

CONFIRMED
DECEMBER 2007

Specification for

Apparatus for the determination of distillation range (including flasks and receivers)

UDC 542.48:542.231.3:542.3:006.3/8

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Laboratory Apparatus Standards Policy Committee (LBC/-) to Technical Committee LBC/25, upon which the following bodies were represented:

British Laboratory Ware Association
 CLEAPSE
 Chemical Industries Association
 Department of Health
 Glass Manufacturers' Federation
 Institute of Medical Laboratory Sciences
 Institute of Science Technology
 Manufacturing, Science and Finance
 Royal Society of Chemistry

This British Standard, having been prepared under the direction of the Laboratory Apparatus Standards Policy Committee, was published under the authority of the Board of BSI and comes into effect on 30 March 1990

© BSI 11-1999

BS 571 First published November 1934
 First revision February 1953
 BS 605 First published May 1935
 First revision April 1952
 BS 658 First published February 1936
 First revision February 1952
 Second revision incorporating BS 571 and BS 605, July 1962
 Third revision March 1990

The following BSI references relate to the work on this standard:
 Committee reference LBC/25
 Draft for comment 88/50448 DC

Amendments issued since publication

Amd. No.	Date of issue	Comments

ISBN 0 580 17693 2

Contents

	Page
Committees responsible	Inside front cover
Foreword	iii
<hr/>	
Section 1. General	
1 Scope	1
2 Definitions	1
3 Basis of adjustment	1
<hr/>	
Section 2. Distillation flasks	
4 Designation	2
5 Sizes	2
6 Material	2
7 Dimensions	2
8 Details of construction	2
9 Marking	2
<hr/>	
Section 3. Receivers	
10 Volumetric accuracy	4
11 Type	4
12 Series of nominal capacities	4
13 Limits of volumetric error	4
14 Material	4
15 Dimensions	4
16 Details of construction	4
17 Graduation and numbering	7
18 Marking	7
<hr/>	
Section 4. Condensers	
19 General	8
20 Type 1, fluid-cooled glass condensers	8
21 Type 2, air-cooled glass condensers	8
22 Type 3, metal condensers and cooling baths	9
<hr/>	
Section 5. Draught screens	
23 General	12
24 Type A draught screen	12
25 Type B draught screen	12
26 Type C draught screen	12
27 Heat resistant flask support sheets	13
28 Wire gauze	13
<hr/>	
Section 6. Heaters	
29 General	18
30 Gas heaters	18
<hr/>	
Appendix A Guidance on the assembly of distillation apparatus	19
<hr/>	
Figure 1 — Distillation flask	3
Figure 2 — Graduation and numbering of Crow receivers	6
Figure 3 — Type 1 condenser	8
Figure 4 — Type 2 condenser	9
Figure 5 — Straight metal condenser in cooling bath	10
Figure 6 — Top view of arrangement of curved metal condenser tube in cooling bath	11
Figure 7 — Type A draught screen	14
Figure 8 — Type B draught screen	15

	Page
Figure 9 — Removable shutter for draught screen	16
Figure 10 — Type C draught screen	17
Figure 11 — Typical assembly of distillation apparatus with type 1 condenser	20
Figure 12 — Position of thermometer in distillation flask	21
Figure 13 — Typical assembly for electrically heated apparatus with curved metal condenser and type A draught screen	22
Table 1 — Dimensions for distillation flasks	2
Table 2 — Limits of error of capacity for receivers	4
Table 3 — Dimensions of distillation receivers	5
Table 4 — Dimensions of straight metal condenser tube	9
Table 5 — External dimensions of cooling bath for straight metal condenser	9
Publications referred to	Inside back cover

Foreword

This British Standard has been prepared under the direction of the Laboratory Apparatus Standards Policy Committee. It was first published in 1936 and was revised in 1952 and 1962. This edition supersedes the 1962 edition, which is withdrawn.

In the preparation of this revision of BS 658 account was taken of the following:

- a) ISO 918:1983, published by the International Organization for Standardization (ISO), which is technically equivalent to BS 4591;
- b) BS 2000:123, which is identical with IP 123/84, published by the Institute of Petroleum (IP);
- c) BS 2000:195, which is identical with IP 195/81.

Distillation can be used to determine a number of properties (e.g. initial boiling point, final boiling point, boiling range, boiling range of a particular fraction) of a material. This British Standard does not describe the determinations which may be made with the apparatus described in this standard, as these are more properly described in the methods of test associated with the performance requirements of a material. Similarly, special safety requirements that are needed for a specific determination are more appropriately described in the specific test procedure. Advice on the general assembly of the apparatus is given in Appendix A.

The principal differences between this edition and the 1962 edition are as follows:

- a) text associated with the determination of distillation properties (e.g. correction of barometric pressure) has been omitted;
- b) the 130 mL distillation flask has been replaced by a 125 mL distillation flask which is now in widespread use;
- c) a 200 mL distillation flask has been introduced;
- d) the type 2 receivers have been omitted since, for very small volumes, the type 1 receivers should be used and, for larger volumes graduated glass measuring cylinders complying with the requirements of BS 604 are considered suitable;
- e) glass tubing complying with BS 5895 has, where possible, been used;
- f) the type 1 b) glass condenser constructed using rubber tubing has been omitted because it is not in current use;
- g) the two types of draught screen in the previous edition have been retained but a third type, used with electrical heating, has been introduced;
- h) the multiple metal condenser system has been omitted because it is not in current use;
- i) the assembly of the apparatus specified has been transferred to Appendix A and given as guidance;
- j) the appendix giving corrections of barometric readings has been omitted because the information is contained in BS 2520;
- k) all references to asbestos or asbestos based material have been omitted.

Product certification. Users of this British Standard are advised to consider the desirability of third party certification of product conformity with this British Standard based on testing and continuing surveillance, which may be coupled with assessment of a supplier's quality systems against the appropriate Part of BS 5750.

Enquiries as to the availability of third party certification schemes will be forwarded by BSI to the Association of Certification Bodies. If a third party certification scheme does not already exist, users should consider approaching an appropriate body from the list of Association members.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 22, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

Section 1. General

1 Scope

This British Standard specifies requirements for a range of components for the following apparatus used in the determination of the distillation characteristics of materials:

- a) distillation flasks of sizes between 50 mL and 750 mL;
- b) three Crow receivers of two classes of accuracy;
- c) glass condensers of air-cooled and fluid-cooled designs;
- d) metal condensers and cooling bath;
- e) draught screens of three types;
- f) heaters using either gas or electricity.

NOTE 1 It is recommended that, unless otherwise specified in the relevant method of test, one of the types of thermometers listed in BS 593, with an immersion length of 100 mm, is used.

NOTE 2 Guidance on how the apparatus may be assembled is given in Appendix A.

NOTE 3 The titles of the publications referred to in this standard are listed on the inside back cover.

2 Definitions

For the purposes of this British Standard the following definitions apply.

2.1

standard reference temperature

the temperature at which the receiver is intended to contain its nominal capacity (nominal volume)

2.2

capacity

the volume, in millilitres, of water, at the standard reference temperature, contained by a receiver at any graduation line when the meniscus is set so that the plane of the upper edge of the graduation line is horizontally tangential to the lowest point of the meniscus, the line of sight being in the same plane

3 Basis of adjustment

3.1 Unit of volume

The unit of volume shall be the millilitre (mL).

NOTE The millilitre is commonly used as the special name for the cubic centimetre, in accordance with the International System of Unit (SI).

3.2 Standard reference temperature

The standard reference temperature shall be 20 °C.

NOTE See 2.1.

Section 2. Distillation flasks

4 Designation

The size of flask shall be designated as two-thirds of the nominal bulb capacity in millilitres.

NOTE 1 The bulb capacity is determined by the bulb diameter.

NOTE 2 Distillation should not normally be carried out in a flask more than two-thirds full.

5 Sizes

The sizes of flasks shall be as given in Table 1.

6 Material

The flasks shall be made from either colourless borosilicate glass 3.3, as defined in BS 2598-1, or other glasses of at least equivalent strength.

NOTE Flasks should be as free as possible from visible defects and reasonably free from internal stress.

7 Dimensions

The dimensions of flasks shall be as given in Table 1.

8 Details of construction

8.1 Design

The general design of flasks shall be as shown in Figure 1.

8.2 Bulb

The bulb of each flask shall be spherical.

8.3 Top of the flask

The top of each flask shall be smoothly finished with a strengthening bead [see Figure 1(a)] or flange [see Figure 1(b)], and shall be at right angles to the axis of the flask.

8.4 Side tube

The side tube shall be smoothly joined to the neck and shall slope downwards in the same plane as the axis of the flask.

The end of the side tube shall be fire-polished and there shall be no constriction.

NOTE For certain determinations, e.g. pharmaceutical, ground glass joints are used.

9 Marking

The following shall be permanently and legibly marked on all flasks:

- the size of the flask, e.g. 150 mL;
- the maker's and/or vendor's name or trademark;
- the number and date of this British Standard, i.e. BS 658:1989¹⁾.

Table 1 — Dimensions for distillation flasks

Dimension	Size							
	50 mL	100 mL	125 mL	150 mL	200 mL	250 mL	500 mL	750 mL
	mm	mm	mm	mm	mm	mm	mm	mm
Internal diameter of neck	16 ± 1	16 ± 1	17 ± 1	18 ± 1	20 ± 1	20 ± 1	24 ± 1.5	28 ± 1.5
Wall thickness of side tube	1 ± 0.10	1 ± 0.10	1 ± 0.10	1 ± 0.10	1 ± 0.10	1.5 ± 0.20	1.5 ± 0.20	1.5 ± 0.20
External diameter of side tube	6 ± 0.4	6 ± 0.4	7 ± 0.4	7 ± 0.4	7 ± 0.4	8 ± 0.4	10 ± 0.4	11 ± 0.4
Minimum wall thickness of neck and bulb	0.75	0.75	0.75	1.0	1.0	1.0	1.0	1.5
Length of side tube	100 ± 3	100 ± 3	100 ± 3	120 ± 4	127 ± 3	124 ± 4 ^a 160 ± 4	140 ± 4	160 ± 5
Overall height base to top of neck	201 ± 3	215 ± 3	214 ± 3	216 ± 3	220 ± 3	226 ± 3	240.5 ± 3	251.5 ± 3
Distance from base of bulb to centre of side tube	126.5 ± 3	137 ± 3	137 ± 3	141 ± 3	147 ± 3	151.5 ± 3	165.5 ± 3	176.5 ± 3
External bulb diameter	50 ± 2	65 ± 2	69 ± 1	74 ± 2	82 ± 2	85 ± 2	106 ± 3	125.5 ± 3
Angle of inclination of side arm (in degrees)	75 ± 3°							

^a Alternative lengths of side tube are provided for the 250 mL flasks.

¹⁾ Marking BS 658:1989 on or in relation to a product represents a manufacturer's declaration of conformity, i.e. a claim by or on behalf of the manufacturer that the product meets the requirements of the standard. The accuracy of the claim is therefore solely the responsibility of the person making the claim. Such a declaration is not to be confused with third party certification of conformity, which may also be desirable.

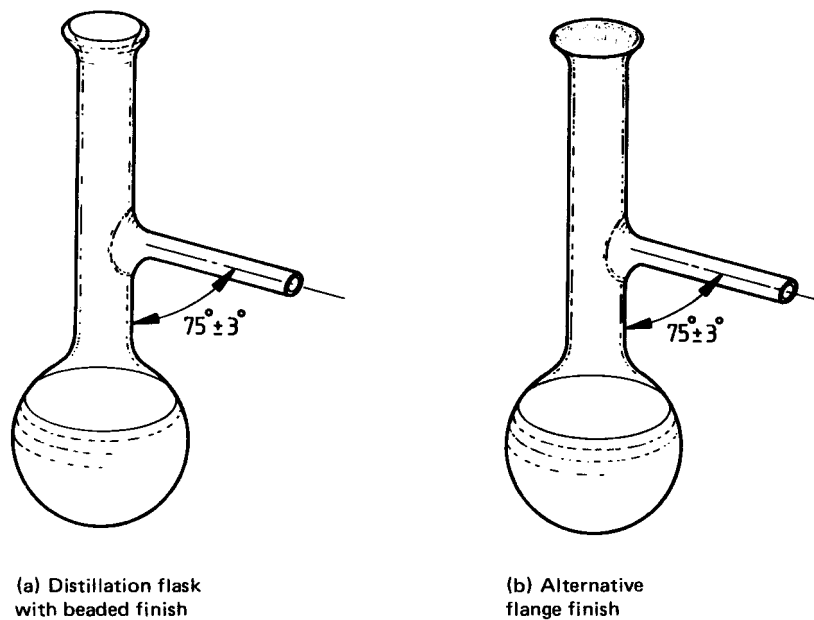


Figure 1 — Distillation flask

Section 3. Receivers

10 Volumetric accuracy

There shall be two classes of accuracy (see Table 2):

- a) class A for higher grade receivers;
- b) class B for lower grade receivers.

11 Type

The receivers shall be of the Crow type, as illustrated in Figure 2.

12 Series of nominal capacities

The series of nominal capacities shall be 25, 50 and 100 mL.

13 Limits of volumetric error

The limits of error of capacity, when determined in accordance with BS 6696, using water complying with grade 3 of BS 3978, shall be as given in Table 2.

14 Material

The receivers shall be manufactured from either colourless soda-lime-silica or borosilicate glass complying with class HGB 3 or better of BS 3473-2.

NOTE The receivers should be reasonably free from visible defects and internal stress.

15 Dimensions

The dimensions shall be as given in Table 3 and in Figure 2.

16 Details of construction

16.1 Design

The general design shall be as shown in Figure 2.

16.2 Graduated portion

The graduated portion of the receiver shall be a cylinder terminating in a conical portion of the bottom.

16.3 Spout

The receiver shall be provided with a spout as shown in Figure 2. A slight external bead shall be permitted for strengthening purposes. Visual inspection shall reveal no bellling or constriction.

16.4 Shape of bottom

The bottom of the inside of the receiver shall be either flat or rounded, but shall not be pointed.

16.5 Base

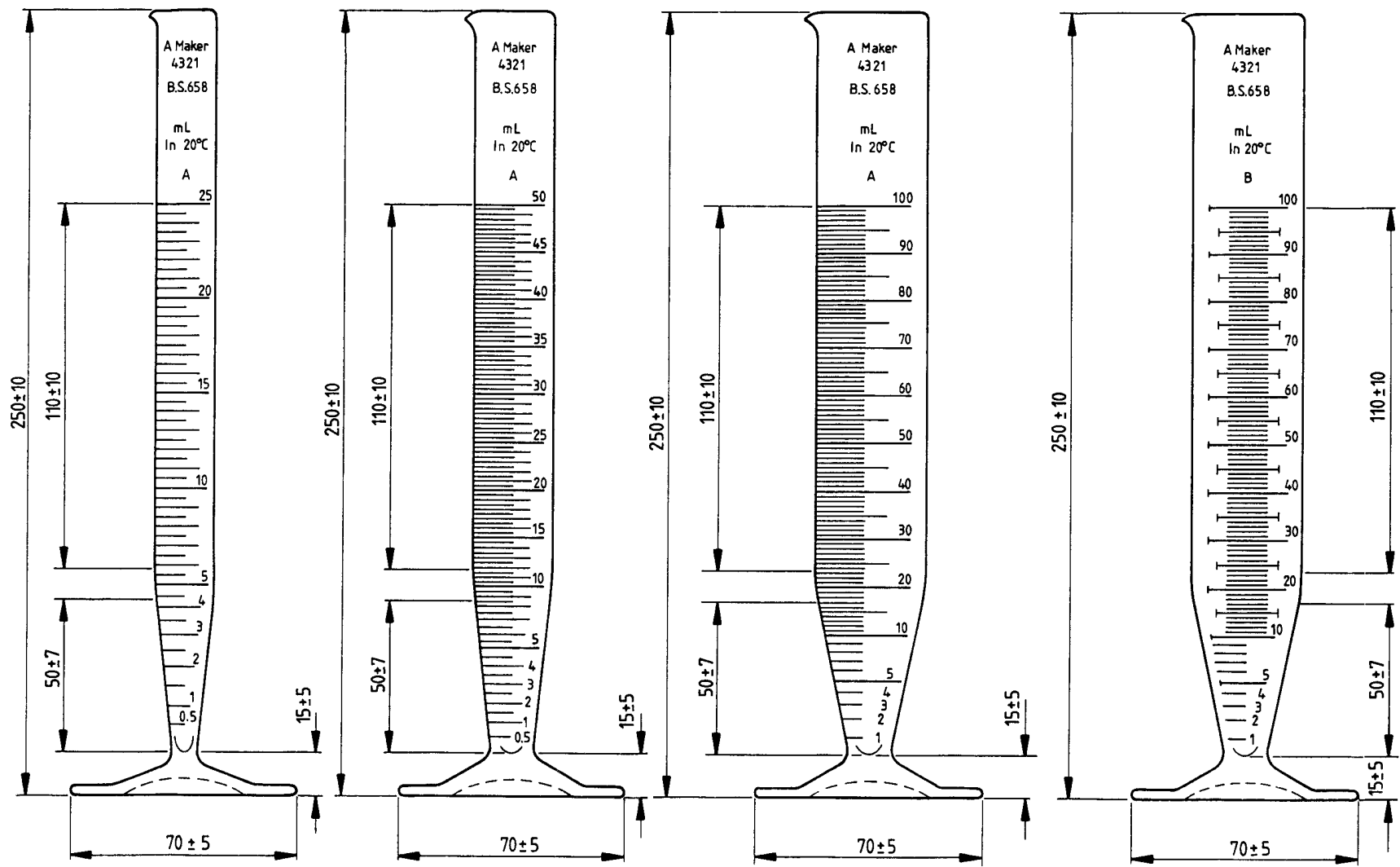
The receiver shall be provided with a base on which it shall stand vertically, without rocking. The receiver shall not topple when placed empty on a surface inclined at an angle of 15° to the horizontal. The base shall either be circular or have six or more equal sides. In the latter case, the spout shall be vertically above an apex of the base.

Table 2 — Limits of error of capacity for receivers

Class	Nominal capacity					
	25 ml		50 mL		100 mL	
	Limit of error					
	Up to and including 2.5 mL line	Above 2.5 mL line	Up to and including 5 mL line	Above 5 mL line	Up to and including 10 mL line	Above 10 mL line
	mL	mL	mL	mL	mL	mL
A	± 0.04	± 0.1	± 0.1	± 0.2	± 0.2	± 0.4
B	± 0.1	± 0.2	± 0.2	± 0.4	± 0.4	± 0.8

Table 3 — Dimensions of distillation receivers

Nominal capacity	25 mL	50 mL	100 mL
	mm	mm	mm
Overall height	250 ± 10	250 ± 10	250 ± 10
Height of base ^a	15 ± 5	15 ± 5	15 ± 5
Diameter of base ^b	70 ± 5	70 ± 5	70 ± 5
Minimum wall thickness at any point (including base receiver)	1.2	1.2	1.2
Distance from 6 mL line to 25 mL line	110 ± 10	—	—
Distance from 12.5 mL line to 50 mL line	—	110 ± 10	—
Distance from 25 mL line to 100 mL line	—	—	110 ± 10
Distance from inside of bottom of receiver to 4 mL line	50 ± 7	—	—
Distance from inside of bottom of receiver to 7.5 mL line	—	50 ± 7	—
Distance from inside of bottom of receiver to 15 mL line	—	—	50 ± 7
Graduation lines between which the conical portion merges into the cylindrical portion	4 mL and 6 mL	7.5 mL and 12.5 mL	15 mL and 25 mL
^a This dimension is measured as the difference between the external and internal height of the receiver.			
^b For a polygonal base, the dimension applies to the inscribed circle.			



(a) Class A receivers capacity 25 mL, 50 mL and 100 mL

(b) Alternative markings for class B receivers

All dimensions are in millimetres.

Figure 2 — Graduation and numbering of Crow receivers

17 Graduation and numbering

17.1 Position of scales

When viewed with the spout of the receiver facing left, the scale shall be vertical and shall appear as shown in Figure 2.

17.2 Graduation lines (see Figure 2)

The graduation lines shall be clean permanent lines of a uniform thickness not exceeding 0.3 mm.

The graduation lines shall be in planes perpendicular to the axis of the receiver and shall be horizontal when the measure is standing on a horizontal surface.

17.3 Spacing of graduation lines

There shall be no obvious irregularity in the spacing of the graduation lines on the cylindrical portion of the receiver.

17.4 Numbering of graduation lines

The graduation lines shall be numbered in accordance with, and as illustrated in, Figure 2. Each number shall be permanently and legibly marked above or close to the end of the graduation line to which it relates.

17.5 Length of graduation lines

17.5.1 For class A receivers. The numbered graduation lines at 5 mL and at each successive 5 mL interval for the 25 mL and 50 mL receivers and at corresponding 10 mL intervals on the 100 mL receiver, shall either completely encircle the receiver, or shall have a gap (as shown in Figure 2) not exceeding 10 % of the circumference. The shortest graduation lines indicating 0.5 mL points on the 25 mL and 50 mL receivers and 1 mL points on the 100 mL receiver shall extend half-way around the receiver.

The graduation lines of intermediate length indicating 1 mL points on the 25 mL and 50 mL receivers and 5 mL on the 100 mL receiver shall extend equal distances beyond the shortest lines at both ends.

17.5.2 For class B receivers. The length of the graduation lines shall be either in accordance with **17.5.1** or graduation lines shall be confined to the part of the receiver which is facing the observer when viewed with the spout to the left. The length of these graduation lines shall be varied so as to emphasize the same graduation lines as are emphasized in **17.5.1**.

The length of the shortest graduation line at any point shall be not less than one-quarter of the diameter of the receiver at that point.

18 Marking

18.1 The following inscriptions shall be permanently and legibly marked on all receivers:

- a) the symbol "mL" to indicate the unit in terms of which the receiver was graduated;
- b) the inscription "A" or "B" to indicate the class of accuracy for which the receiver has been assessed;
- c) the maker's and/or vendor's name or trademark;
- d) the number and date of this British Standard, i.e. BS 658:1989²⁾;
- e) the temperature of which the capacity is as indicated in °C.

18.2 An identification number shall be marked on those class A receivers intended for official verification or certification.

NOTE This additional inscription should preferably be marked on all other class A receivers and may also be used, if desired, on class B receivers.

²⁾ Marking BS 658:1989 on or in relation to a product represents a manufacturer's declaration of conformity, i.e. a claim by or on behalf of the manufacturer that the product meets the requirements of the standard. The accuracy of the claim is therefore solely the responsibility of the person making the claim. Such a declaration is not to be confused with third party certification of conformity, which may also be desirable.

Section 4. Condensers

19 General

Condensers shall be of one of the following types:

- type 1, a fluid-cooled glass condenser complying with clause 20.
- type 2, an air-cooled glass condenser complying with clause 21.
- type 3, metal condensers and cooling baths complying with clause 22.

20 Type 1, fluid-cooled glass condensers

20.1 Material

Type 1 condensers shall be made from colourless borosilicate glass tubing complying with BS 5895.

NOTE Type 1 condensers should be as free as possible from visible defects and reasonably free from internal stress.

20.2 Dimensions

The dimensions shall be as shown in Figure 3.

20.3 Details of construction

20.3.1 Design. The design shall be as shown in Figure 3.

NOTE 1 For certain determinations, e.g. pharmaceutical, ground glass joints are used.

NOTE 2 Connections to the coolant fluid may be of the olive or screw thread types.

20.3.2 Inner surface of the inner tube. The inner surface of the inner tube shall be without any pockets that would trap distillate.

20.3.3 Open ends of inner tube. The inlet of the inner tube shall be finished at right angles to the axis and slightly flared.

The outlet of the inner tube shall be smoothly finished at an angle to the axis of this tube as shown in Figure 3.

The outlet end of the tube shall be curved to form an angle with the axis of the rest of the tube as shown in Figure 3.

21 Type 2, air-cooled glass condensers

21.1 Material

Type 2 condensers shall be made from colourless borosilicate glass tubing complying with BS 5895.

21.2 Dimensions

The dimensions shall be as shown in Figure 4.

21.3 Details of construction

21.3.1 Design. The design shall be as shown in Figure 4.

21.3.2 Inner surface of the tube. The inner surface of the tube shall be without any pockets that would trap distillate.

21.3.3 Open ends. One end of the condenser shall be finished at right angles to the axis and slightly flared, as shown in Figure 4.

The other end shall be smoothly ground at an angle of $45 \pm 3^\circ$ to the axis, as shown in Figure 4.

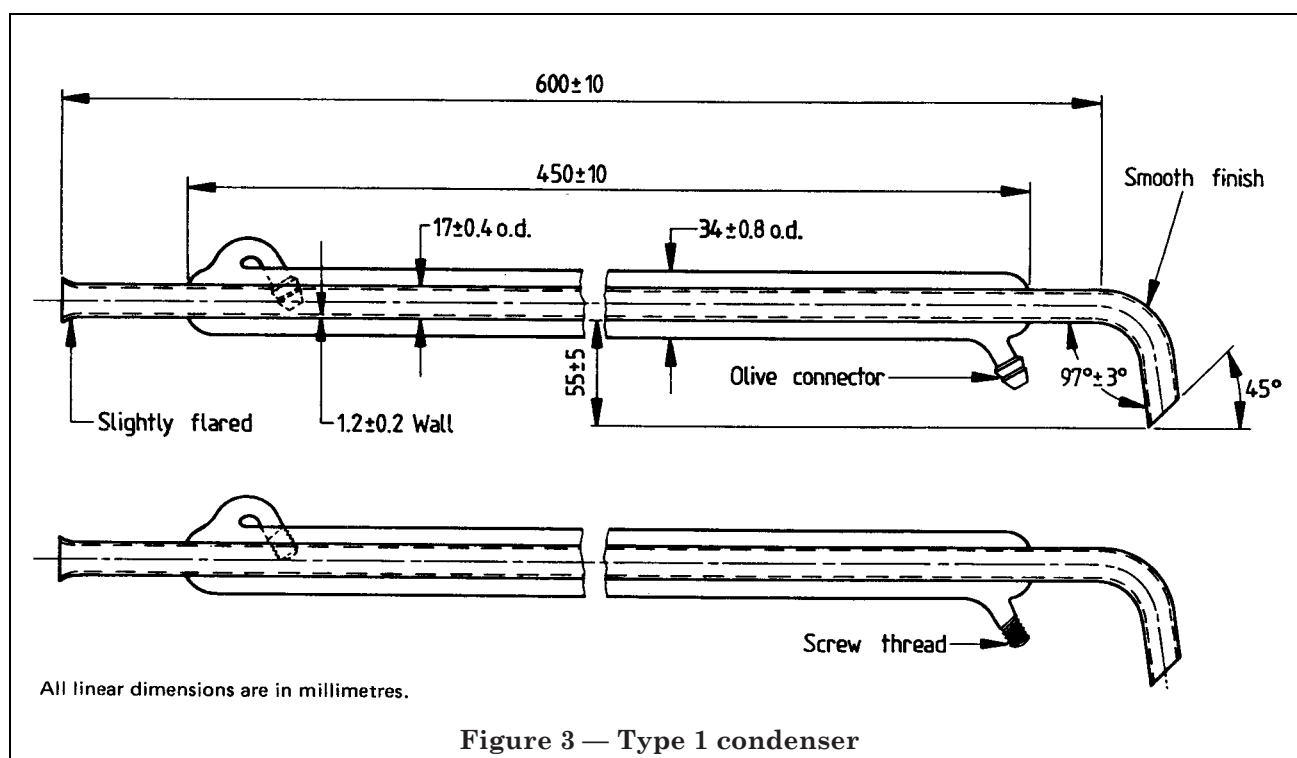
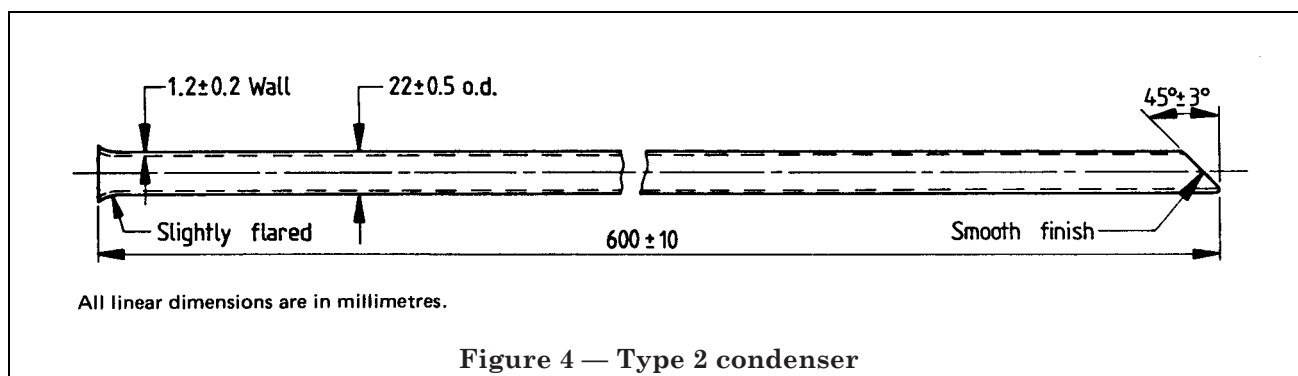


Figure 3 — Type 1 condenser



22 Type 3, metal condensers and cooling baths

22.1 Forms

Metal condensers with cooling baths shall be of one of the following forms:

- a) straight metal condenser and cooling bath;
- b) curved metal condenser and cooling bath.

22.2 Straight metal condenser

22.2.1 Material. The cooling tube shall be either a seamless brass or nickel-coated brass tube.

22.2.2 Dimensions. The dimensions shall be as given in Table 4.

Table 4 — Dimensions of straight metal condenser tube

Dimension	Value
	mm
External diameter	$14.0^{+0.5}_{-0}$
Wall thickness	$1.00^{+0}_{-0.2}$
Overall length	560 ± 5
Length of shorter limb (<i>e</i> in Figure 5)	75 ± 1
NOTE For certain uses, the length of the shorter limb (dimension in Figure 5) may be the same as shown for the glass condenser in Figure 3.	

22.2.3 Details of construction

22.2.3.1 Design. The condenser shall be of the general design shown in Figure 5.

22.2.3.2 Inner surface of the tube. The inner surface of the tube shall be without any pockets that would trap distillate.

22.2.3.3 Lower end of the tube. The lower end of the tube shall be bent to form an angle of $80 \pm 5^\circ$ to the axis of the tube.

The tip shall be cut off at an angle of 30° and shall be smoothly finished.

22.3 Cooling bath for straight metal condenser

22.3.1 Material. The cooling bath shall be made from brass, copper or stainless steel not less than 0.7 mm thick.

NOTE 1 Tin plating on copper for anti-corrosion purposes is permitted.

NOTE 2 Provision for recirculation of coolant fluid may be permitted.

22.3.2 Dimensions. The dimensions shall be as given in Table 5.

Table 5 — External dimensions of cooling bath for straight metal condenser

Dimension	Value
	mm
Height	150 ± 5
Length	380 ± 5
Width	100 ± 5

22.3.3 Details of construction

22.3.3.1 Design. The cooling bath for the straight metal condenser shall be of the general design shown in Figure 5.

NOTE 1 Insulation may be applied to the external surfaces provided that it does not intrude on the condenser.

NOTE 2 Provision for recirculation may also be made.

22.3.3.2 Tap. A tap shall be provided at the bottom of the bath for drainage, or inlet.

22.3.3.3 Overflow tube. If an overflow tube is provided, the bottom of the overflow tube shall be not more than 25 mm from the top of the bath.

NOTE An overflow tube positioned as shown in Figure 5 is recommended.

22.3.3.4 Stand. The cooling bath shall be provided with a stand to raise it to not less than 300 mm above bench level.

NOTE Small variations in the height of the draught screen and of the cooling bath affecting the alignment of the side arm of the distillation flask and condenser are unavoidable. They can be accommodated by standing either the draught screen or the cooling bath on a board of suitable thickness.

22.3.3.5 Cover. If the cooling bath is provided with a cover, it shall be easily removable.

22.4 Curved metal condenser

The curved metal condenser shall be as specified in 22.2.1, except that it shall be curved in a continuous smooth curve such that the entry to and the exit from the cooling bath are on the same face (see Figure 6).

22.5 Cooling bath for curved metal condensers

The cooling bath shall be a self supporting bath of not less than 5.5 L capacity.

22.6 Arrangement of the metal condenser in the cooling bath (see Figure 5 and Figure 6)

The metal condenser tube (22.2 or 22.4) shall be arranged in the appropriate cooling bath 22.3 or 22.5 so that:

a) the length of condenser in the cooling bath is 390 ± 5 mm;

b) the length of condenser projecting from the cooling bath at the upper end is 50 ± 2 mm;

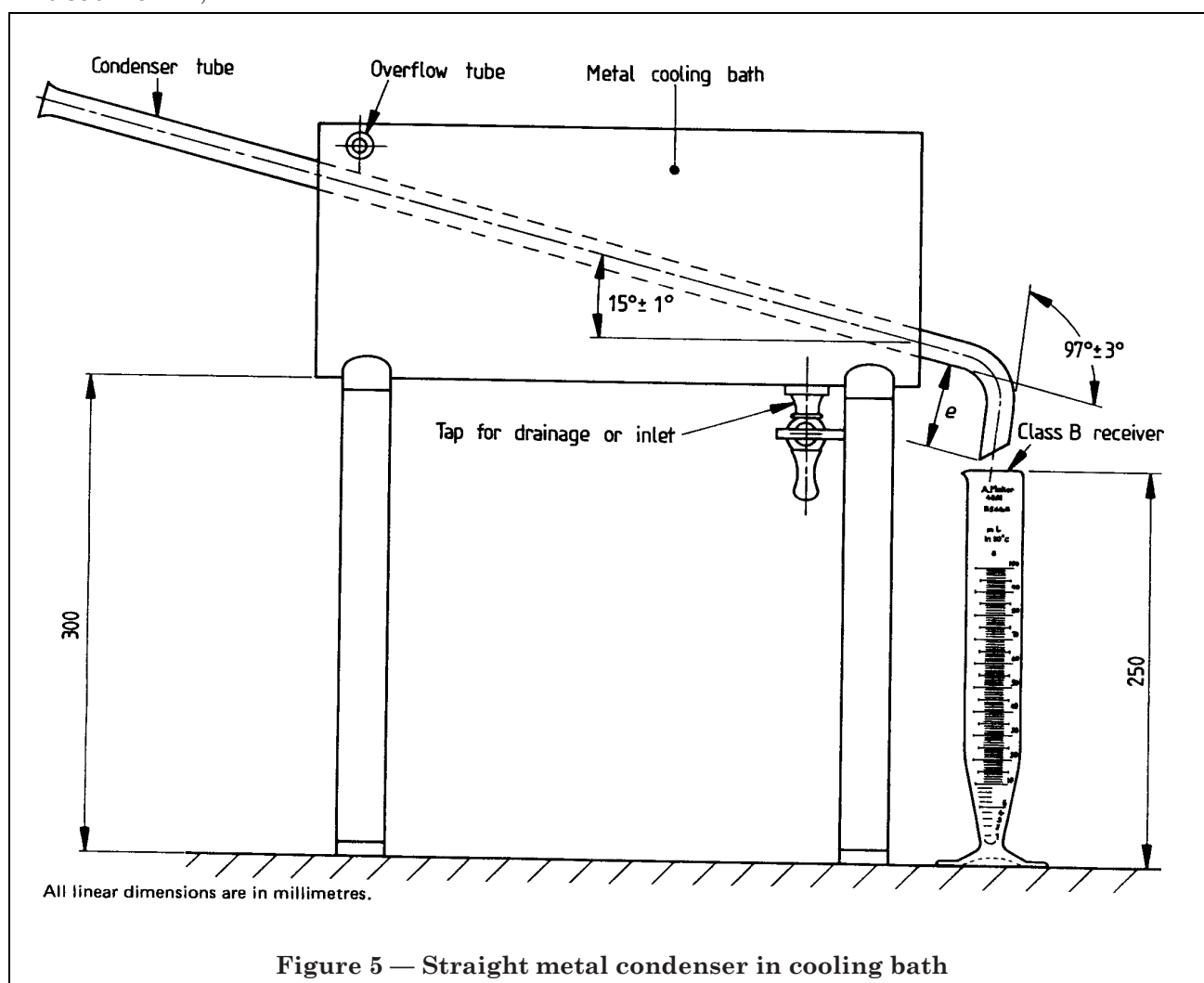
c) the length of condenser projecting from the cooling bath at the lower end is 115 ± 5 mm.

The centreline of the metal condenser tube shall be not less than 32 mm below the plane of the top of the bath at its point of entrance and not less than 19 mm above the floor of the bath at its exit.

The clearance between the condenser tube and the walls of the cooling bath shall be at least 13 mm except for the sections adjacent to the points of entrance and exit.

The gradient of the tube through the cooling bath shall be a fall of 0.26 ± 0.02 mm per linear millimetre of tube (equivalent to an angle of $15 \pm 1^\circ$).

The joints between the metal condenser and cooling bath shall be sealed.



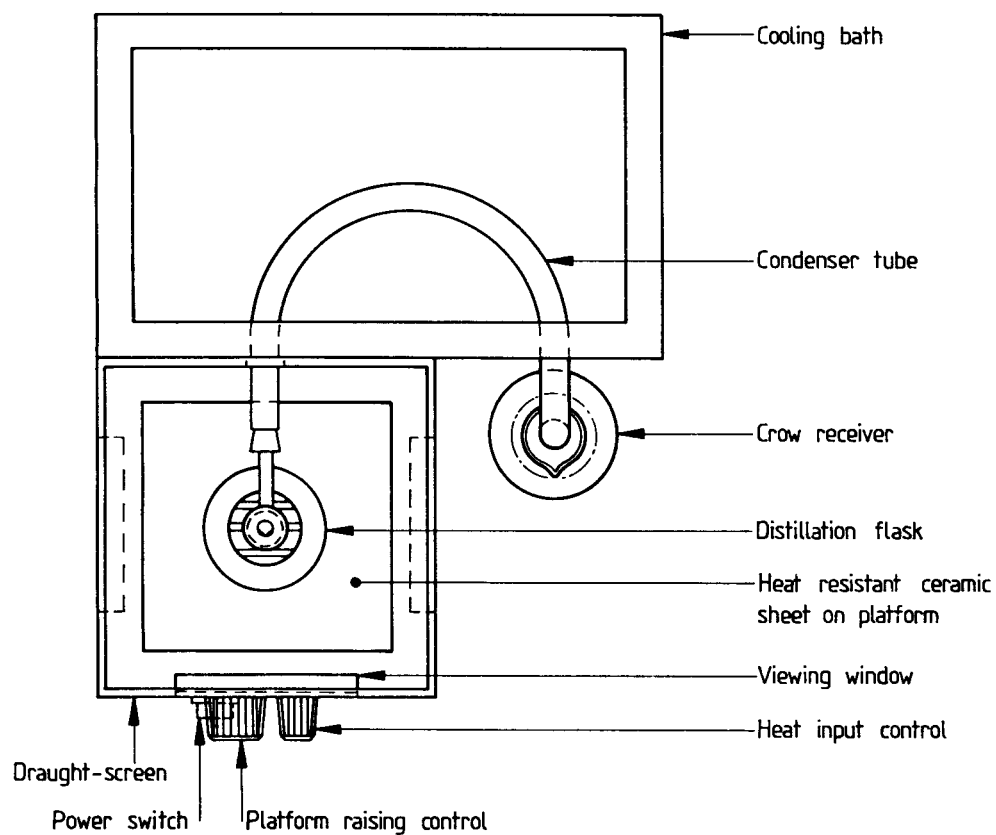


Figure 6 — Top view of arrangement of curved metal condenser tube in cooling bath

Section 5. Draught screens

23 General

The draught screen shall be of one of the following types:

- a) type A complying with clause 24;
- b) type B complying with clause 25;

NOTE 1 Type B is equivalent to type 1 of the 1962 edition of this standard.

- c) type C complying with clause 26.

NOTE 2 Type C is equivalent to type 2 of the 1962 edition of this standard.

When the apparatus is heated by gas, using screens of type B or type C they shall have in addition three heat resistant flask support sheets complying with clause 27 and a wire gauze complying with clause 28.

24 Type A draught screen

24.1 Material

Type A draught screens shall be made from sheet metal of thickness 0.8 ± 0.2 mm.

24.2 Dimensions

The dimensions shall be as shown in Figure 7.

24.3 Details of construction

24.3.1 Design. The draught screen shall be square in cross section, open at the top, and generally of the design shown in Figure 7.

24.3.2 Window. In the front side, there shall be a window of mica or heat resistant glass. The window shall be placed centrally and at a height which allows viewing of whichever flask is installed on the ceramic heat resistant sheet (24.3.3) as shown in Figure 7.

24.3.3 Shelf. There shall be a supporting shelf overlaid with a ceramic heat resistant sheet as described in clause 27 forming the top of the heater unit. Provision shall be made for adjusting the position of the heater unit in order to place the distillation flask so that direct heat is applied to the flask only through the opening in the ceramic heat resistant sheet (see Figure 7 and Figure 13).

24.3.4 Opening in rear side. An opening shall be provided to accommodate the side arm of the distillation flask as shown in Figure 7.

NOTE An optional slot for alternative condensers may also be provided.

25 Type B draught screen

25.1 Material

Type B draught screens shall be made from sheet metal of not less than 0.7 mm thickness.

25.2 Dimensions

The dimensions shall be as shown in Figure 8.

25.3 Details of construction

25.3.1 Design. The draught screen shall be rectangular in cross section, open at the top and bottom, and of the design shown in Figure 8.

25.3.2 Hinged door. In one of the shorter sides there shall be a hinged door overlapping all around an opening in the screen by 5 ± 2 mm, as shown in Figure 8.

25.3.3 Windows. In either or both of the shorter sides there shall be a window of mica, or heat resistant glass, placed centrally with the bottom of the window level with the top of the shelf of ceramic heat resistant sheet, as shown in Figure 8.

25.3.4 Shelf. There shall be a shelf of ceramic heat resistant material not more than 7 mm thick, with a central hole 110 ± 10 mm in diameter. It shall be of sufficient mechanical strength to support the distillation flask and be free from cracks or deformations.

The shelf shall be supported horizontally in the screen and shall fit closely to the sides of the screen to ensure that hot gases from the source of heat do not come into contact with the sides or neck of the flask.

NOTE The supports for the shelf may conveniently consist of triangular pieces of metal sheet firmly fixed to the screen at its four corners.

25.3.5 Holes in the longer sides. In each of the longer sides there shall be three holes, as shown in Figure 8.

In the middle of each of the longer sides a vertical slot for the side arm of the distillation flask shall be cut downwards from the top of the screen, as shown in Figure 8.

25.3.6 Removable shutter. There shall be a removable shutter, as shown in Figure 9, for closing whichever vertical slot is not in use.

25.3.7 Holes in the shorter sides. In each of the shorter sides there shall be five holes, two of which shall be circular and situated below the ceramic heat resistant shelf, as shown in Figure 8.

26 Type C draught screen

26.1 Material

Type C draught screens shall be made from sheet metal of not less than 0.7 mm thickness.

26.2 Dimensions

The dimensions shall be as shown in Figure 10.

26.3 Details of construction

26.3.1 Design. The draught screen shall be rectangular in cross section, open at the top and the bottom, and of the design shown in Figure 10.

26.3.2 Sliding door. In one of the shorter sides, there shall be a sliding door of either toughened or heat resistant glass, as shown in Figure 10. It shall be provided with a handle at the top end. It shall fit loosely, and a means shall be provided for retaining it in the open position.

26.3.3 Shelf. The shelf shall comply with 25.3.4.

26.3.4 Holes in the longer sides. In each of the longer sides, there shall be two circular holes 25 ± 0.5 mm in diameter situated below the ceramic heat resistant shelf, and with their centres 265 ± 5 mm above the base, as shown in Figure 10.

In each of the longer sides, there shall be a horizontal slot situated with its centre 25 ± 0.5 mm above the base, as shown in Figure 10.

In the middle of each of the longer sides, a vertical slot, for the side arm of the distillation flask, shall be cut downwards from the top of the screen, as shown in Figure 10.

26.3.5 Removable shutter. There shall be a removable shutter as shown in Figure 9 for closing whichever of the vertical slots is not in use.

26.3.6 Holes in the shorter side. In the shorter side, opposite the side containing the sliding door, there shall be two circular holes 25 ± 0.5 mm in diameter situated below the ceramic heat resistant shelf with their centres 265 ± 5 mm above the base, as shown in Figure 10.

27 Heat resistant flask support sheets

Three flask support sheets having central holes of respectively 32 ± 1 mm, 38 ± 1 mm, and 50 ± 1 mm diameter shall be provided.

The flask support sheets shall be 150 ± 5 mm square and of thickness not less than 4 mm and not more than 7 mm and shall be made of ceramic heat resistant material of adequate mechanical strength to support the distillation flask and contents. They shall be free from cracks and deformities.

NOTE The sides of the central holes should be chamfered to ensure a snug fit to the flask in use.

28 Wire gauze

The wire gauze shall be made of a $500 \mu\text{m}$ to $710 \mu\text{m}$ nominal aperture iron or nickel wire gauze and shall be 150 ± 5 mm square. This gauze shall be used in conjunction with type B and type C screens when using gas heating.

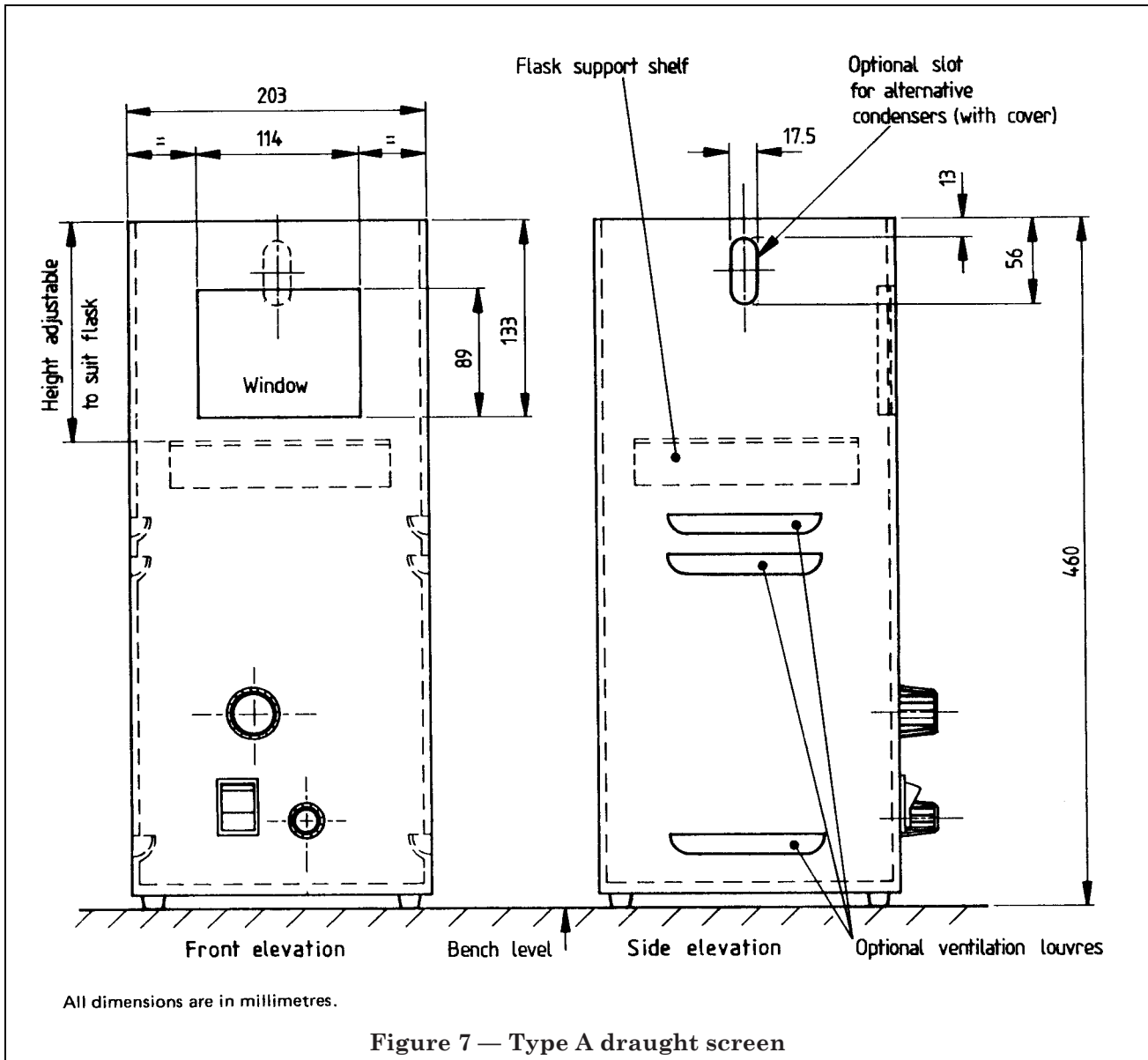


Figure 7 — Type A draught screen

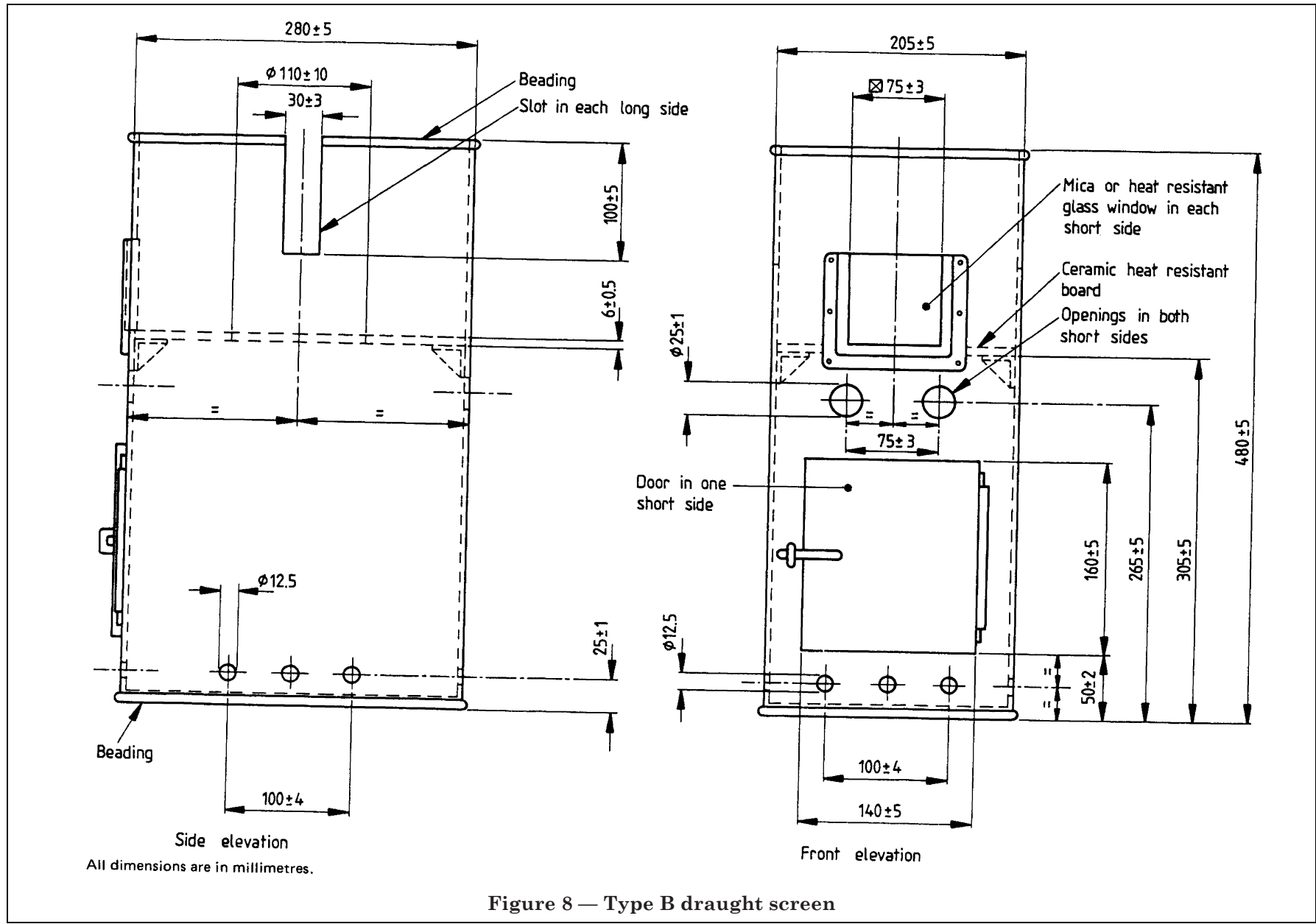
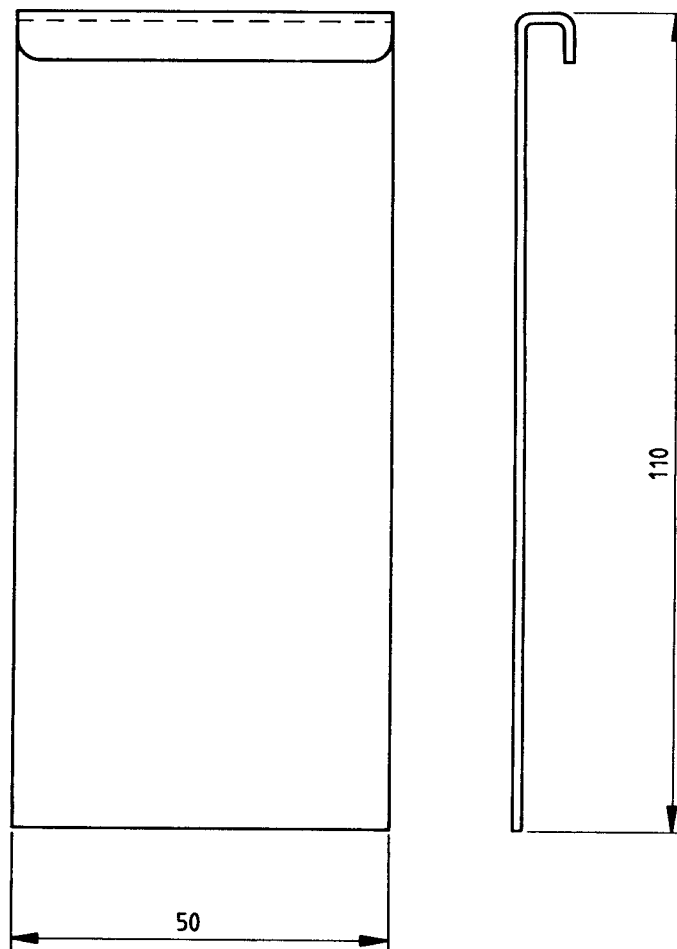


Figure 8 — Type B draught screen



All dimensions are in millimetres.

Figure 9 — Removable shutter for draught screen

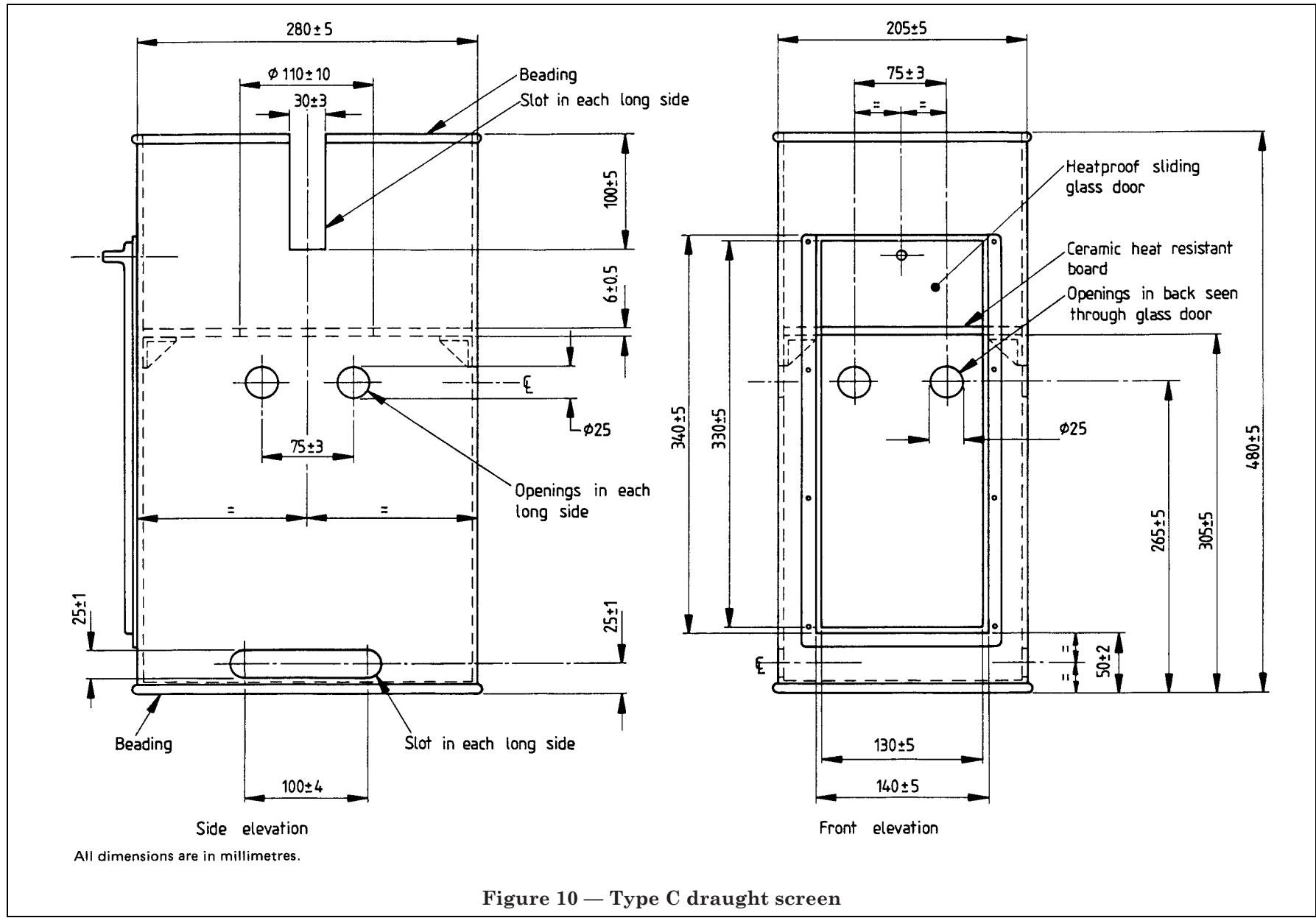


Figure 10 — Type C draught screen

Section 6. Heaters

29 General

The heater shall be either:

- a) a gas heater; or
- b) an electric radiant heater.

NOTE The electric radiant heater should be capable, when started from cold, of yielding the first drop of distillate within the time laid down in the material specification, and should be capable of effecting the distillation at the specified rate of temperature rise.

30 Gas heaters

The gas heater shall be either a Bunsen burner or other aerated type of burner.

The gas supply shall have a constant pressure governor in combination with a fine adjustment valve. A wire gauze as specified in clause 28 shall be used in order to maintain the required heat input.

NOTE The fine adjustment valve should afford a sensitive and reproducible control of the heat input.

Appendix A Guidance on the assembly of distillation apparatus

A.1 General

The object of this appendix is to give general guidance on the assembly of the apparatus specified in this British Standard and to draw attention to particular points on which care should be taken. For the appropriate assembly of apparatus, and the detailed procedures, including any specific safety precautions, for carrying out a specific distillation, reference should be made to the appropriate test methods, as they will differ according to the liquid under test and the objective of the test.

A.2 Assembly of the apparatus

Typical assemblies of the apparatus are shown in Figure 11 and Figure 13.

A.3 Points to which special attention should be paid

A.3.1 *Position of the thermometer*

The thermometer (which should be of one of the types specified in BS 593) should be held concentrically in the neck of the flask by means of a well-fitting cork, and the lower end of the main capillary tube of the thermometer should be level with the highest point of the bottom of the bore of the vapour tube, as shown in Figure 12. The cork should project about 10 mm above the top of the flask.

A.3.2 *Support for flask*

When a heat resistant sheet (see clause 27) is used to support the flask in the draught screen, the sheet having a central hole of size appropriate to the size of the flask specified by the test method should be placed on top of the supporting shelf (see 24.3.3, 25.3.4 or 26.3.3) so that the holes are approximately concentric. The flask should be placed into position and pressed down so as to close completely the hole in the heat resistant sheet.

A.3.3 *Connection of the flask to the condenser*

The flask should be connected to the condenser so that the end of the side arm projects not less than 10 mm and not more than 50 mm beyond the cork into the condenser.

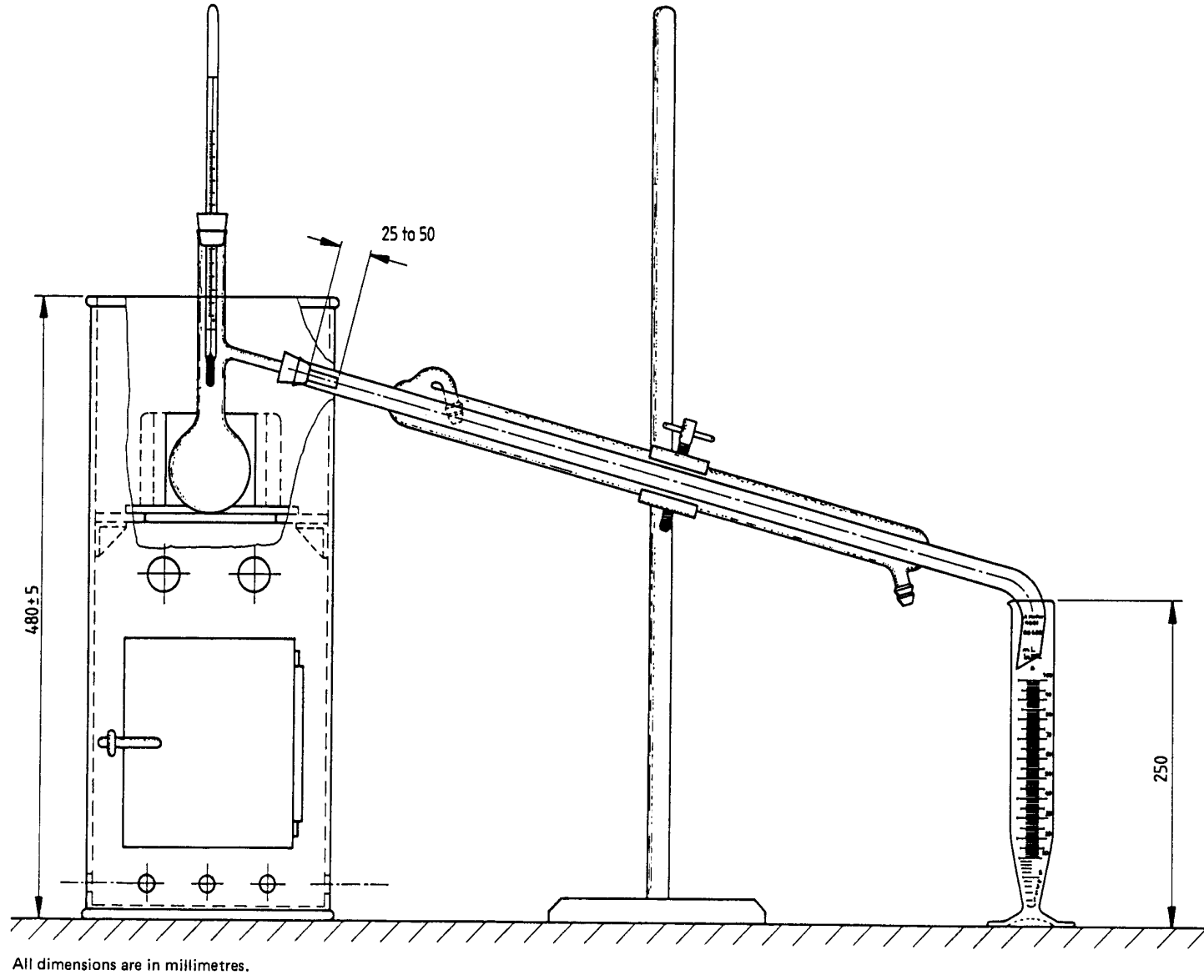
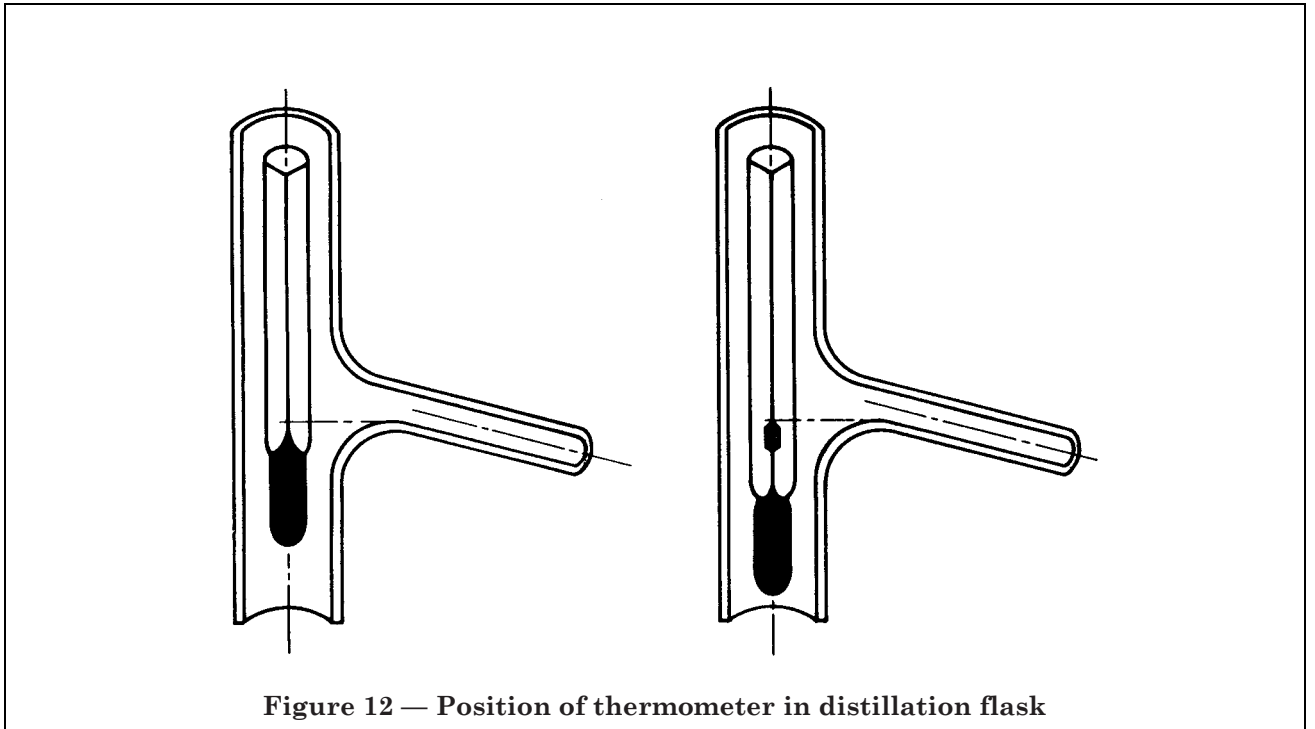
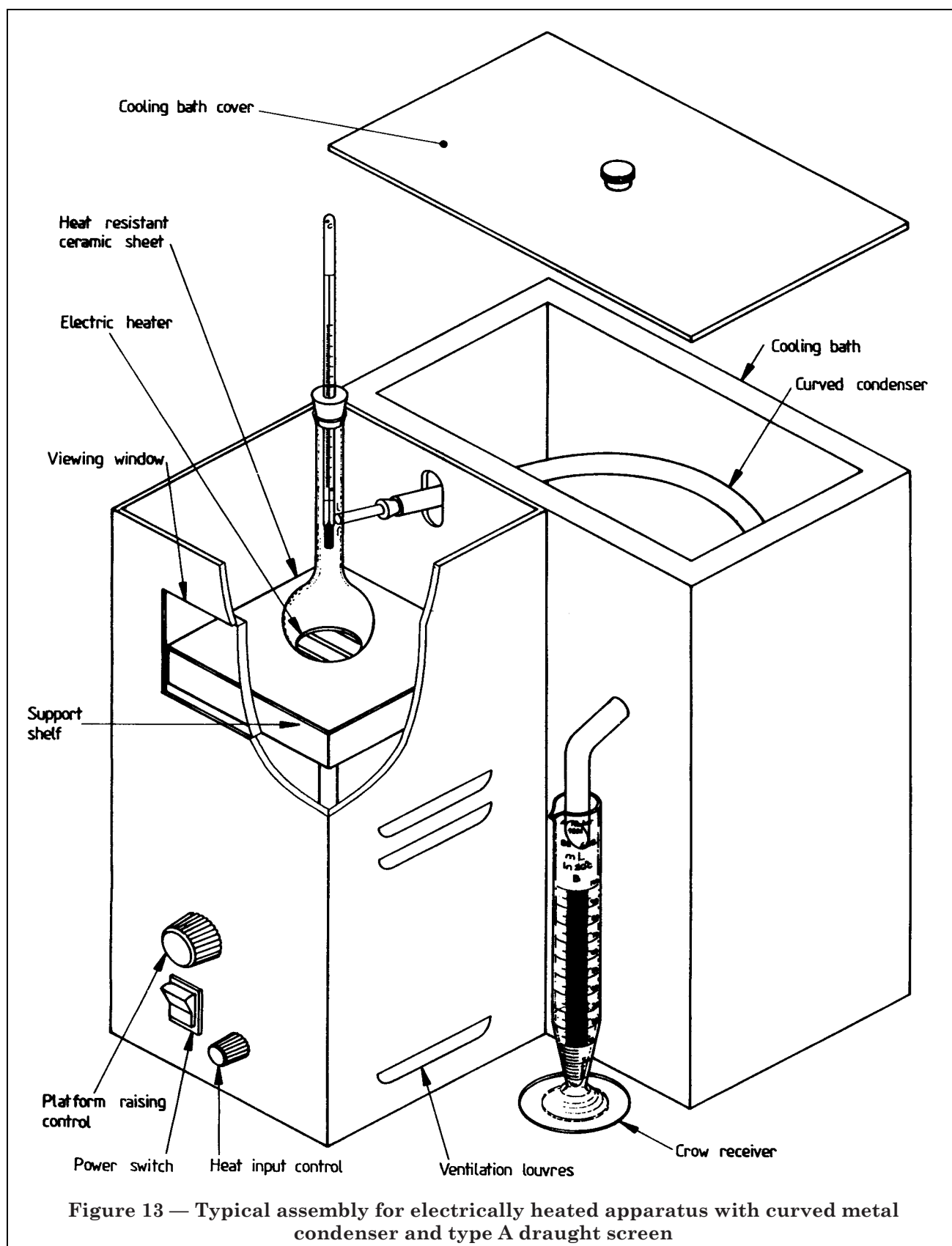


Figure 11 — Typical assembly of distillation apparatus with type 1 condenser





Publications referred to

- BS 593, *Specification for laboratory thermometers.*
- BS 604, *Specification for graduated glass measuring cylinders³⁾.*
- BS 2000, *Methods of test for petroleum and its products.*
- BS 2000-123, *Distillation of petroleum products³⁾.*
- BS 2000-195, *Distillation range of volatile organic liquids³⁾.*
- BS 2520, *Specification for barometer conventions and tables, their application and use.*
- BS 2598, *Glass plant, pipeline and fittings.*
- BS 2598-1, *Specification for properties of borosilicate glass 3.3.*
- BS 3473, *Chemical resistance of glass used in the production of laboratory glassware.*
- BS 3473-2, *Method for determination of hydrolytic resistance of glass grains at 98 °C.*
- BS 3978, *Specification for water for laboratory use.*
- BS 4591, *Method for the determination of distillation characteristics (distillation range and distillation yield)³⁾.*
- BS 5895, *Specification for borosilicate glass tubing for laboratory apparatus.*
- BS 6696, *Methods for use and testing of capacity of volumetric glassware.*
- ISO 918, *Volatile organic liquids for industrial use — Determination of distillation characteristics³⁾.*
- IP 123-84, *Distillation of petroleum products³⁾.*
- IP 195-81, *Distillation range of volatile organic liquids³⁾.*

³⁾ Referred to in the foreword only.

BSI — British Standards Institution

BSI is the independent national body responsible for preparing British Standards. It presents the UK view on standards in Europe and at the international level. It is incorporated by Royal Charter.

Revisions

British Standards are updated by amendment or revision. Users of British Standards should make sure that they possess the latest amendments or editions.

It is the constant aim of BSI to improve the quality of our products and services. We would be grateful if anyone finding an inaccuracy or ambiguity while using this British Standard would inform the Secretary of the technical committee responsible, the identity of which can be found on the inside front cover. Tel: 020 8996 9000. Fax: 020 8996 7400.

BSI offers members an individual updating service called PLUS which ensures that subscribers automatically receive the latest editions of standards.

Buying standards

Orders for all BSI, international and foreign standards publications should be addressed to Customer Services. Tel: 020 8996 9001. Fax: 020 8996 7001.

In response to orders for international standards, it is BSI policy to supply the BSI implementation of those that have been published as British Standards, unless otherwise requested.

Information on standards

BSI provides a wide range of information on national, European and international standards through its Library and its Technical Help to Exporters Service. Various BSI electronic information services are also available which give details on all its products and services. Contact the Information Centre. Tel: 020 8996 7111. Fax: 020 8996 7048.

Subscribing members of BSI are kept up to date with standards developments and receive substantial discounts on the purchase price of standards. For details of these and other benefits contact Membership Administration. Tel: 020 8996 7002. Fax: 020 8996 7001.

Copyright

Copyright subsists in all BSI publications. BSI also holds the copyright, in the UK, of the publications of the international standardization bodies. Except as permitted under the Copyright, Designs and Patents Act 1988 no extract may be reproduced, stored in a retrieval system or transmitted in any form or by any means – electronic, photocopying, recording or otherwise – without prior written permission from BSI.

This does not preclude the free use, in the course of implementing the standard, of necessary details such as symbols, and size, type or grade designations. If these details are to be used for any other purpose than implementation then the prior written permission of BSI must be obtained.

If permission is granted, the terms may include royalty payments or a licensing agreement. Details and advice can be obtained from the Copyright Manager. Tel: 020 8996 7070.