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**Anaesthetic vaporizers — Agent-specific  
filling systems**

*Évaporateurs d'anesthésie — Systèmes de remplissage spécifiques à  
l'agent*

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. 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.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 5360 was prepared by Technical Committee ISO/TC 121, *Anaesthetic and respiratory equipment*, Subcommittee SC 1, *Breathing attachments and anaesthetic machines*.

This second edition cancels and replaces the first edition (ISO 5360:1993) which has been technically revised by virtue of incorporation of Technical Corrigendum 1:1998, inclusion of the changes presented and approved for ISO 5360:1993/Amd 1 (not published) and the need to update cross-references and other factual matters due to the passage of time.

# Anaesthetic vaporizers — Agent-specific filling systems

## 1 Scope

This International Standard specifies the dimensions of agent-specific filling systems for agent-specific anaesthetic vaporizers.

This International Standard does not specify construction materials. Materials used for the parts of filling systems which come into contact with liquid anaesthetic agent should be selected with regard to:

- a) toxicity;
- b) compatibility with anaesthetic agents;
- c) minimization of health risks due to substances leached from the materials.

Because of the unique properties of desflurane, dimensions for this agent have not been specified in this International Standard.

NOTE Designs of connection systems are encouraged which only permit engagement of the agent-specific bottle adaptor to the bottle when the bottle collar is in place.

## 2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 1101:2004, *Geometrical Product Specifications (GPS) — Geometrical tolerancing — Tolerances of form, orientation, location and run-out*

## 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

### 3.1

#### **agent-specific**

having both a prescribed configuration and prescribed dimensions, which are specific for a prescribed liquid anaesthetic agent

### 3.2

#### **agent-specific filling system**

functional system of agent-specific coded connections between an anaesthetic bottle and an agent-specific anaesthetic vaporizer, consisting of, for example, a threaded bottle neck with collar, bottle connector, male adaptor and filler receptacle

NOTE Different types of agent-specific filling systems are shown in Annex A.

**3.3**

**anaesthetic vaporizer**

device designed to facilitate the change of an anaesthetic agent from a liquid to a vapour

**3.4**

**bottle adaptor**

assembly that is intended to connect a bottle for liquid anaesthetic agent to an agent-specific anaesthetic vaporizer

**3.5**

**bottle collar**

agent-specific component on the neck of a bottle causing it to be agent-specific

**3.6**

**bottle connector**

agent-specific component that fits the thread on the bottle neck and mates with the agent-specific bottle collar

**3.7**

**bottle neck**

external threaded part of the bottle and the adjacent contour over which an agent-specific collar is fitted

**3.8**

**filler receptacle**

receptacle for a bottle or a bottle adaptor on an agent-specific anaesthetic vaporizer

**3.9**

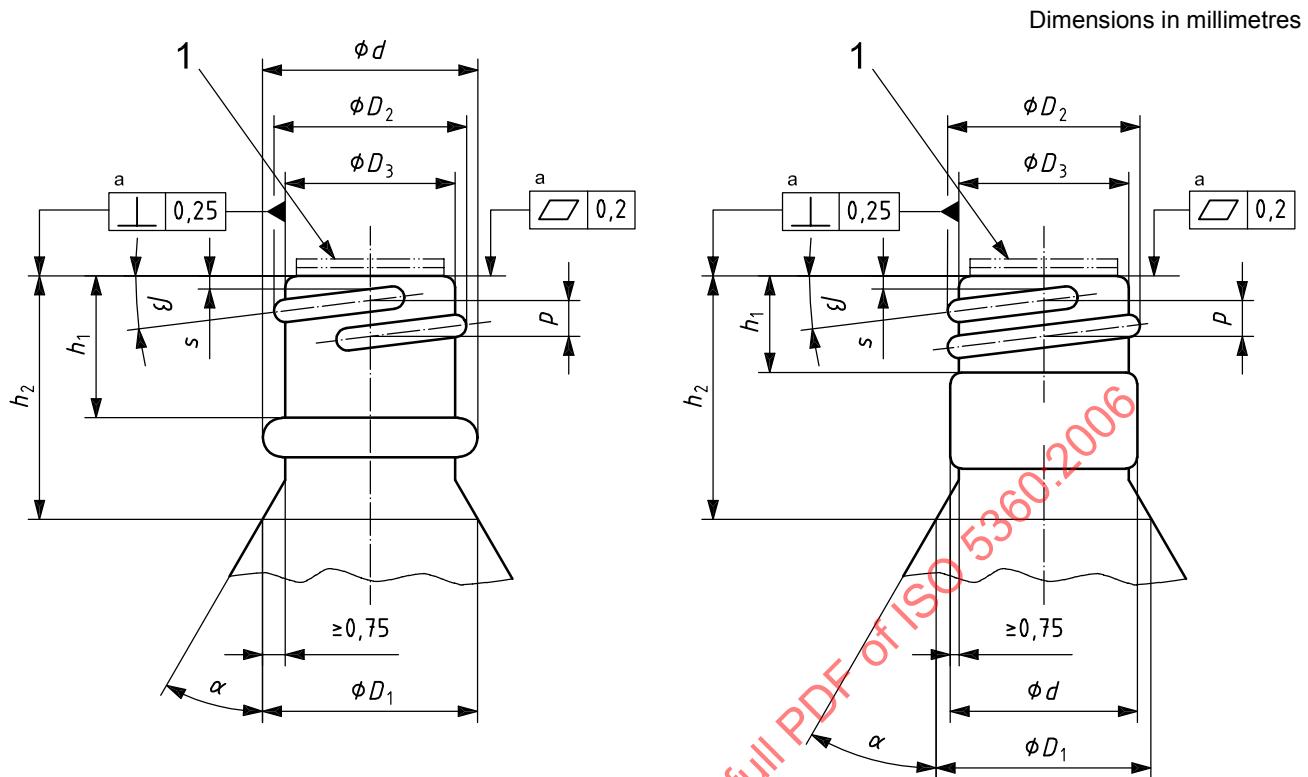
**male adaptor**

part of a bottle adaptor that mates with a filler receptacle on an agent-specific vaporizer

## 4 Bottle

Each bottle shall have:

- a) the name of the anaesthetic agent, with which it is intended to be used, marked on it;
- b) either a bottle collar complying with Clause 5 and a threaded neck complying with Figure 1 and Table 1, or a permanently attached bottle adaptor complying with 6.2.

**Key**

1 optional pouring lip (not dimensioned)

a Flatness and perpendicularity tolerances in accordance with ISO 1101.

NOTE The dimensions shown form part of this International Standard. Other features are for illustrative purposes only. See also Table 1.

**Figure 1 — Two examples of threaded necks of bottles for anaesthetic agents****Table 1 — Dimensions of threaded necks of bottles for anaesthetic agents (see also Figure 1)**

Bottle type	Anaesthetic agent	$h_1$ ± 0,3 mm	$h_2$ <sup>a</sup> min. mm	$s$ ± 0,45 mm	$\beta$	$\alpha$ min. at $\phi D_1$	$p$ mm	Thread turns min.	$D_1$ <sup>a</sup> nom. mm	$D_2$ <sup>b</sup> ± 0,3 mm	$D_3$ <sup>b</sup> ± 0,3 mm	$d$ max. mm.
1	Isoflurane Enflurane	9,75	23	1,2	2° 35'	30°	3,2	1	28	23,6	21,5	28
2	Halothane	6,8	18,7	1,2	2° 15'	30°	2,54	1,25	24	21,45	19,7	28
3	Halothane (North America)	15	26,3	1	2° 50'	30°	3,2	1,75	24	21,7	19,5	28
4	Spare	9,05	20	1,15	3° 30'	30°	3,2	1,25	20	17,65	15,5	28
5	Spare	9,05	20	1,15	3° 7'	30°	3,2	1,25	22	19,65	17,5	28
6	Methoxy- flurane	9,8	20	1,15	2° 57'	30°	4,25	1,25	30	27,3	24,9	32
7	Spare	9,85	20	1,15	2° 31'	30°	4,25	1,25	34	31,8	29,4	32
8	Sevoflurane	8,9	23,9	1,3	2° 56'	30°	3,63	1,25	23,9	23,5	21,5	28

<sup>a</sup> Recommended values.<sup>b</sup> Summation of the tolerances of measures  $D_2$  and  $D_3$  shall be avoided. A maximum tolerance of ± 0,3 mm for  $(D_2 - D_3)$  should be required to avoid problems with the fitting of any bottle connector.

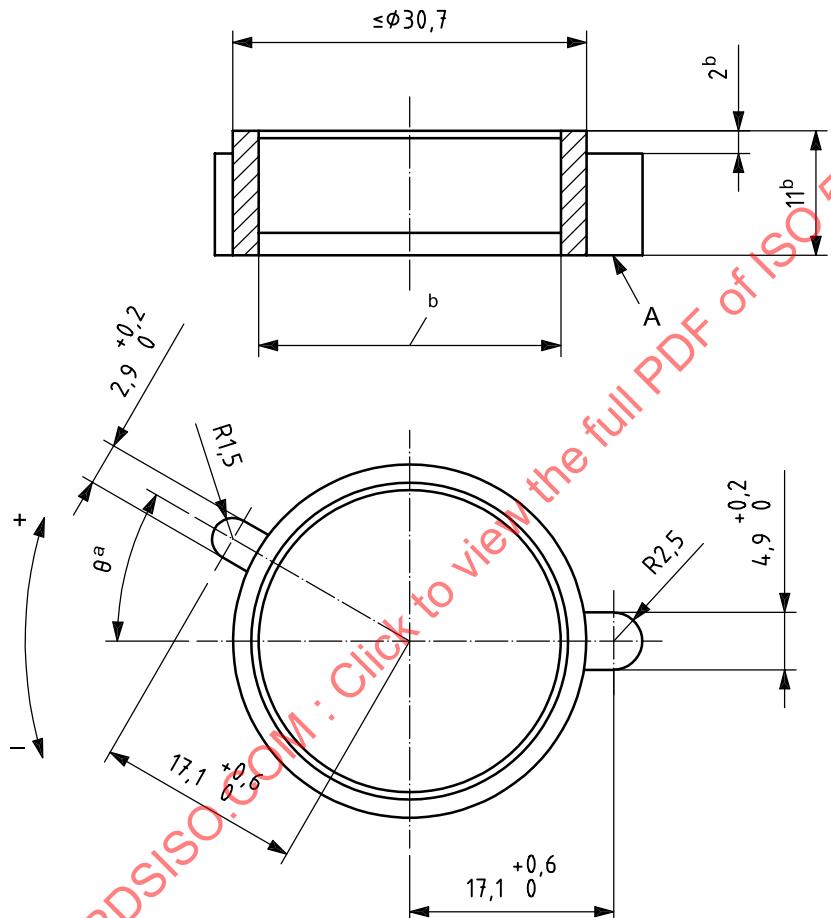
## 5 Bottle collar

5.1 Bottle collars shall comply with the configuration and dimensions shown in Figure 2 and angle  $\theta$  specified in Table 2 for the anaesthetic agent with which it is intended to be used.

5.2 The position of the bottle collar relative to the screw thread of the bottle shall be as shown in Figure 3.

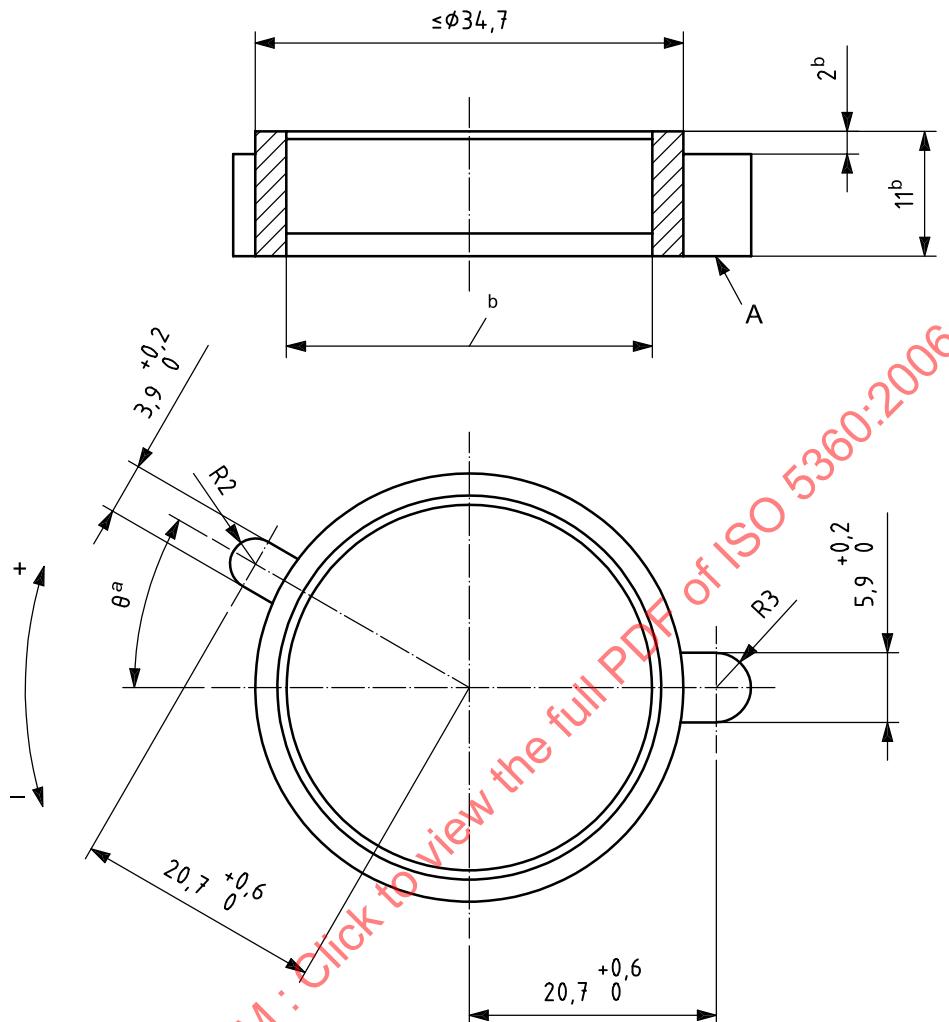
5.3 The bottle collar shall be attached to the bottle and shall be rotatable by hand.

Dimensions in millimetres



a) Bottle collar for small bottles, i.e. types 1 to 5 and 8

Dimensions in millimetres



b) Bottle collar for large bottles, i.e. types 6 and 7

A = Face A

a See Table 2.

b May vary to suit bottle.

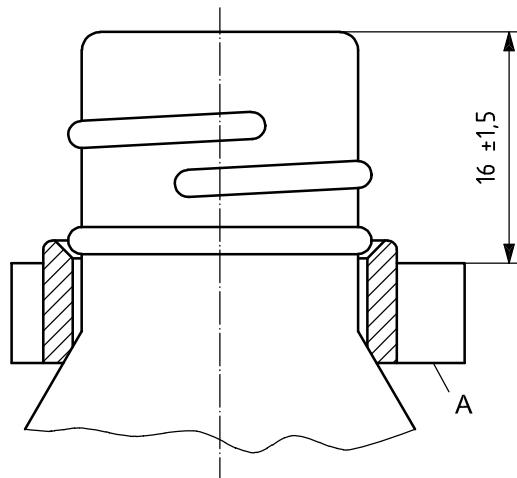
Figure 2 — Configuration of agent-specific bottle collars

Table 2 — Dimensions and colours of agent-specific bottle collars and connectors

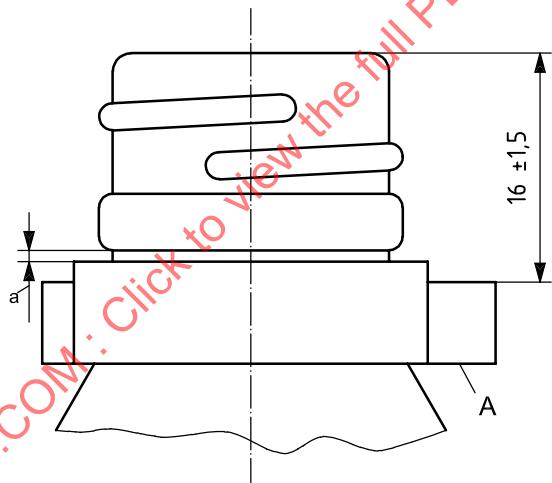
Anaesthetic agent	$\theta^a$ $\pm 0^\circ 30'$	Specified colour <sup>b</sup>	Example of colour samples					
			Federal Standard 595:1994 colour	BS 5252 colour	Pantone colour	SS 01 91 02: 2004 colour	Munsell colour <sup>c</sup>	DIN 6164 colour
Halothane	– 20°	Red	11 105	04 E 56	200 C	NCS S 1080 R	5R4/14	8:7:2
Enflurane	+ 20°	Orange	22 510	06 E 55	151 C	NCS S 0585-Y50R	2,5YR 6/16	5:5:1
Methoxyflurane	0°	Green	14 187	14 E 53	334 C	NCS S 2060-B90G	10G 5/10	21:6:3
Desflurane	N.S. <sup>d</sup>	Blue	n.a. <sup>e</sup>	18 E 53	3015 C	NCS S 3060 B	10B 4/10	18:4:3
Not for agent identification		White	37 875	18 B 15	5455 C	NCS S 0502-B	10B 9/1	N:0:0.5
Not for agent identification		Black	15 042	00 E 53	Process black C	NCS S 9000-N	N 0,5	N:0:9
Sevoflurane	+ 50°	Yellow	n.a. <sup>e</sup>	10 E 53	108 C	NCS S 0570-Y	6,25Y 8,5/12	2:6:1
Isoflurane	– 40°	Purple	n.a. <sup>e</sup>	24 E 53	254 C	NCS S 3055-R50B	7,5P4/12	11:4:4
Spare		Grey	16 251	00 A 09	Cool grey 9 C	NCS S 5502 B	5PB 5/1	N:0:4

<sup>a</sup> Sign “+” means clockwise rotation and sign “–” means anticlockwise rotation, when viewed from the top.  
<sup>b</sup> If a colour is used on a vaporizer, bottle or package label to facilitate correct identification, it is important that only the colour for the appropriate anaesthetic agent be used.  
<sup>c</sup> Munsell colour is the original. Other colour systems show nearest available colour sample.  
<sup>d</sup> N.S. = not specified.  
<sup>e</sup> n.a. = not available.

Dimensions in millimetres



a) Position without clearance between collar and transfer ring



b) Position with clearance between collar and transfer ring

A = Face A (see Figure 2)

a Clearance to suit bottle.

Figure 3 — Alternative positions of agent-specific bottle collar

## 6 Bottle adaptor

**6.1** If the bottle adaptor is not permanently attached to the bottle or the vaporizer (see Annex A), it shall include an agent-specific bottle connector complying with the configuration and dimensions specified in Figure 6 for the anaesthetic agent with which it is intended to be used. The bottle connector shall be designed so that the coding slots in the bottle connector engage with the bottle collar before a tight connection is obtained.

If an agent-specific male adaptor is used, it shall comply with the dimensions specified in Figure 4 or Figure 5 for the anaesthetic agent with which it is intended to be used.

**6.2** If the bottle adaptor is permanently attached to the bottle and an agent-specific male adaptor is used, the agent-specific male adaptor shall comply with the dimensions specified in Figure 4 or Figure 5 for the anaesthetic agent with which it is intended to be used.

**6.3** If the bottle adaptor is a permanent part of the vaporizer, it shall include an agent-specific bottle connector complying with the configuration and dimensions specified in Figure 6 for the anaesthetic agent with which it is intended to be used. The bottle connector shall be designed so that the coding slots in the bottle connector engage with the bottle collar before a tight connection is obtained.

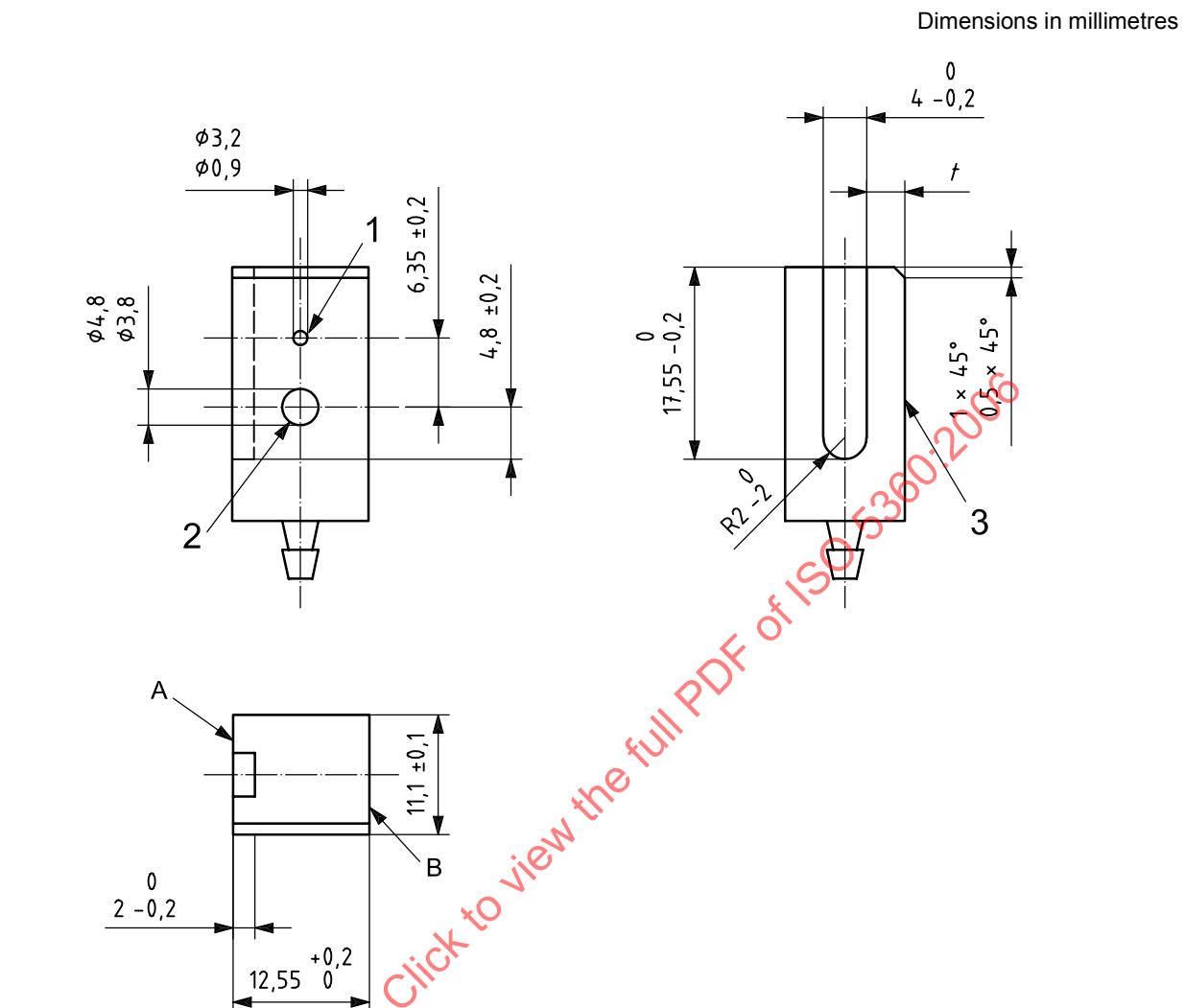
**6.4** Bottle adaptor threads shall be designed so that they:

- a) ensure an engagement of at least 0,75 thread turns on a threaded neck [see 4 b)] of an anaesthetic bottle;
- b) withstand, without visible damage, a tightening torque of  $(3 \pm 0,3)$  N·m, when fitted to an appropriate bottle.

NOTE The intention of these requirements is to render the bottle adaptor unlikely to be accidentally displaced from the bottle during filling.

**6.5** If the bottle adaptor is permanently attached to the bottle (see Annex A), and an agent-specific male adaptor complying with the configuration shown in Figure 4 or Figure 5 is used, means shall be provided for sealing the liquid and air/vapour passages on the adaptor when it is not inserted into the filler receptacle.

**6.6** The bottle adaptor shall not break when dropped from a height of 1 m on to a hard surface.



NOTE 1 See also Table 3.

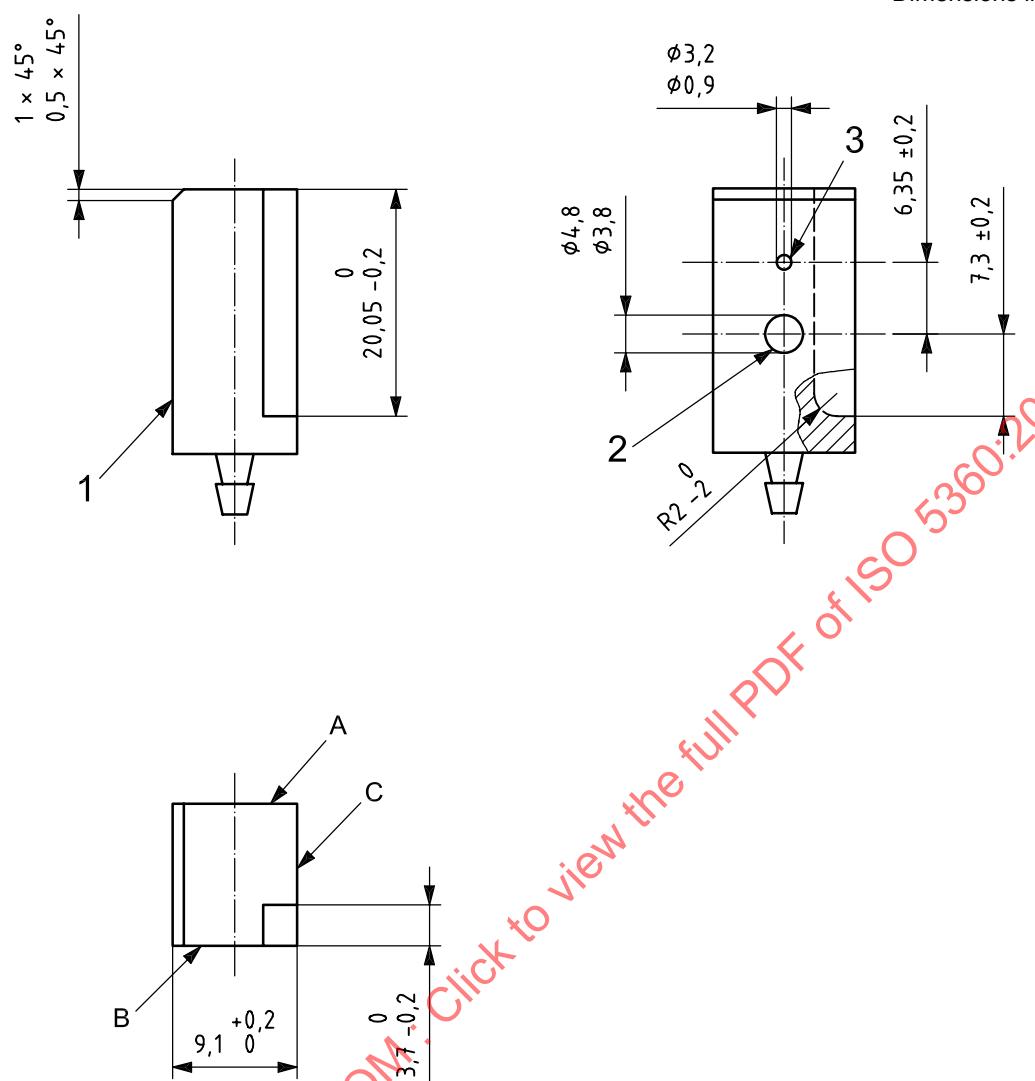
NOTE 2 Port identification applies to filling procedure only.

**Figure 4 — Configuration and dimensions of agent-specific male adaptors for use with enflurane, methoxyflurane and halothane**

**Table 3 — Details of male adaptors for use with enflurane, methoxyflurane and halothane**

Anaesthetic agent	$t$ +0,1 mm 0 mm	Slot in face
Enflurane	3,5	A
Methoxyflurane	7,5	B
Halothane	3,5	B
Spare	5,5	B
Spare	5,5	A
Spare	1,5	A
Spare	1,5	B

Dimensions in millimetres

**Key**

1 sealing face      A = Face A  
 2 liquid port      B = Face B  
 3 air/vapour port      C = Face C

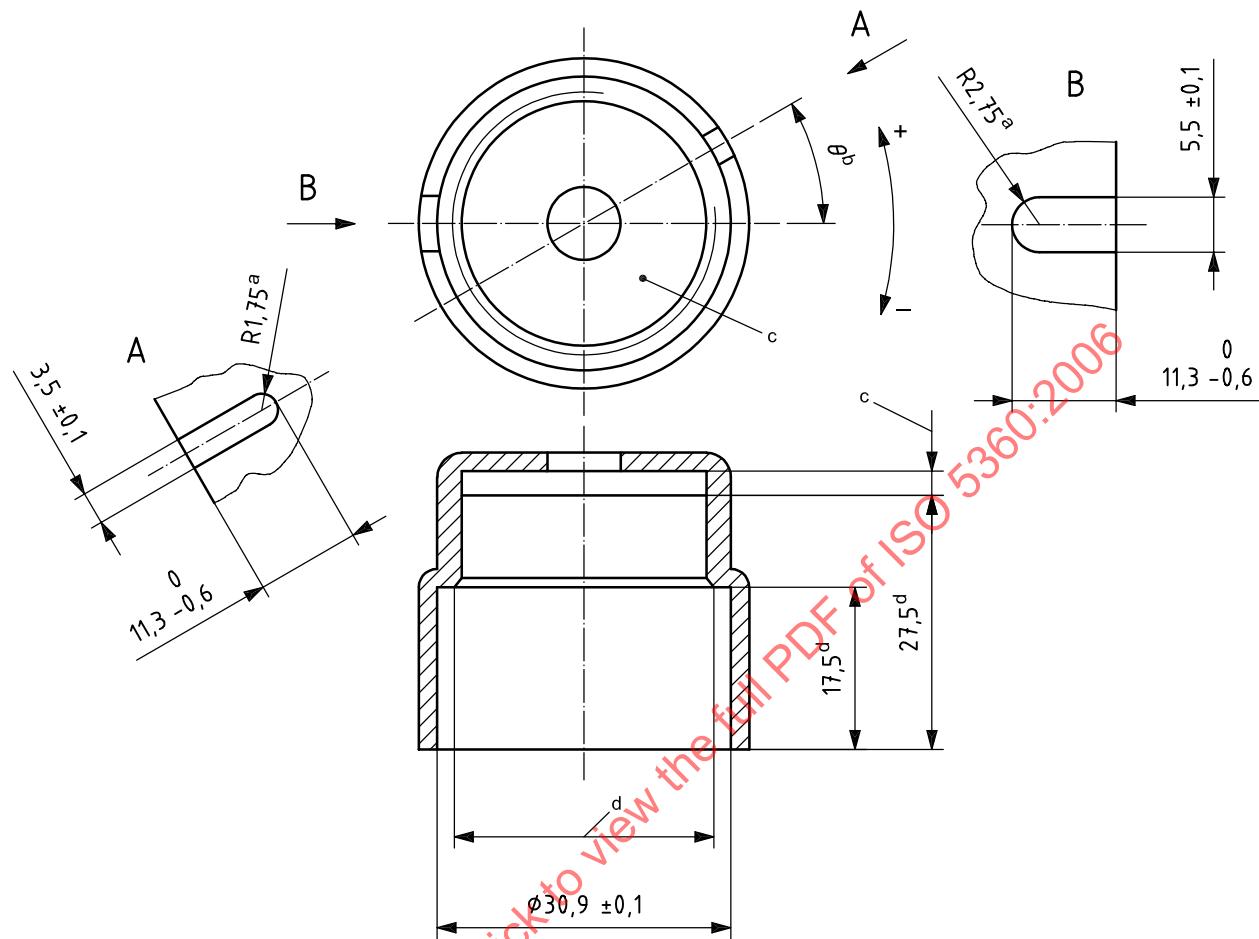
NOTE See also Table 4 and Figure 4

**Figure 5 — Configuration and dimensions of agent-specific male adaptors for use with isoflurane and sevoflurane**

**Table 4 — Details of male adaptors for use with isoflurane and sevoflurane**

Anaesthetic agent	Slot position
Isoflurane	Faces A and C
Sevoflurane	Faces B and C

Dimensions in millimetres

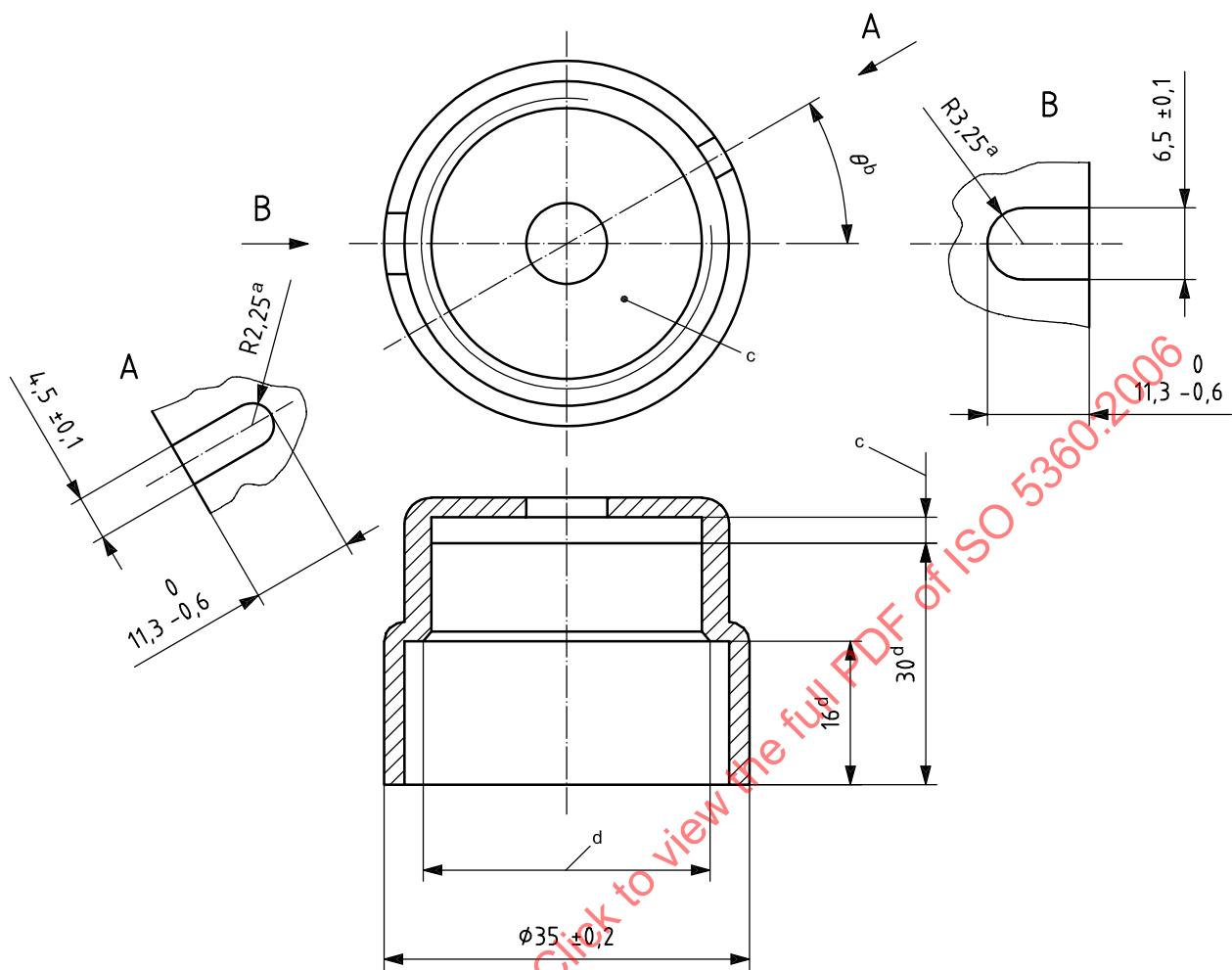


a) Connector for small bottles i.e. types 1 to 5 and 8

- a) Square corners optional.
- b) See Table 2.
- c) Space (not dimensioned) for sealing component.
- d) May vary to suit bottle.

Figure 6 — Configuration and dimensions of agent-specific bottle connectors

Dimensions in millimetres



**b) Connector for large bottles i.e. types 6 and 7**

- a Square corners optional.
- b See Table 2.
- c Space (not dimensioned) for sealing component.
- d May vary to suit bottle.

**Figure 6 (continued)**

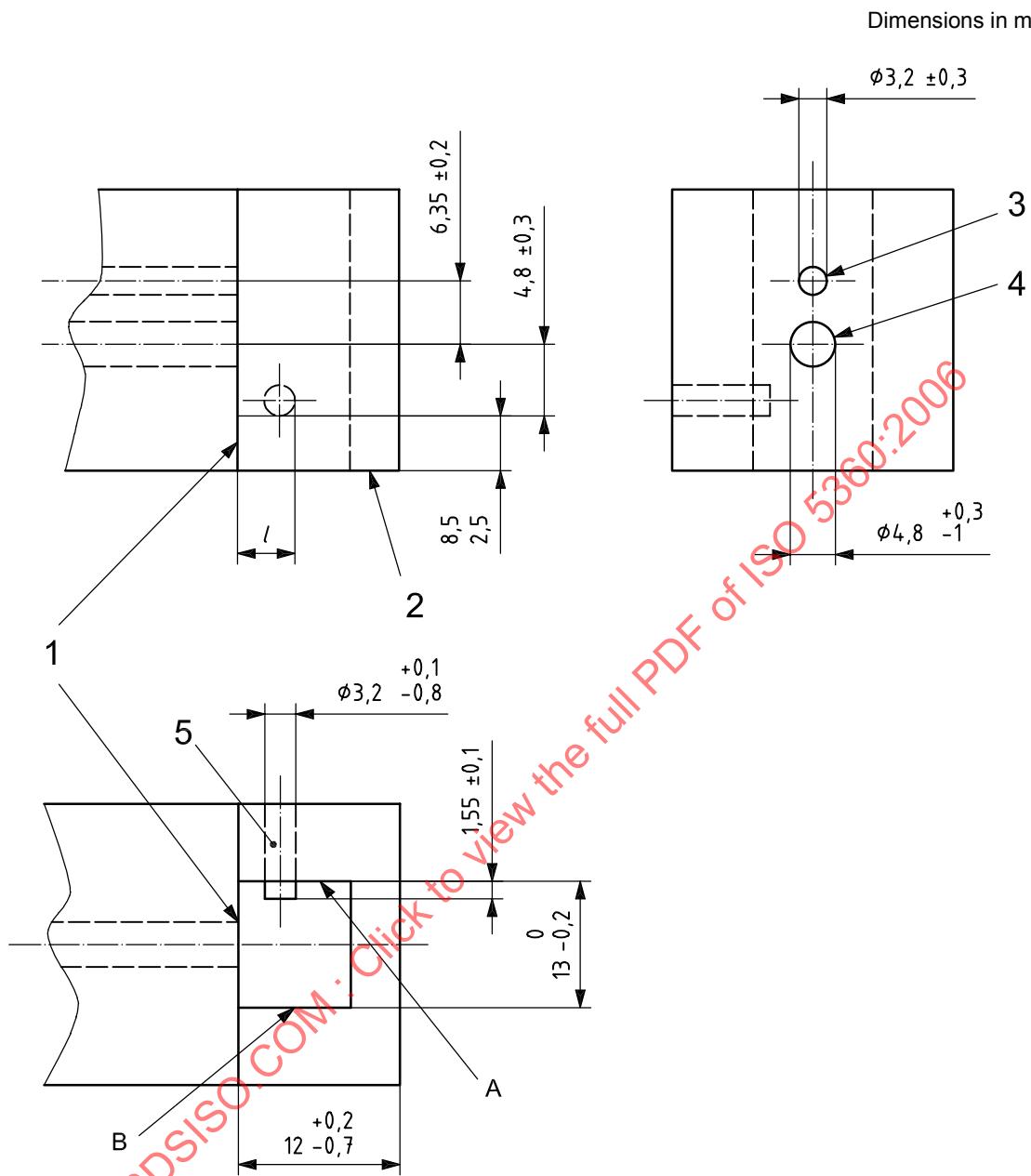
## 7 Filler receptacle

## 7.1 The filler receptacle of the vaporizer shall:

a) comply with the configuration and dimensions shown in Figure 7 or Figure 8 for the anaesthetic agent with which it is intended to be used, and the design shall only permit the insertion of the agent-specific male adaptor complying with 6.1 or 6.2 into the front face of the filler receptacle as illustrated in Figure 7 or Figure 8,

or

b) comply with the configuration and dimensions of the bottle connector shown in Figure 6 and angle  $\theta$  specified in Table 2 for the anaesthetic agent with which it is intended to be used.

**Key**

- 1 sealing face, space (not dimensioned) for sealing component
- 2 front face
- 3 air/vapour port
- 4 liquid port
- 5 pin

A = Face A

B = Face B

NOTE 1 See also Table 5.

NOTE 2 Port identification applies to filling procedure only.

**Figure 7 — Configuration and dimensions of agent-specific filler receptacles for use with enflurane, methoxyflurane and halothane**

**Table 5 — Details of filler receptacles for use with enflurane, methoxyflurane and halothane**

Anaesthetic agent	$l$ $^{+0,15}_{-0,10}$ mm	Pin in face
Enflurane	7,1	A
Methoxyflurane	11,1	B
Halothane	7,1	B
Spare	9,1	B
Spare	9,1	A
Spare	5,1	A
Spare	5,1	B

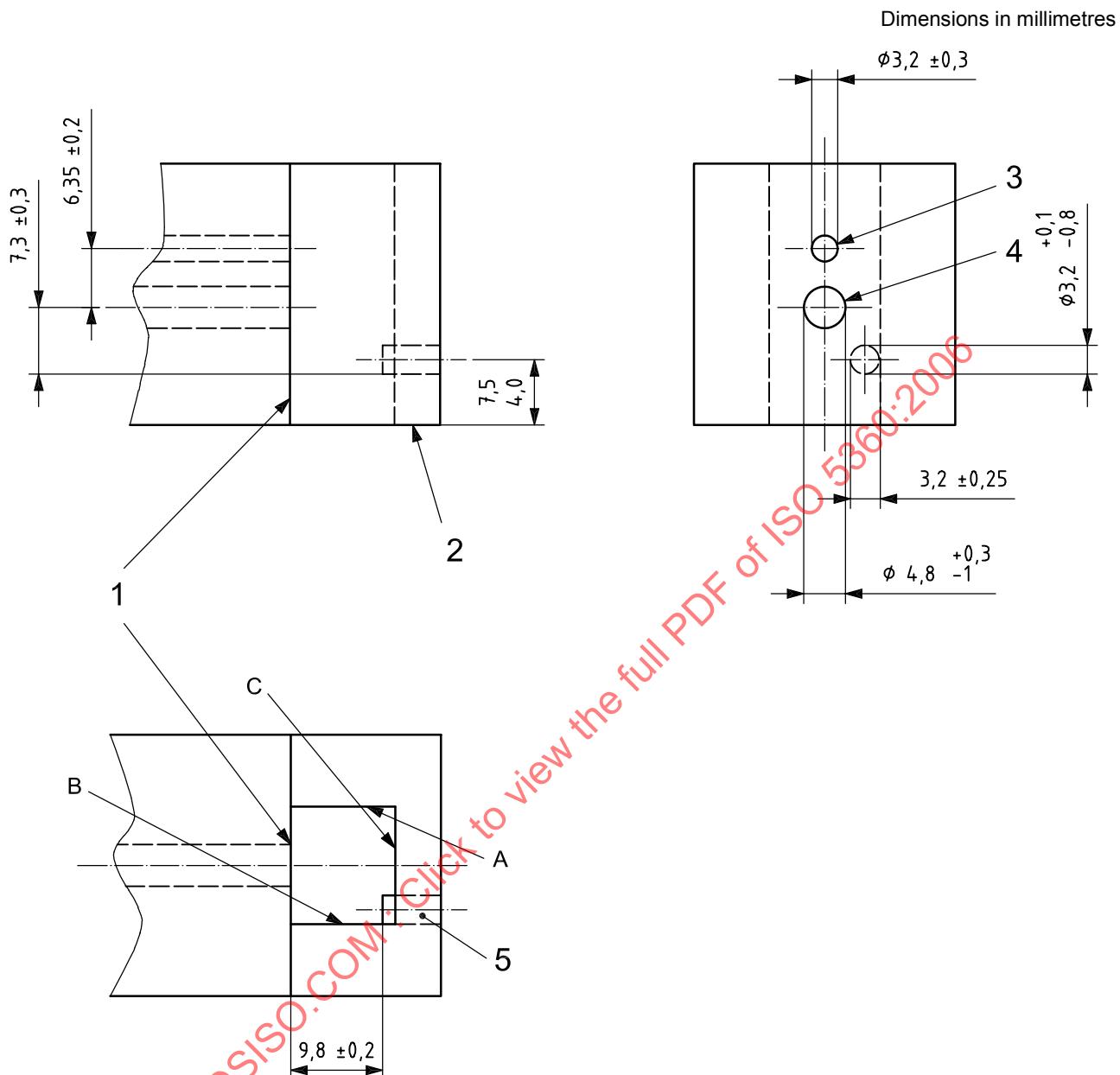
**7.2** If the filler receptacle is of the type specified in 7.1 a), then means shall be provided for tightening the male adaptor against the receptacle seal(s) when the adaptor is inserted into the filler receptacle.

**7.3** The filler receptacle shall be provided with means of sealing the liquid and air/vapour passages in the receptacle while the bottle adaptor is not inserted.

## 8 Filling rate

When tested according to the manufacturer's instructions the mean filling rate shall exceed 2 ml/s.

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**Key**

1 sealing face, space (not dimensioned) for sealing component

2 front face

3 air/vapour port

4 liquid port

5 pin

A = Face A

B = Face B

C = Face C

NOTE 1 See also Table 6.

NOTE 2 See Figure 7 for all other details.

**Figure 8 — Configuration and dimensions of agent-specific filler receptacles for use with isoflurane and sevoflurane**

**Table 6 — Details of filler receptacles for use with isoflurane and sevoflurane**

Anaesthetic agent	Pin inserted in face C and adjacent to:
Isoflurane	Face A
Sevoflurane	Face B

## 9 Leakage

When measured in accordance with Annex B, the mean leakage of liquid or vaporized anaesthetic agent into the atmosphere shall not exceed 0,5 ml.

It is recognized that during disconnection of the male adaptor from the vaporizer and the bottle adaptor from the bottle, small amounts of anaesthetic agent will escape to the environment. This should be noted in the user instruction manual.

Means should be provided to ensure that as little anaesthetic agent as possible escapes from the male adaptor to the environment when the adaptor is affixed to the bottle during storage.

## 10 Overfilling protection

When filled in accordance with the manufacturer's instructions, it shall not be possible to overfill the vaporizer such that:

- a) its performance is affected;
- b) the fluid level is no longer visible.

## 11 Colour coding

The bottle collar and the bottle connector shall incorporate the colour coding using the colour specified by name in Table 2 for the anaesthetic agent intended.

If the filler receptacle is colour-coded, the colour shall comply with the colour specified by name in Table 2.

## 12 Information provided by the manufacturer

### 12.1 Marking

Agent-specific filling systems or bottle collars or bottle adaptors supplied individually shall be marked with:

- a) the manufacturer's name and/or trademark;
- b) the batch code or the serial number;
- c) the name of the anaesthetic agent with which it is intended to be used.

NOTE The use of the generic names of anaesthetic agents according to Table 2 is recommended.