — An "open-top can" is a can one end of which is double-seamed after filling. An "aerosol can" is a non-refillable can intended to contain a product which is dispensed by pre-stored pressure in a controlled manner through a valve.

## 1 Scope and field of application

This part of ISO 90 defines general use containers, types, cross-sections, constructions, shapes, special features and capacities. It specifies methods for determining cross-sections, and gross lidded and brimful capacities. It also recommends an international designation.

## 2 Definitions

For the purposes of ISO 90 and related International Standards, the following definitions apply.

### 2.1 Cans and containers

**2.1.1 can:** Rigid container made of metal with a maximum nominal material thickness of 0,49 mm.

**2.1.2 general use container:** Container which is sealed after filling with a closure that need not be double-seamed. In general, the container can be closed again.

NOTE — Figures 1 to 8 apply to both round and non-round cross-sections.

2.1.3 full-friction can: Can with a removable plug which fits into the open end of the can body.

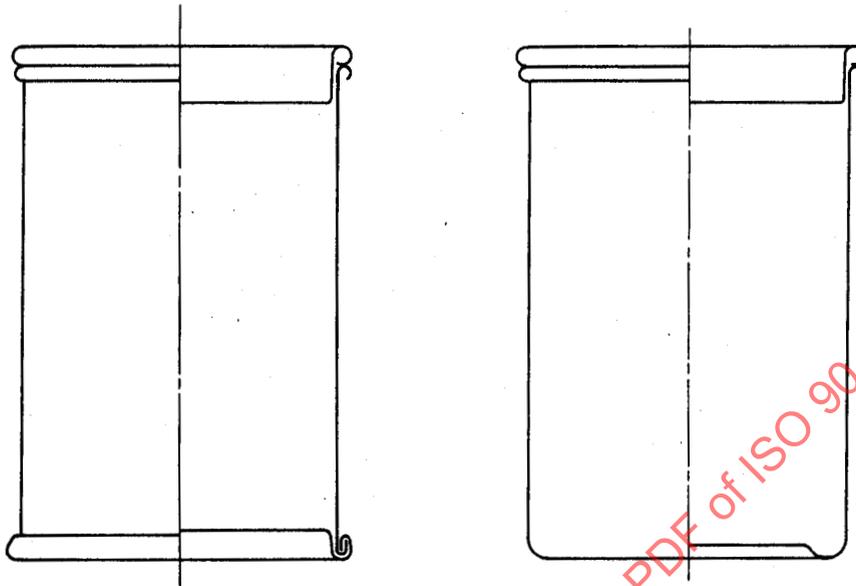


Figure 1

2.1.3.1 pail: Can with a removable plug which fits into the open end of the can body; the can is fitted with a bail [see figure 2a)] or one or more handles [see figure 2b)].

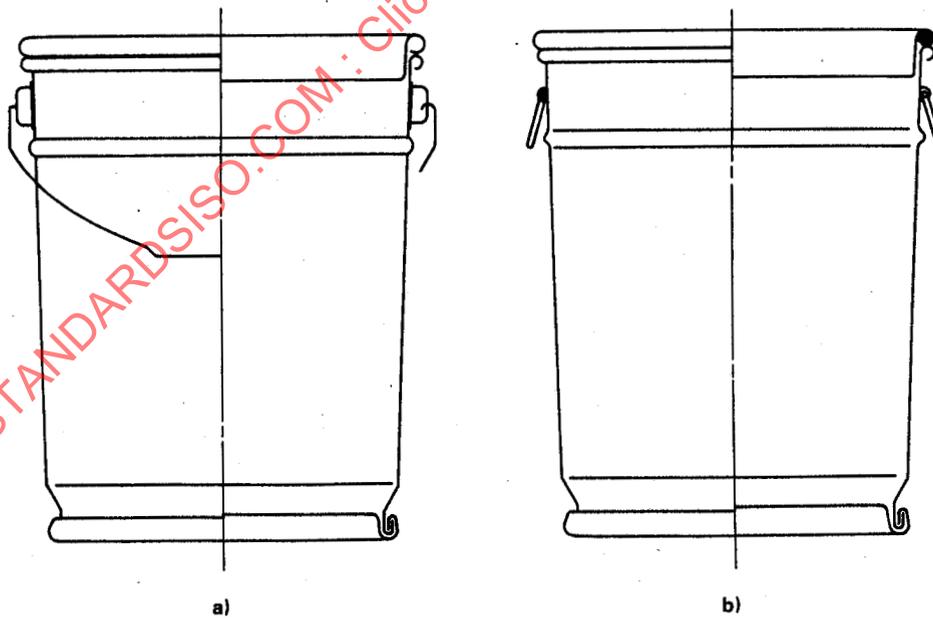


Figure 2

2.1.3.2 **banded-cover can**: Can with a removable cover which is held in position by a closing band.

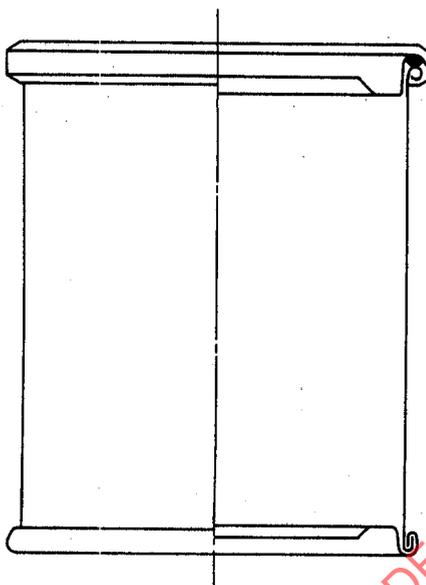


Figure 3

2.1.4 **friction-closure can**: Can with a double-seamed ring on top and a plug which fits into a ring. The can is filled through the closure aperture and is not equipped with a diaphragm.

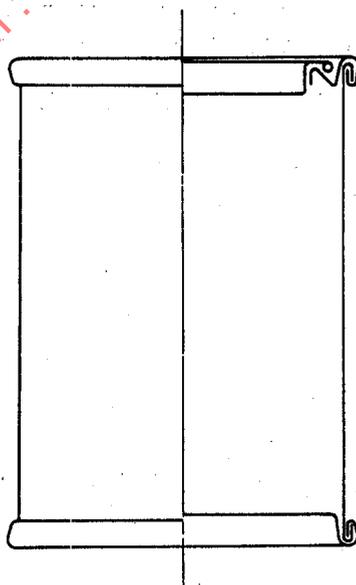


Figure 4

2.1.5 slip-cover can: Can with a removable cover which fits over and around the open end of the can body.

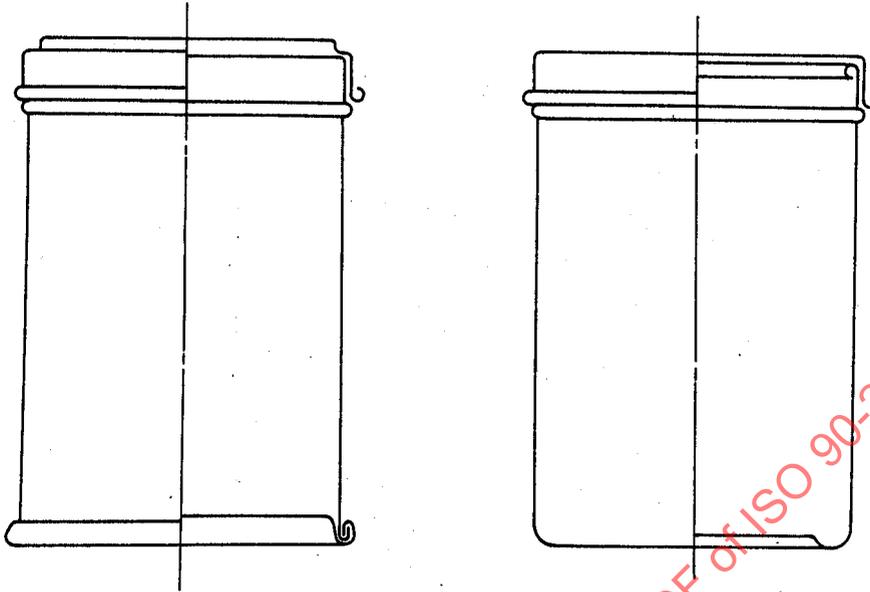


Figure 5

2.1.5.1 crimped-cover can: Can with a removable cover which is crimped over an external curl around the open end of the can body.

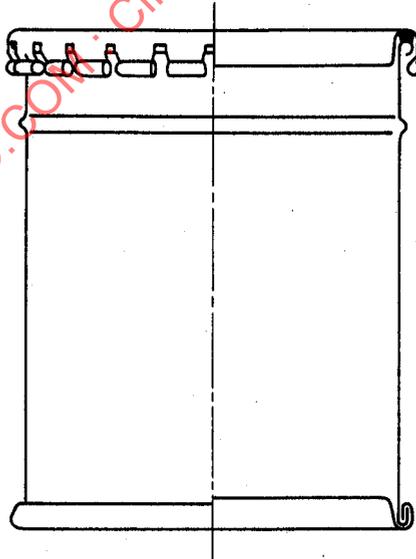


Figure 6

2.1.6 flat-top can: Can with a double-seamed flat top which can be provided with a variety of closures.

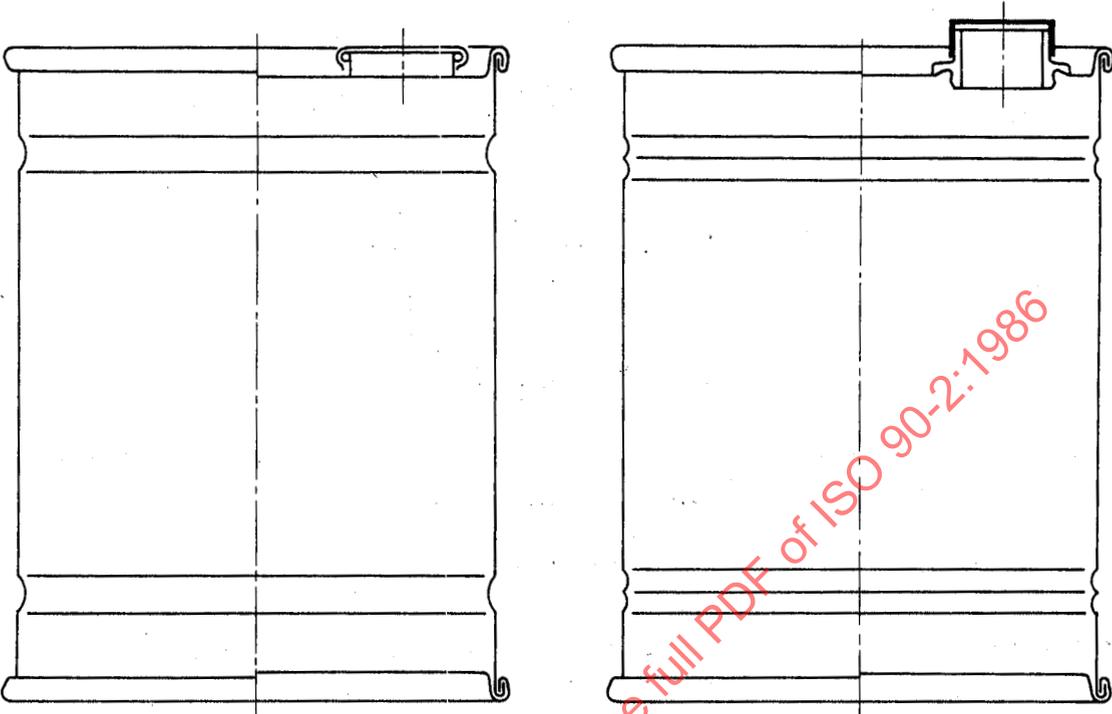


Figure 7

2.1.7 cone-top can: Can with a double-seamed cone-shaped top which can be provided with a variety of closures.

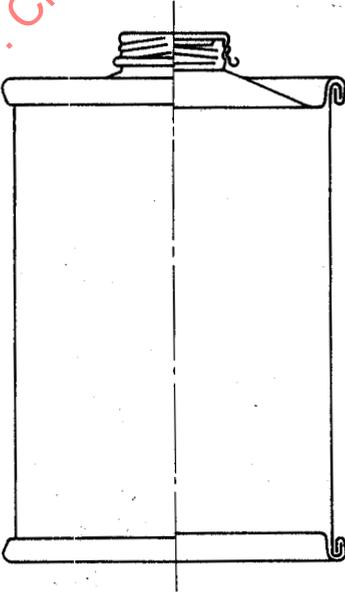


Figure 8

2.2 Cross-sections

2.2.1 round can: Can with a circular cross-section.

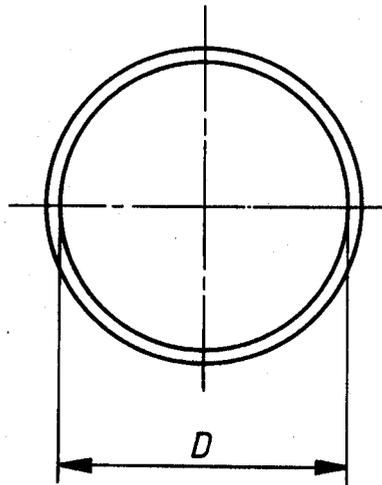


Figure 9

2.2.2 rectangular can: Can with a rectangular [see figure 10a)] or square [see figure 10b)] cross-section.

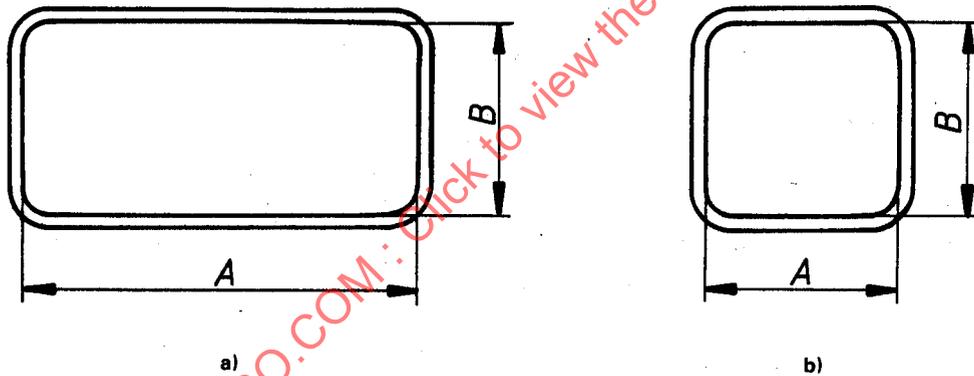


Figure 10

2.2.3 obround can: Can with a cross-section of parallel sides of equal length joined by two curved ends; these may be semicircular [see figure 11a)] or include different radii [see figure 11b)].

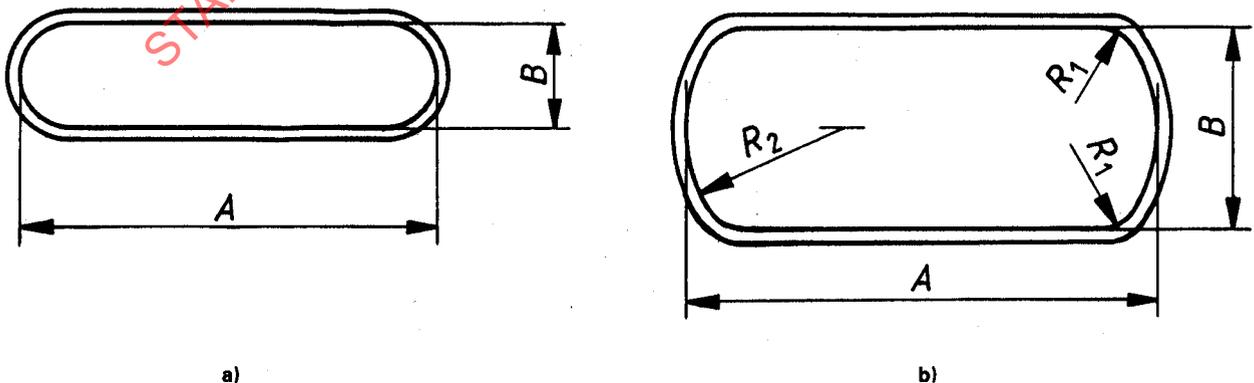


Figure 11

2.2.4 oval can: Can with an oval cross-section.

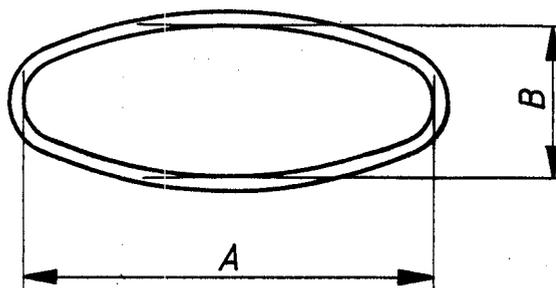


Figure 12

2.2.5 trapezoidal can: Can with an approximately trapezoidal cross-section with rounded corners. The shorter of the parallel sides [see figure 13a)] and the non-parallel sides [see figure 13b)] may be curved.

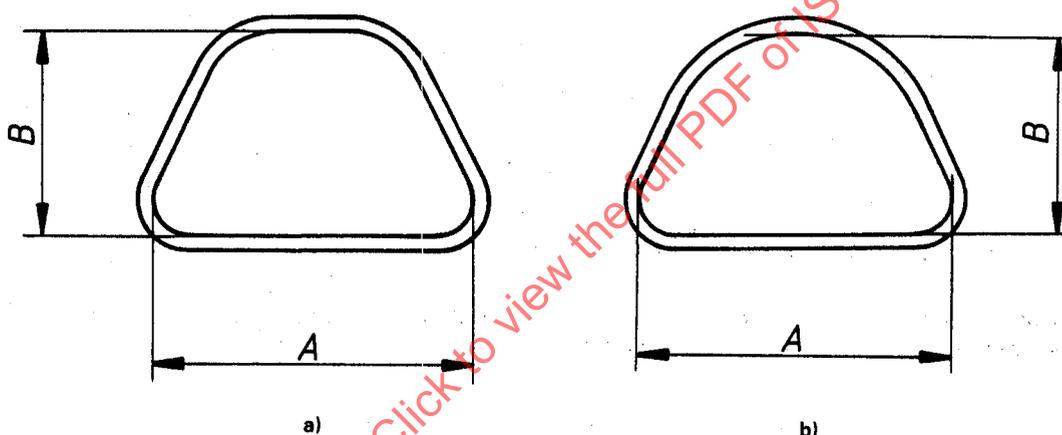


Figure 13

### 2.3 Constructions

2.3.1 three-piece can; built-up can: Can made from three main components: body, top end and bottom end.

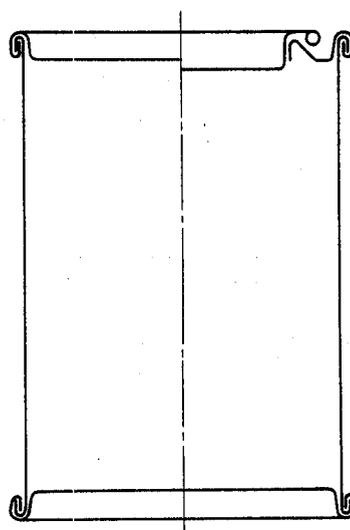


Figure 14

2.3.2 **two-piece can**: Can made from two main components: body and bottom which are one piece, and a top end.

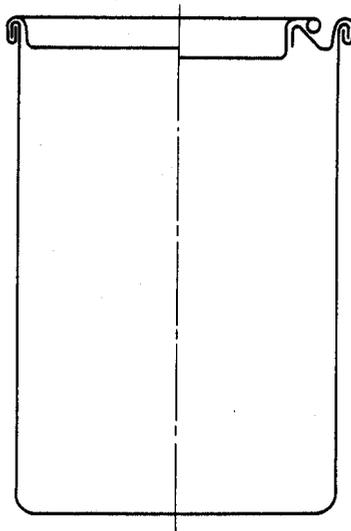


Figure 15

## 2.4 Shapes

NOTE — Figures 16 and 17 apply to both round and non-round cross-sections.

2.4.1 **cylindrical can**: Can the cross-section of which is constant in dimension from top to bottom, local variations caused by special features, such as beading, necking-in, etc., being disregarded.

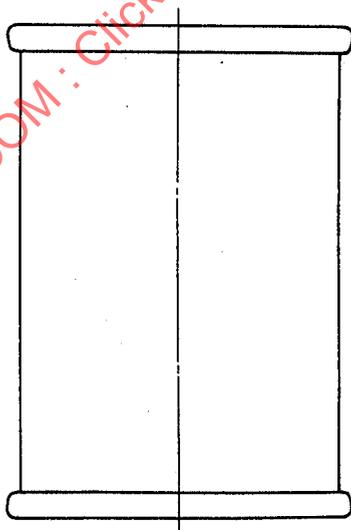


Figure 16

**2.4.2 tapered can:** Can the cross-section of which changes in dimension from top to bottom, local variations caused by special features, such as beading, necking-in, etc., being disregarded.

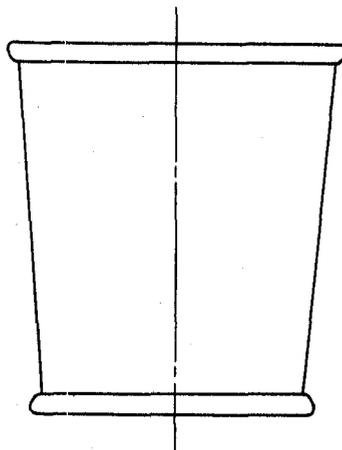


Figure 17

## 2.5 Special features

NOTE — Figures 18 to 20 apply to both round and non-round cross-sections.

**2.5.1 necked-in can:** Can the body of which has been reduced in cross-section at one or both extremities.

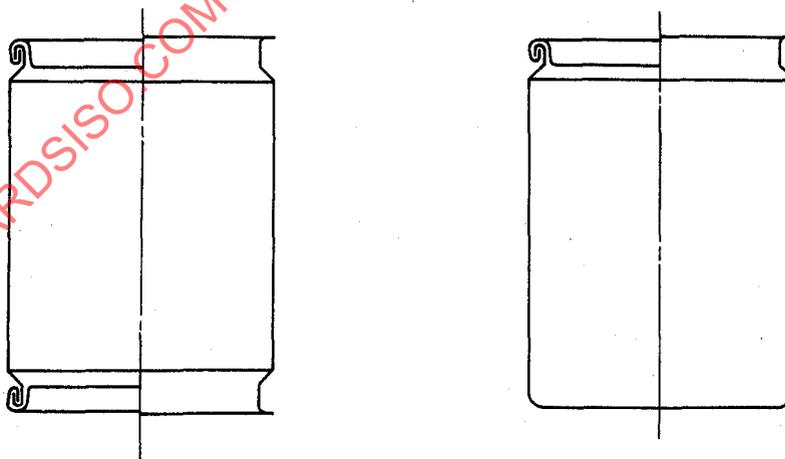


Figure 18

2.5.2 **step-sided can**: Can of which one extremity of the body has been increased in cross-section.

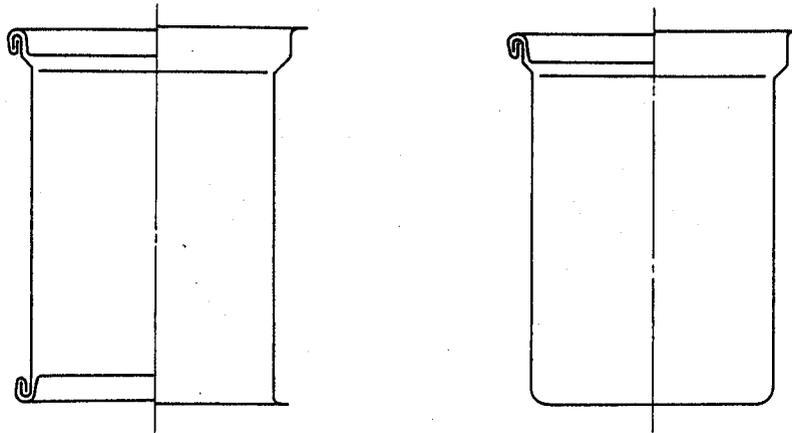


Figure 19

2.5.3 **beaded can**: Can the body of which has small internal and/or external changes in the cross-section.

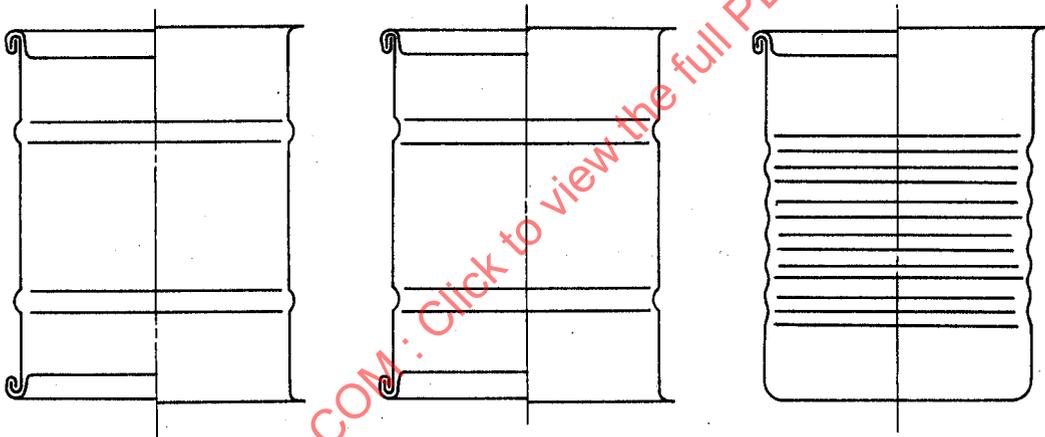


Figure 20

2.5.4 **curled can**: Can of which one extremity of the body has a curled edge; this curl may be internal or external.

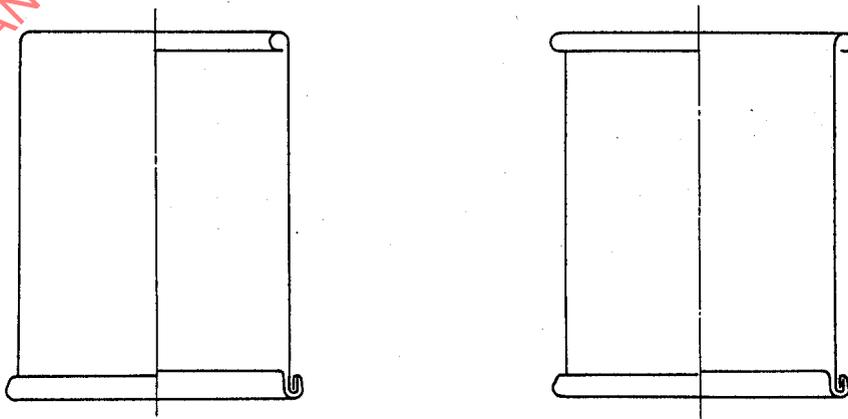


Figure 21

## 2.6 Capacities

**2.6.1 nominal filling volume,  $V$**  (in millilitres): The volume of product that the can is required to hold.

**2.6.1.1 nominal filling mass,  $m$**  (in grams): The mass of product that the can is required to hold.

**2.6.2 gross lidded capacity,  $C$**  (in millilitres): The total capacity of a closed can, determined in accordance with 4.2.

**2.6.3 brimful capacity,  $C_2$**  (in millilitres): The total capacity of a non-closed can, determined in accordance with 4.3.

**2.6.4 head space,  $K$** : The difference between the gross lidded capacity and the filling volume, expressed in millilitres or as a percentage of the filling volume.

## 3 Determination of dimensions

### 3.1 Measurement of cross-sections

**3.1.1** Measure the internal body cross-section using a plug gauge or derive it from the external cross-section measured with a vernier caliper.

**3.1.2** Measure the necked-in or step-sided opening cross-section using a plug gauge applied to the internal cross-section of the extremity to which the end is to be fixed.

**3.1.3** Measure the opening cross-section of a cylindrical or tapered can using a plug gauge applied to the internal cross-section of the extremity to which the end is to be fixed.

### 3.2 Nominal cross-sections

Where a series of standard internal body cross-sections has been agreed, the tolerances define the limits of acceptable deviation resulting from variations in can design and manufacture.

Determine nominal cross-sections by rounding the standard internal body cross-sections (see 3.1.1) or necked-in or step-sided cross-sections (see 3.1.2) to the nearest whole millimetre (if the first decimal is 5 or above, round up; in all other cases, round down).

### 3.3 Measurement of height

See the annex.

### 3.4 Characteristic dimensions

Nominal cross-sections are characterized by the data specified in 3.4.1 to 3.4.4.

#### 3.4.1 Cylindrical round cans

Dimension  $D$  (see 2.2.1).

#### 3.4.2 Cylindrical non-round cans

Dimensions  $A$  and  $B$  (see 2.2.2 to 2.2.5).

#### 3.4.3 Tapered round cans

Dimensions  $D_1$  and  $D_2$ , of which  $D_1$  is the larger, and  $D_2$  the smaller dimension (see clause 5).

#### 3.4.4 Tapered non-round cans

Dimensions  $A_1$ ,  $B_1$ ,  $A_2$  and  $B_2$ , of which  $A_1$  and  $B_1$  are the larger, and  $A_2$  and  $B_2$  the smaller dimensions (see clause 5).

## 3.5 Special features

### 3.5.1 Necked-in cans

The cross-sections in the necked-in area shall be indicated as follows (see clause 5):

- round cans :  $D_{N1}$  — top end  
 $D_{N2}$  — bottom end
- non-round cans:  $A_{N1} \times B_{N1}$  — top end  
 $A_{N2} \times B_{N2}$  — bottom end

### 3.5.2 Step-sided cans

The cross-sections in the step-sided area shall be indicated as follows (see clause 6):

- round cans:  $D_S$
- non-round cans:  $A_S \times B_S$

## 4 Determination of capacities

### 4.1 General

The methods for determining capacity all rely on obtaining the mass of water in the can. For cans with a capacity equal to or greater than 400 ml, a correction factor (see 4.1.1) can be applied, but only if a very precise determination of capacity is necessary.

#### 4.1.1 Temperature-dependent correction factor

Table 1 — Correction factors

Water temperature °C	Correction factor $F$
12	1,000 5
14	1,000 8
16	1,001 1
18	1,001 4
20	1,001 8
22	1,002 2
24	1,002 7
26	1,003 3
28	1,003 8
30	1,004 4

**4.1.2 Accuracy of the balances**

The scales used for weighing the cans shall be at least as accurate as specified in table 2.

**Table 2 — Balance accuracy**

Mass of can <i>m</i> g	Accuracy g
$m < 500$	± 0,5
$500 < m < 2\,500$	± 1,0
$2\,500 < m < 5\,000$	± 2,5
$5\,000 < m$	± 5,0

**4.2 Determination of gross lidded capacity,  $C$**

NOTE — The gross lidded capacity is normally determined on empty cans.

**4.2.1** Attach one end to the body by the usual method for three-piece cans only. (For cans as described under 2.1.3, 2.1.3.1, 2.1.3.2, 2.1.4, 2.1.6 and 2.1.7, this should be the top end.)

**4.2.2** Drill two holes, 3 to 6 mm in diameter and about 7 mm apart, in the loose end of the can from the inside surface outwards (the positioning of the holes depends on the end profile).

In covers for cans as described under 2.1.5 and 2.1.5.1, place the holes as close as possible to the edge from the inside surface outwards. In non-round ends, drill the holes as close as possible to a corner radius.

**4.2.3** Attach this end to the body by the usual method. In case of slip-cover cans, secure the cover to the can by means of adhesive tape.

**4.2.4** Determine the mass of the empty can,  $m$ , in grams, as accurately as possible (see 4.1.2).

**4.2.5** If necessary, measure the temperature of the water to be used (see 4.1.1).

**4.2.6** Fill the can with water through one of the holes, with the can inclined at an angle to the vertical so that the holes are as high as possible.

When water runs out of the second hole, close the holes with the fingers, shake the can gently, and complete filling.

**4.2.7** If the above filling method would result in distortion (due to deformation of the can), proceed as follows:

Place the can in a container, filled with water, with the can inclined at an angle to the vertical so that the holes are as high as possible. Fill the can completely with water through one of the holes. The water in the container should be not more than

10 mm below the highest point of the can. Close the holes with small strips of adhesive tape. Remove the can from the container.

**4.2.8** Remove any surplus water from the outside of the can.

**4.2.9** Determine the mass of the filled can,  $m_2$ , in grams, as accurately as possible (see 4.1.2).

**4.2.10** The difference between the weighings ( $m_2 - m_1$ ), if necessary multiplied by the relevant correction factor (see 4.1.1), represents the gross lidded capacity,  $C$ , of the can, in millilitres.

**4.3 Determination of brimful capacity,  $C_2$**

NOTE — Method to be used for cans with non-flexing sides and/or ends as described under 2.1.5, 2.1.5.1, 2.1.6 and 2.1.7.

**4.3.1** Attach the bottom end to the body by the usual method for three-piece cans only. (For cans as described under 2.1.6 and 2.1.7, attach both ends.)

**4.3.2** Close the can with a rigid disc of transparent plastic with two holes, 3 to 6 mm in diameter and about 7 mm apart, or one hole, 6 mm in diameter.

**4.3.3** Determine the mass of the empty can together with the disc,  $m_{d1}$ , in grams, as accurately as possible (see 4.1.2).

**4.3.4** If necessary, measure the temperature of the water to be used (see 4.1.1).

**4.3.5** Fill the can with water, avoiding air bubbles.

**4.3.6** Close the can with the disc, the hole(s) in the disc being as close as possible to the inside of the can and complete filling through the hole(s).

**4.3.7** If the above filling method would result in distortion (due to deformation of the can), proceed as follows:

Place the can in a container, filled with water, with the can inclined at an angle to the vertical so that the holes are as high as possible. Fill the can completely with water through one of the holes. The water in the container should be not more than 10 mm below the highest point of the can. Close the holes with small strips of adhesive tape. Remove the can from the container.

**4.3.8** Remove any surplus water from the outside of the can.

**4.3.9** Determine the mass of the filled can together with the disc,  $m_{d2}$ , in grams, as accurately as possible (see 4.1.2).