INTERNATIONAL STANDARD

ISO 90-2

Second edition
1997-07-01

Light gauge metal containers — Definitions and determination of dimensions and capacities —

Part 2:
General use containers

Récipients métalliques légers — Définitions et détermination des dimensions et des capacités —

Partie 2: Récipients à usage général

Reference number
ISO 90-2:1997(E)

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 90-2 was prepared by Technical Committee ISO/TC 52, *Light gauge metal containers*, Subcommittee SC 5, *General use containers*.

This second edition cancels and replaces the first edition (ISO 90-2:1986), which has been technically revised.

ISO 90 consists of the following parts, under the general title *Light gauge metal containers — Definitions and determination of dimensions and capacities:*

— *Part 1: Open-top cans*

— *Part 2: General use containers*

— *Part 3: Aerosol cans*

Annexes A and B of this part of ISO 90 are for information only.

Introduction

ISO 90 consists of three parts which group definitions, methods for determination of dimensions and capacities, as well as tolerances and designations of rigid containers made of metal with a maximum nominal material thickness of 0,49 mm.

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

Light gauge metal containers — Definitions and determination of dimensions and capacities —

Part 1:
General use containers

1 Scope

This part of ISO 90 defines general use containers, types of container, 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 this part of ISO 90, the following definitions apply:

2.1 General use containers

2.1.1 general use container: Rigid container made of metal with a maximum nominal material thickness of 0,49 mm, which is sealed after filling with a closure that need not be seamed and which may be made of a different material. In general the container can be reclosed after initial opening.

NOTE — Figures 1 to 8 apply to both round and non-round cross-sections. In addition to those shown in figure 2 a) and 2 b), general use containers may be fitted with one or two handles.

2.1.2 full-friction can: Can with a removable plug which fits into the open end of the can body (see figure 1).

2.1.2.1 pail: Full-friction can fitted with one or more handles (see figure 2).

2.1.2.2 full-friction can with clamping ring: Full-friction can whose lid is held in position by a closing band.

2.1.3 lever-lid can with ring: Can, with a seamed ring on top and a lid that fits into the ring, which is filled through the closure aperture and is not equipped with a diaphragm (see figure 4).

2.1.4 slip-lid can: Can with a removable lid which fits over and around the open end of the can body (see figure 5).

2.1.4.1 crimped-cover can [pail]: Can [pail] with a removable cover which is crimped over an external curl around the open end of the can body (see figure 6).

2.1.5 flat-top can: Can with a seamed flat top with an aperture which can be provided with a variety of closures (see figure 7).

2.1.6 cone-top can: Can with a seamed cone-shaped top with an aperture which can be provided with a variety of closures (see figure 8).

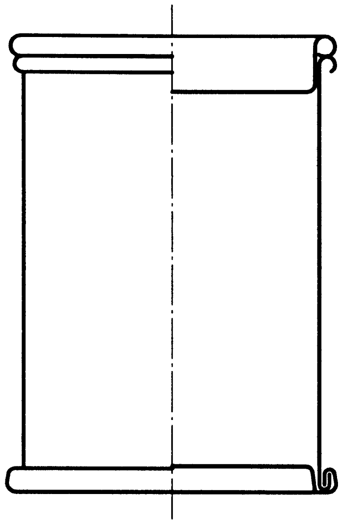
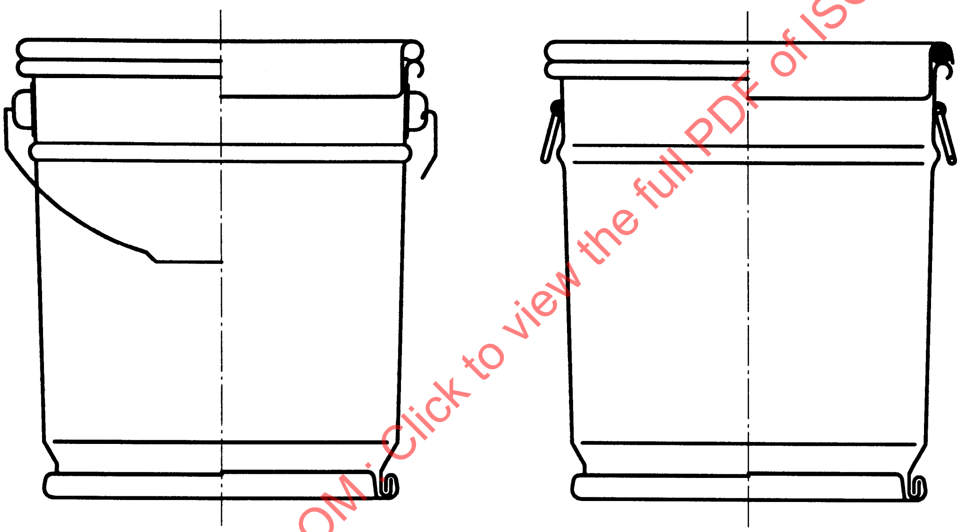


Figure 1 — Full-friction can



a) Single-handle

b) Double-handle

Figure 2 — Pail

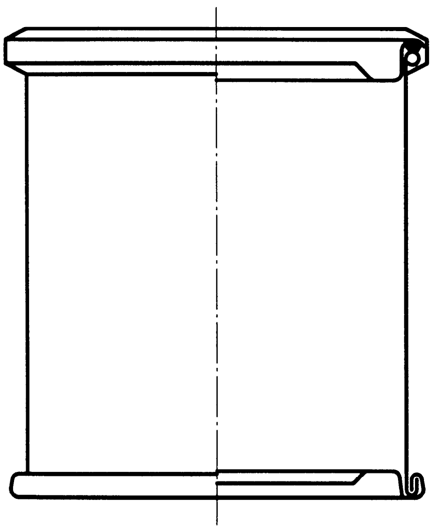


Figure 3 — Full-friction can with clamping ring

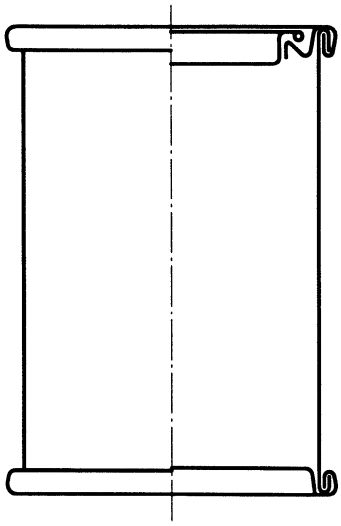
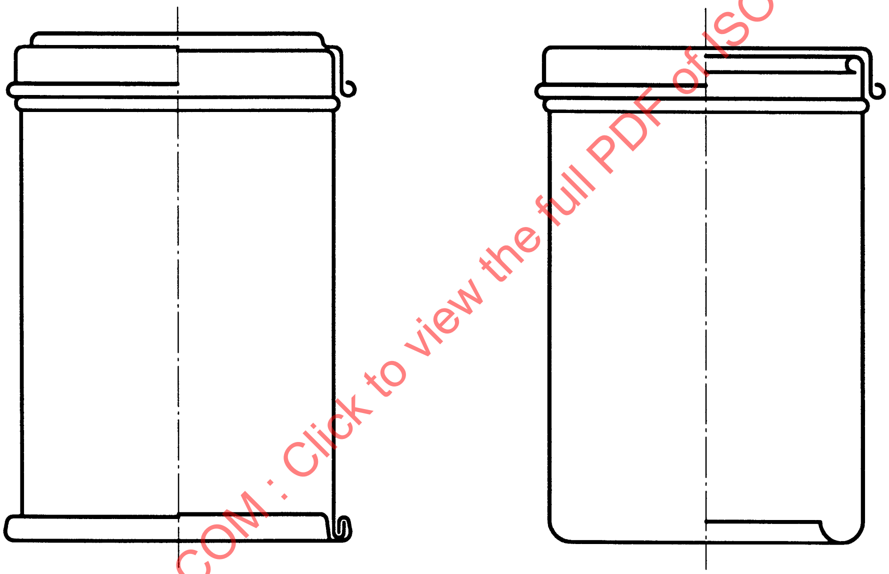


Figure 4 — Lever-lid can with ring



a) b)

Figure 5 — Slip-lid can

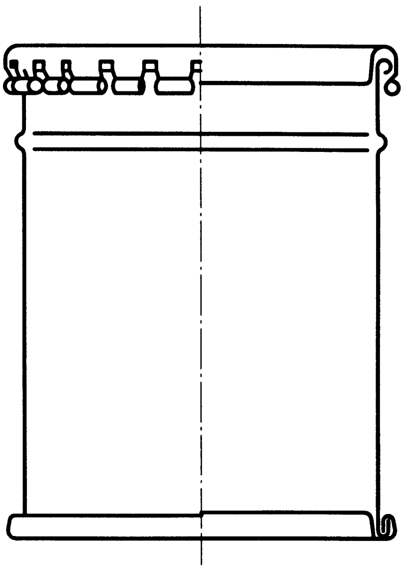


Figure 6 — Crimped-cover can [pail]

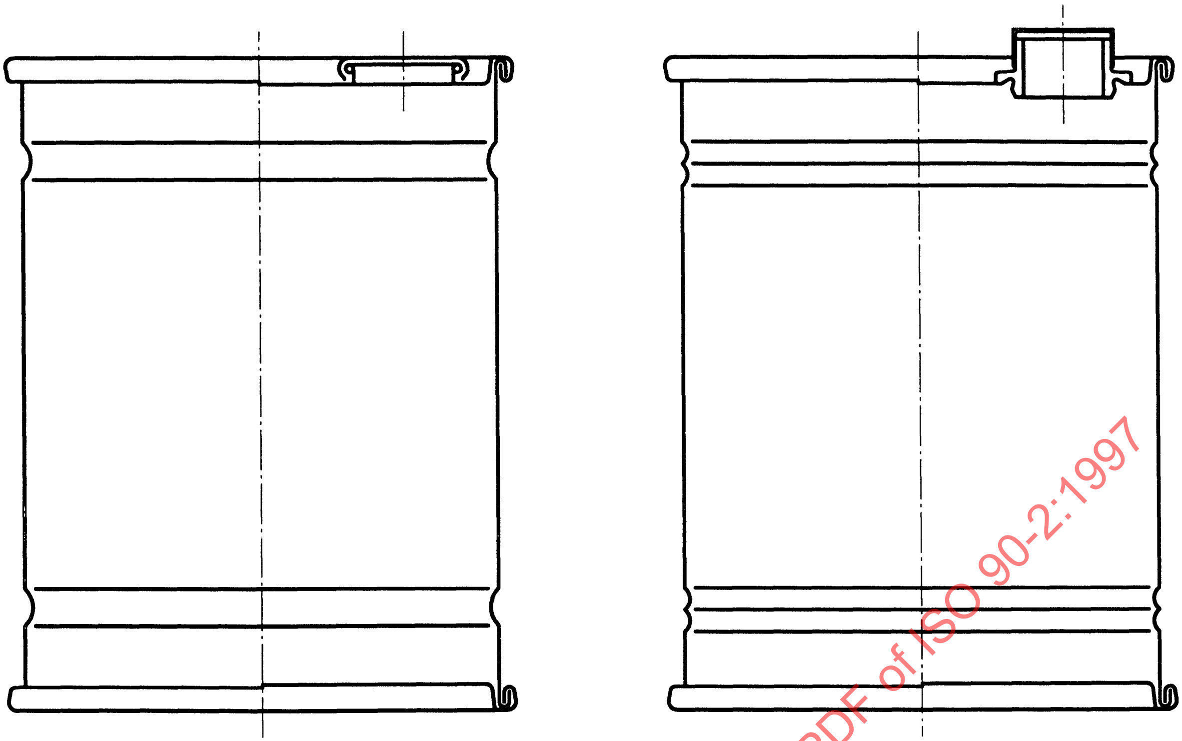


Figure 7 — Flat-top can

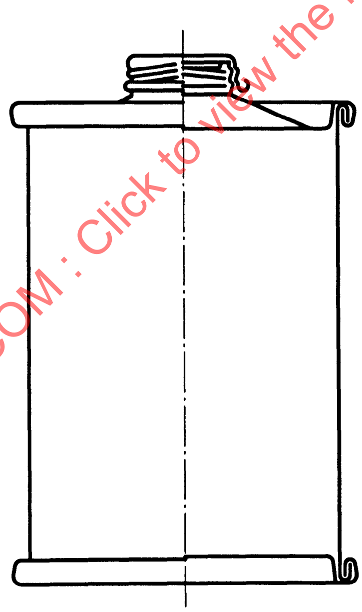


Figure 8 — Cone-top can

2.2 Cross-sections

2.2.1 round can: Can with a circular cross-section (see figure 9).

2.2.2 Non-round can

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

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

2.2.2.3 oval can: Can with an oval cross-section (see figure 12).

2.2.2.4 trapezoidal can: Can with a trapezoidal cross-section with rounded corners (see figure 13).

NOTE — The shorter of the parallel sides [see figure 13 a)] and the non-parallel sides [see figure 13 b)] may be curved.

2.3 Constructions

NOTE — Figures 14 and 15 apply to both round and non-round cross-sections.

2.3.1 three-piece can: Can made from three main components: body, top end and bottom end (see figure 14).

2.3.2 two-piece can: Can made from two main components: body and bottom, which form one piece, and a top end (see 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 which has a cross-section of constant dimension from top to bottom, local variations caused by special features such as beading, etc. being disregarded (see figure 16).

2.4.2 tapered can: Can whose cross-section changes linearly from top to bottom, local variations caused by special features such as beading, necking-in, etc. being disregarded (see figure 17).

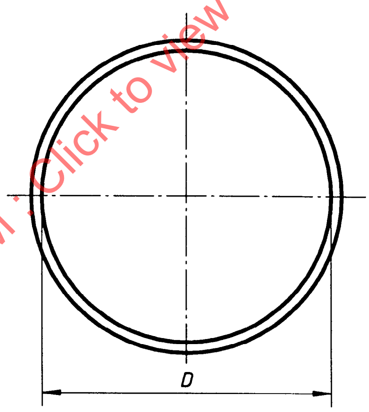
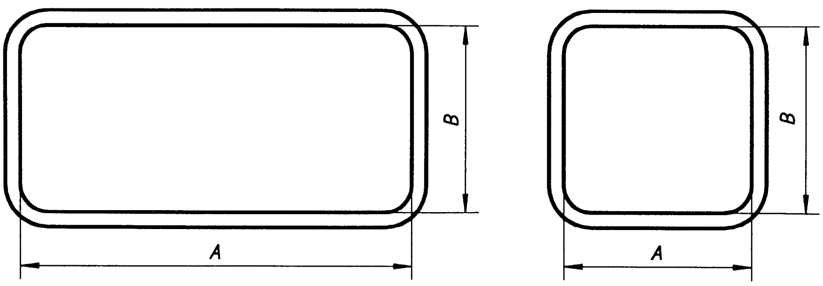
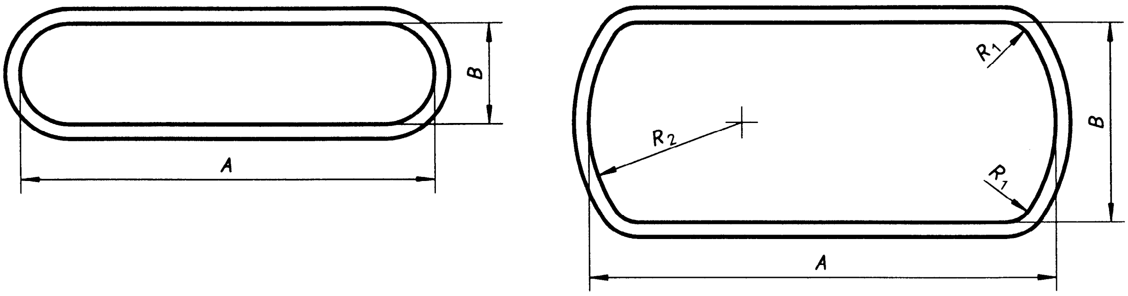


Figure 9 — Round can



a) Rectangular cross-section b) Square cross-section

Figure 10 — Rectangular cans



a) Semicircular ends

b) Ends of different radii

Figure 11 — Obround cans

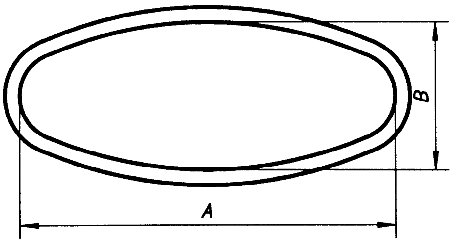
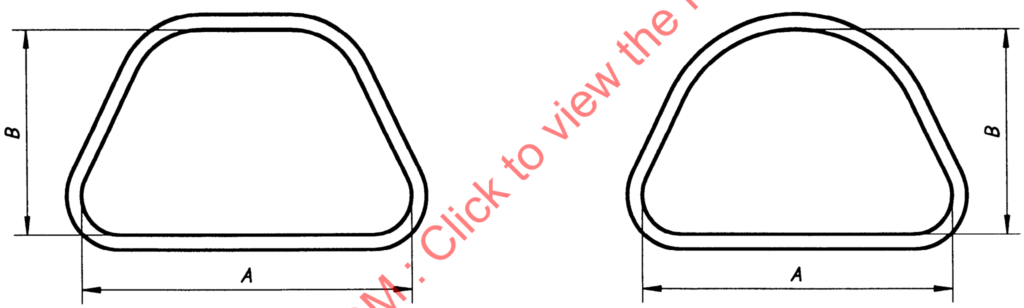


Figure 12 — Oval can



a)

b)

Figure 13 — Trapezoidal cans

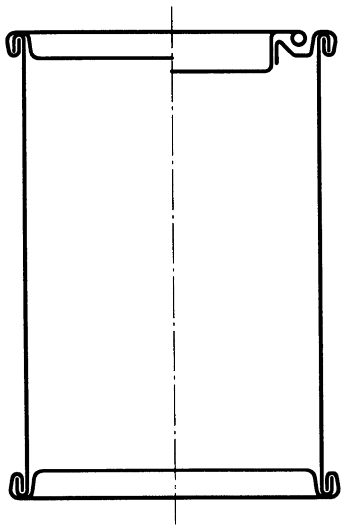


Figure 14 — Three-piece can

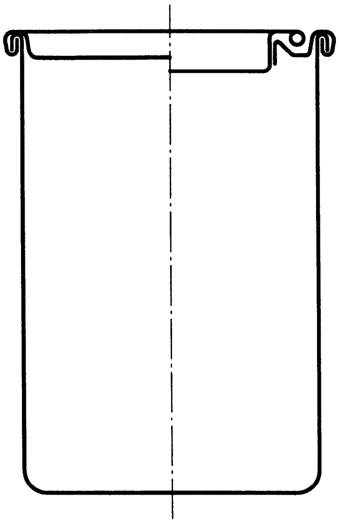


Figure 15 — Two-piece can

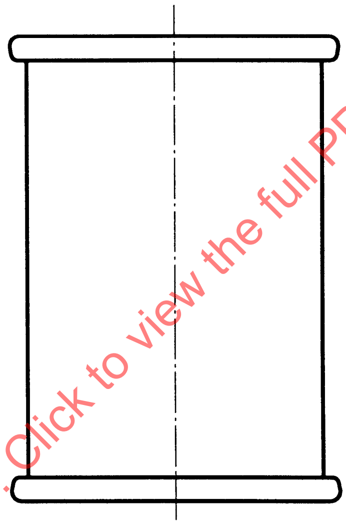


Figure 16 — Cylindrical can

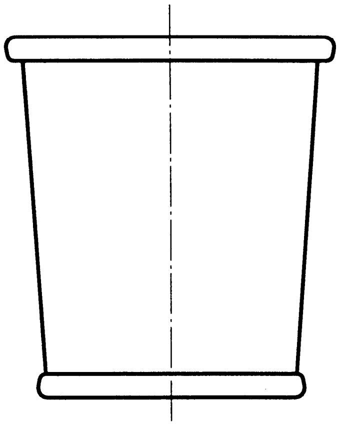


Figure 17 — Tapered can

2.5 Special features

NOTE — Figures 18 to 21 apply to both round and non-round cross-sections.

2.5.1 necked-in can: Can whose body is reduced in cross-section at one [see figure 18 b)] or both [see figure 18 a)] extremities.

2.5.2 step-sided can: Can whose body is increased in cross-section at one extremity (see figure 19).

2.5.3 beaded can: Can whose body has small internal and/or external peripheral changes in cross-section (see figure 20).

2.5.4 curled can: Can whose body has a curled edge at one extremity; this curl may be internal or external.

2.5.5 special-profile can: Can whose body varies in cross-section to give a particular profile.

2.6 Capacities

2.6.1 nominal filling volume, V: Volume, in millilitres, of product that the can is required to hold.

2.6.2 nominal filling mass, m: Mass, in grams, of product that the can is required to hold.

2.6.3 gross lidded capacity, C: Total capacity, in millilitres, of a closed can, determined in accordance with 4.2.

2.6.4 brimful capacity, C_2: Total capacity, in millilitres, of a non-closed can, determined in accordance with 4.3.

2.6.5 head space, K: Difference between the gross lidded capacity and the nominal filling volume, expressed in millilitres or as a percentage of the gross lidded capacity.

2.6.6 body height, H_1: Height of the container body over the seams (see figure A.1).

2.6.7 overall height, H_3: Height of the container with the closure fitted (see figure A.1).

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

The nominal cross-section is determined by rounding the internal body cross-section (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 annex A.

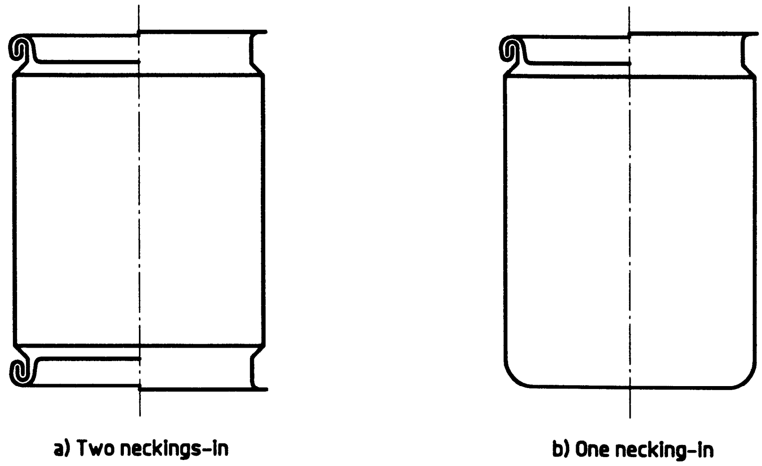


Figure 18 — Necked-in cans

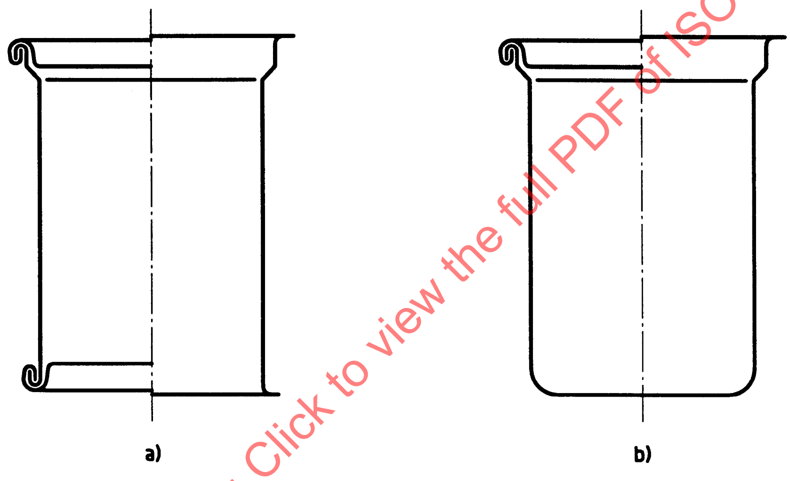


Figure 19 — Step-sided cans

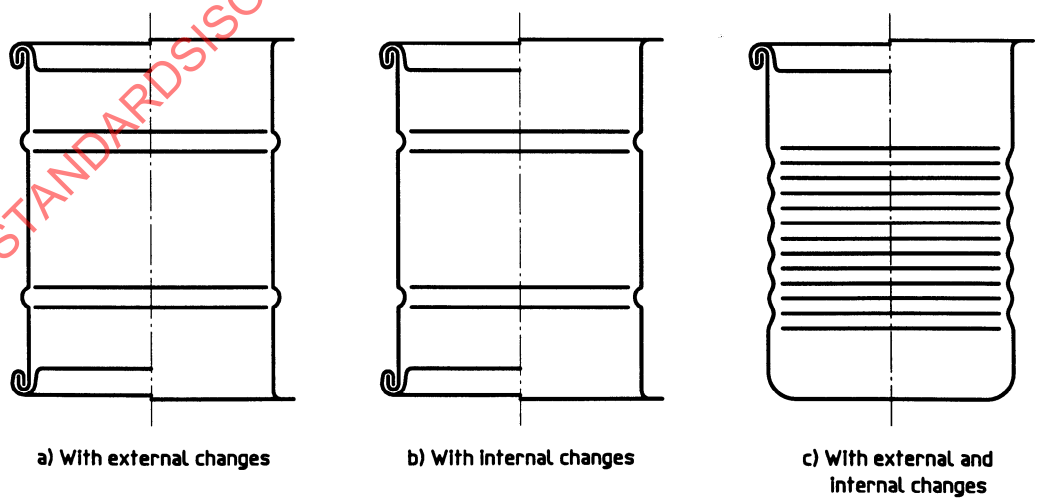


Figure 20 — Beaded cans

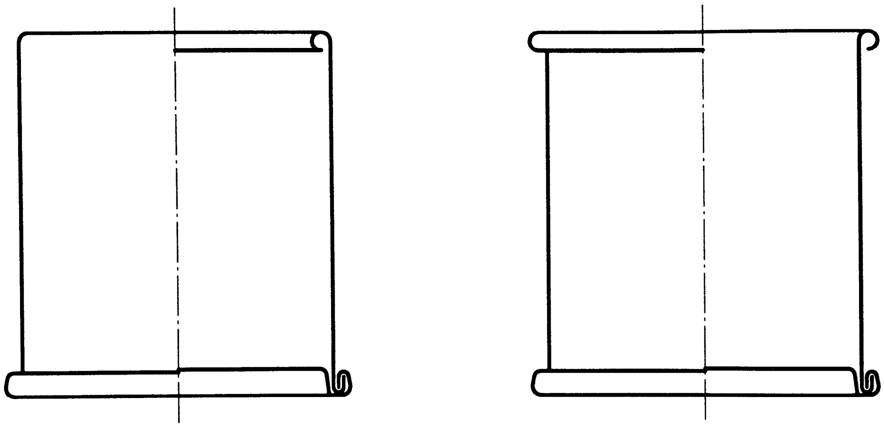


Figure 21 — Curled cans

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 can

Dimension D (see figure 9).

3.4.2 Cylindrical non-round can

Dimensions A and B (see figures 10 to 13).

3.4.3 Tapered round can

Dimensions D_1 and D_2, of which D_1 is the larger and D_2 the smaller dimension (see figure 22).

3.4.4 Tapered non-round can

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 figure 22).

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 6 and figure 22):

— for round cans:

D_{N1} - top end,

D_{N2} - bottom end;

— for non-round cans:

$A_{N1} \times B_{N1}$ - top end,

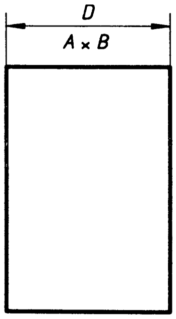
$A_{N2} \times B_{N2}$ - bottom end.

3.5.2 Step-sided cans

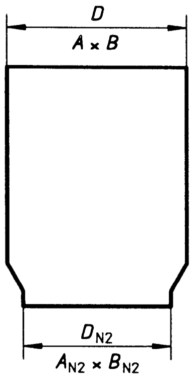
The cross-sections in the step-sided area shall be indicated as follows (see clause 6 and figure 22):

— for round cans: D_S;

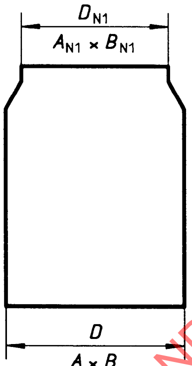
— for non-round cans: $A_S \times B_S$.



a) Cylindrical cans



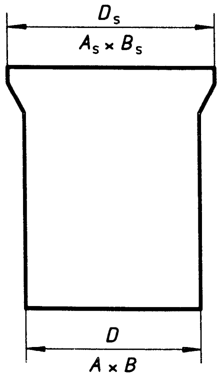
b) Necked-in cylindrical cans (bottom end)



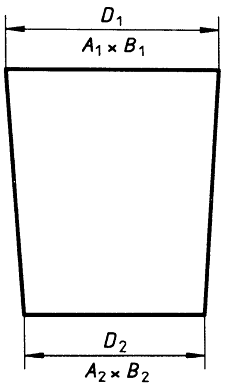
c) Necked-in cylindrical cans (top end)

	Code letter	Round cans	Non-round cans
a) Cylindrical cans	Cy	$V\text{-}D$	$V\text{-}A \times B$
b) Necked-in cylindrical cans (bottom end)	N	$V\text{-}D/D_{N2}$	$V\text{-}A \times B/A_{N2} \times B_{N2}$
c) Necked-in cylindrical cans (top end)	N	$V\text{-}D/D_{N1}$	$V\text{-}A \times B/A_{N1} \times B_{N1}$

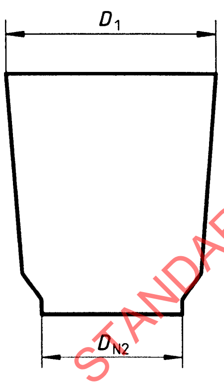
Figure 22 — Examples of designation of general use containers



d) Step-sided cylindrical cans



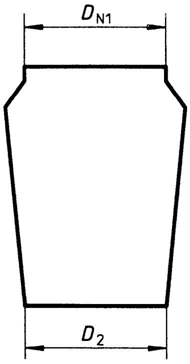
e) Tapered cans



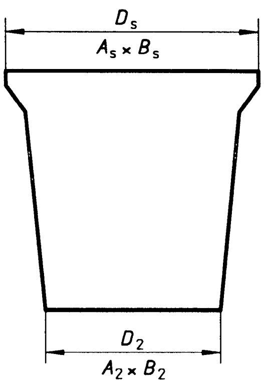
f) Necked-in tapered cans (bottom end)

	Code letter	Round cans	Non-round cans
d)	S	$V\text{-}D/D_s$	$V\text{-}A \times B/A_s \times B_s$
e)	T	$V\text{-}D_1/D_2$	$V\text{-}A_1 \times B_1/A_2 \times B_2$
f)	T	$V\text{-}D_1/D_{N2}$	—

Figure 22 (*continued*)



g) Necked-in tapered cans (top end)



h) Step-sided tapered cans

	Code letter	Round cans	Non-round cans
g) Necked-in tapered cans (top end)	T	V-D_2/D_{N1}	—
h) Step-sided tapered cans	S	V-D_2/D_S	V-$A_2 \times B_2/A_S \times B_S$

Figure 22 (*concluded*)

4 Determination of capacities

4.1 General

The methods for determining capacity all rely on determining 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 Correction factors

The correction factor to be applied to determine capacity depends on the water temperature (see table 1).

4.1.2 Accuracy of the balances

The balance used for determining the mass, *m*, of the cans shall have at least the accuracy specified in table 2.

Table 1 — Correction factors as a function of temperature

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

Table 2 — Balance accuracy

Values in grams

Mass of can, m	Accuracy
$m \leqslant 500$	± 0,5
$500 < m \leqslant 2\,500$	± 1,0
$2\,500 < m \leqslant 5\,000$	± 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 From the inside surface outwards, drill two holes, 3 mm to 6 mm in diameter and about 7 mm apart, near the rim in the unattached end of the can. In non-round ends, drill the holes as close as possible to a corner radius. Assemble the can by seaming on the end(s) as appropriate. For two-piece cans, drill the two holes near the rim of the integral base.

4.2.2 Close the can tightly with the appropriate closure. If it is impossible to close tightly, use adhesive tapes or varnish for sealing.

4.2.3 Determine the mass of the empty can, m_1, in grams, (see 4.1.2).

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

4.2.5 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.

4.2.6 If the above filling method results in deformation of the can, proceed as follows.

Place the can in a test 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 shall 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.

4.2.7 Remove any surplus water from the outside of the can.

4.2.8 Determine the mass of the filled can, m_2, in grams (see 4.1.2).

4.2.9 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, in millilitres, of the can.

4.3 Determination of brimful capacity, C_2

This method shall be used for cans with non-flexible sides (body) and/or ends as described under 2.1.3, 2.1.3.1, 2.1.4 and 2.1.5.

4.3.1 For three-piece cans only, attach the bottom end to the body by the usual method. (For cans as described under 2.1.4 and 2.1.5, attach both ends.)

4.3.2 Close the can with a rigid disc of transparent plastic with two holes 3 mm 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 plastic 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 edge of the can, and complete filling through the hole(s).

4.3.7 If the above filling method results in deformation of the can, proceed as follows.

Place the can in a test 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 level in the test container shall not be 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, in grams, of the filled can together with the disc, m_{d2}, as accurately as possible (see 4.1.2).

4.3.10 The difference between the weighings ($m_{d2} - m_{d1}$), if necessary multiplied by the relevant correction factor (see 4.1.1), represents the brimful capacity, C_2, in millilitres, of the can.

5 Tolerances on capacities

Tolerances for gross lidded capacities and brimful capacities are given in table 3.

At least 99,7 % of the individual cans shall exhibit capacities which lie within these limits[1)].

1) This percentage is derived from statistical theory: when a variable, x, is distributed according to the normal distribution of parameters μ and σ (where μ is the arithmetic mean and σ is the standard deviation), 99,7 % of its values are between ($\mu - 3\sigma$) and ($\mu + 3\sigma$).