INTERNATIONAL STANDARD

ISO 17717

First edition
2017-08

Meteorological balloons — Specification

Ballons météorologiques — Spécifications

Reference number
ISO 17717:2017(E)

ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

Contents

Page

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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html

This document was prepared by Technical Committee ISO/TC 45, *Rubber and rubber products*, Subcommittee SC 4, *Products (other than hoses)*.

Meteorological balloons — Specification

1 Scope

This document specifies the minimum requirements and test methods for meteorological balloons made from natural rubber latex or natural rubber latex compounded with synthetic rubber emulsion.

This document applies to two types of balloon:

— Type 1: meteorological balloon produced by dipping process;

— Type 2: meteorological balloon produced by moulding process.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 37, *Rubber, vulcanized or thermoplastic — Determination of tensile stress-strain properties*

ISO 188, *Rubber, vulcanized or thermoplastic — Accelerated ageing and heat resistance tests*

ISO 2859-1, *Sampling procedures for inspection by attributes — Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection*

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

3.1
air bubble
thin portion, with definite edge, concave or convex, which is created by air in the balloon film

3.2
body thickness
single-walled thickness of a meteorological balloon

3.3
cracking
localized cracks in the balloon film

3.4
grease mark
stains on the balloon film due to machine grease or oil

3.5
hole
opening due to a ruptured *air bubble* (3.1), foreign body impurities or other external factors

3.6
latex coagulum
gel adhered to inside and outside of the balloon film

3.7
permanent creases with adhesion of the film
localized occurrence of the balloon film folding over and sticking to itself

3.8
thin spot
portion of the balloon which has no defined edge and has a film thickness which is lesser than that of the average thickness of the balloon film

4 Requirements

4.1 Colour

The balloon shall be natural coloured unless otherwise specified.

4.2 Appearance

When inspected according to Annex A, the appearance of the balloons shall conform to requirements in Table 1. If the defect cannot be confirmed by visual inspection, then Annex B shall be referred to.

Table 1 — Appearance

Defects		Requirements
Serious defects	hole, cracking	Non-existent
	grease mark	Non-existent
	permanent creases caused by balloon wall folded and adhered together	Non-existent
Light defects	air bubble, latex coagulum	Air bubble and latex coagulum is allowed to exist, which is not concentrated, obviously thin, not more than 5 mm in diameter and does not affect the ball film stretching.
	thin spot	The thin spot is allowed to exist, is not concentrated, not obvious, does not affect the ball film stretching and the length is not more than 10 mm, double layer thickness is not less than 0,12 mm.

4.3 Size, mass and dimensions

When measured in accordance with Annex C and Annex D, the size, mass and dimensions of the type 1 meteorological balloons shall conform to the values given in Table 2, the size, mass and dimensions of the type 2 meteorological balloons shall conform to the values given in Table 3.

Table 2 — Size, mass and dimensions of the type 1 meteorological balloons

Size	Mass g	Dimension				
		Body length mm	Body thickness mm	Neck diameter mm	Neck length mm	Neck thickness mm
10	10 ± 4	200 to 300	0,05 to 0,3	18 to 26	40 to 80	0,5 to 0,9
20	20 ± 4	245 to 355	0,05 to 0,3	20 to 28	40 to 80	0,5 to 0,9
30	30 ± 4	340 to 460	0,05 to 0,3	24 to 32	60 to 100	0,5 to 0,9
NOTE	In addition to the above sizes, balloons of other sizes are also available for customers with special requirements.					

Table 2 *(continued)*

Size	Mass g	Dimension				
		Body length mm	Body thickness mm	Neck diameter mm	Neck length mm	Neck thickness mm
50	50 ± 5	520 to 680	0,05 to 0,3	25 to 33	60 to 100	0,5 to 0,9
70	70 ± 5	540 to 740	0,05 to 0,3	25 to 35	60 to 100	0,6 to 1,0
100	100 ± 10	560 to 800	0,05 to 0,3	26 to 40	70 to 110	0,8 to 1,2
200	200 ± 20	950 to 1 250	0,05 to 0,3	28 to 54	70 to 110	0,8 to 1,2
300	300 ± 30	1 300 to 1 700	0,05 to 0,3	38 to 65	100 to 160	0,8 to 1,2
350	350 ± 35	1 450 to 1 850	0,05 to 0,3	39 to 65	100 to 160	0,8 to 1,2
400	400 ± 35	1 500 to 1 900	0,05 to 0,3	40 to 65	100 to 160	0,8 to 1,2
500	500 ± 40	1 800 to 2 200	0,05 to 0,3	46 to 70	100 to 160	0,8 to 1,2
600	600 ± 50	2 000 to 2 400	0,05 to 0,3	49 to 75	100 to 190	0,8 to 1,2
700	700 ± 50	2 100 to 2 500	0,05 to 0,3	49 to 75	100 to 190	0,8 to 1,2
800	800 ± 60	2 100 to 2 500	0,05 to 0,3	51 to 80	100 to 190	1,0 to 1,4
1 000	1 000 ± 70	2 100 to 2 500	0,05 to 0,3	51 to 86	100 to 190	1,1 to 1,7
1 200	1 200 ± 100	2 700 to 3 300	0,05 to 0,3	55 to 86	100 to 210	1,1 to 1,7
1 600	1 600 ± 150	2 900 to 3 700	0,05 to 0,3	73 to 90	100 to 210	1,1 to 1,7
2 000	2 000 ± 150	2 900 to 3 700	0,05 to 0,3	74 to 90	100 to 210	1,1 to 1,7
3 000	3 000 ± 200	2 900 to 3 700	0,05 to 0,3	75 to 90	100 to 210	2,1 to 2,7
NOTE	In addition to the above sizes, balloons of other sizes are also available for customers with special requirements.					

Table 3 — Size, mass and dimensions of the type 2 meteorological balloons

Size	Mass g	Dimension				
		Body length mm	Body thickness mm	Neck diameter mm	Neck length mm	Neck thickness mm
20	20 ± 4	250 to 380	0,15 ± 0,05	12 to 18	70 to 100	1,1 ± 0,5
30	30 ± 4	300 to 420	0,15 ± 0,05	12 to 18	70 to 100	1,1 ± 0,5
50	50 ± 4	360 to 560	0,15 ± 0,05	12 to 18	70 to 100	1,1 ± 0,5
70	70 ± 5	550 to 750	0,15 ± 0,05	12 to 18	70 to 100	1,1 ± 0,5
100	100 ± 10	600 to 800	0,15 ± 0,05	12 to 18	70 to 100	1,1 ± 0,5
200	200 ± 12	850 to 1 050	0,15 ± 0,05	25 to 35	100 to 140	1,5 ± 0,5
300	300 ± 15	950 to 1 150	0,15 ± 0,05	25 to 35	100 to 140	1,5 ± 0,5
350	350 ± 20	1 100 to 1 350	0,15 ± 0,05	25 to 35	100 to 140	1,5 ± 0,5
400	400 ± 22	1 150 to 1 400	0,15 ± 0,05	25 to 35	100 to 140	1,5 ± 0,5
500	500 ± 25	1 400 to 1 700	0,15 ± 0,05	25 to 35	100 to 140	1,5 ± 0,5
600	600 ± 27	1 600 to 1 900	0,15 ± 0,05	25 to 35	100 to 140	1,5 ± 0,5
700	700 ± 28	1 700 to 1 950	0,15 ± 0,05	25 to 35	100 to 140	1,5 ± 0,5
800	800 ± 30	1 800 to 2 050	0,15 ± 0,05	25 to 35	100 to 140	1,5 ± 0,5
1 000	1 000 ± 35	1 950 to 2 150	0,15 ± 0,05	25 to 35	100 to 140	1,5 ± 0,5
1 200	1 200 ± 40	2 200 to 2 500	0,15 ± 0,05	25 to 35	100 to 140	1,5 ± 0,5
1 500	1 500 ± 45	2 300 to 2 600	0,15 ± 0,05	25 to 35	120 to 160	2,15 ± 0,55
NOTE	In addition to the above sizes, balloons of other sizes are also available for customers with special requirements.					

Table 3 *(continued)*

Size	Mass	Dimension				
	g	Body length	Body thickness	Neck diameter	Neck length	Neck thickness
		mm	mm	mm	mm	mm
1 600	1 600 ± 50	2 300 to 2 700	0,15 ± 0,05	25 to 35	120 to 160	2,15 ± 0,55
2 000	2 000 ± 80	2 800 to 3 300	0,15 ± 0,05	40 to 60	160 to 200	2,15 ± 0,55
3 000	3 000 ± 110	3 200 to 3 800	0,15 ± 0,05	40 to 60	160 to 200	2,15 ± 0,55
NOTE In addition to the above sizes, balloons of other sizes are also available for customers with special requirements.						

4.4 Tensile Property

4.4.1 General

Tensile properties of balloons shall be measured in accordance with ISO 37, using three Type 1 or Type 1A dumb-bell test pieces and taking the median value as the test result. Test pieces shall be taken from the middle part of balloons and equidistantly distributed along the circumference of the balloon body. The test pieces shall be flat and the edge shall be smooth.

4.4.2 Tensile strength and elongation at break before accelerated ageing

Tensile strength and elongation at break of the balloon before accelerated ageing shall comply with the requirements given in Table 4.

4.4.3 Tensile strength and elongation at break after accelerated ageing

Accelerated ageing shall be conducted in accordance with the method specified in ISO 188. The accelerated ageing conditions are (8 ± 0,25) h at (100 ± 1) °C or (168 ± 2) h at (70 ± 1) °C. For reference purposes, the accelerated ageing conditions shall be (168 ± 2) h at (70 ± 1) °C. Tensile strength and elongation at break of the balloon after accelerated ageing shall comply with the requirements given in Table 4.

Table 4 — Tensile properties

Property	Requirement
Tensile strength before accelerated ageing, MPa	≥ 17,0
Elongation at break before accelerated ageing, %	≥ 600
Tensile strength after accelerated ageing, (8 ± 0,25) h at (100 ± 1) °C or (168 ± 1) h at (70 ± 1) °C, MPa	≥ 16,0
Elongation at break after accelerated ageing, (8 ± 0,25) h at (100 ± 1) °C or (168 ± 1) h at (70 ± 1) °C, %	≥ 600

4.5 Bursting diameters

When tested in accordance with Annex E, the bursting diameters of the type 1 meteorological balloons shall conform to the values given in Table 5, the bursting diameters of the type 2 meteorological balloons shall conform to the values given in Table 6.

Table 5 — Bursting diameters of the type 1 meteorological balloons

Size	10	20	30	50	70	100	200	300	350	400
Bursting diameter, m	≥ 0,4	≥ 0,9	≥ 1,1	≥ 1,3	≥ 1,5	≥ 1,6	≥ 2,9	≥ 3,7	≥ 4,1	≥ 4,4
Size	500	600	700	800	1 000	1 200	1 600	2 000	3 000	—
Bursting diameter, m	≥ 4,9	≥ 5,8	≥ 6,1	≥ 6,6	≥ 7,6	≥ 8,0	≥ 9,2	≥ 10,0	≥ 12,0	—

Table 6 — Bursting diameters of the type 2 meteorological balloons

Size	200	300	350	400	500	600	700
Bursting diameter, m	≥ 3,5	≥ 4,3	≥ 4,8	≥ 5,2	≥ 5,7	≥ 6,8	≥ 6,9
Size	800	1 000	1 200	1 500	1 600	2 000	3 000
Bursting diameter, m	≥ 7,4	≥ 8,2	≥ 8,9	≥ 10,0	≥ 10,5	≥ 11,3	≥ 13,5

4.6 Ozone resistance

When testing the test pieces in accordance with Annex F, crack, hole, split and other deterioration shall not be visible on the test pieces during the time given in Table 7.

Table 7 — Ozone resistance

Size, g	300	350	400	500	600	700	800	1 000	1 200	1 500	1 600	2 000	3 000
Time, h	2									3			

5 Sampling

The inspect unit of product is one balloon, the extent of nonconformity shall be expressed in terms of nonconformities per 100 items. This document does not specify the size of a lot, but it is possible for a purchaser to do so as part of the purchasing contract. Attention is drawn to the difficulties that can be associated with the distribution and control of very large lots. The recommended maximum individual lot size for production is 10 000.

For reference purpose, the balloons shall be sampled and inspected in accordance with single sampling plans for normal inspection specified in ISO 2859-1. The inspection levels and acceptance quality limits (AQLs) shall conform to the requirements in Table 8.

Table 8 — Inspection levels and acceptance quality limits

Characteristic		**Inspection level**	**AQL**
Appearance	**Serious defects**	Special inspection level S-2 but at least code letter D	4,0
	Light defects	Special inspection level S-2 but at least code letter D	6,5
Size, mass and dimensions		Special inspection level S-2 but at least code letter D	6,5
Bursting diameter		No. of samples: mass < 300 g - 5 samples 300 g ≤ mass < 1 200 g - 3 samples mass ≥ 1 200 g - 1 sample	mass < 300 g - 4 samples shall conform to the requirement 300 g ≤ mass < 1 200 g - 1 sample shall conform to the requirement mass ≥ 1 200 g - 1 sample shall conform to the requirement
Tensile property			
Ozone resistance			

6 Packaging, marking, transport and storage

6.1 Packaging

6.1.1 The balloon shall be packed by minimizing the inside air and by keeping sufficient amount of release agents/talc on its inner and outer surface.

6.1.2 Minimum package requirements: Balloons shall be packed individually in plastic bags unless otherwise agreement between the interested parties. Individual plastic bags may be put into paper

boxes which shall be lined with suitable moisture proof paper. The container may be lined with suitable moisture proof paper and shall be sturdy enough to withstand normal wear and tear during transportation. Packing requirements as specified by the user may differ from the above mentioned minimum requirements.

6.1.3 A qualification of certification of product inspection as described in 6.2.3 shall be put on each container.

6.2 Marking

6.2.1 Paper box

Paper boxes for package of balloons shall be marked clearly on the obvious positions at least with the following information:

a) the size, e.g. 500;

b) the quantity, e.g. 10;

c) the colour (if applicable), e.g. red.

6.2.2 Container

Containers for package of balloons shall be marked clearly on the obvious positions at least with the following information:

a) the product name, e.g. Meteorological balloon;

b) the manufacturer's name or identification, e.g. xxxx;

c) the size, e.g. 500;

d) the quantity, e.g. 10;

e) the lot No.;

f) the transportation information, e.g."⇑⇑";

g) the colour (if applicable), e.g. red;

h) the size of container;

i) the date of package, e.g. yymmdd.

6.2.3 Certification of proof

The certification of proof, with the approval stamp, shall be marked clearly at least with the following information:

a) the product name, e.g. Meteorological balloon;

b) a reference to this document, e.g. ISO 17717;

c) the size, e.g. 500;

d) the quantity, e.g. 10;

e) the lot No.;

f) the date of manufacture, e.g. yymm;

g) the colour (if applicable), e.g. red;

h) the code of inspector.

6.3 Transport and storage

6.3.1 Minimum packing requirements are applicable for balloons transported by air, sea, road as well as by rail. During transportation the balloons should be protected from high temperature, direct sunlight, rain and snow. The balloons should also be protected from acids, alkalis, oils, organic solvents and sources of heat, as well as any material that may affect the performance of the rubber.

6.3.2 The store room for balloons should be well ventilated, cool and dry. The storage temperature should be 10°C to 30°C and relative humidity should not exceed 70 %. Balloons shall be placed on shelves with at least 0,2 m distance from the ground. Reasonable number of boxes may be stacked as long as none of the lower boxes are crushed. Stacked boxes should be shuffled at least once every three months.

6.3.3 Under the storage conditions (see 6.3.1, 6.3.2), the quality guarantee period of the product is 18 months.

Annex A
(normative)

Visual inspection of meteorological balloons

A.1 Principle

Prepare a hemispherical hollow balloon and put it under a filament lamp. Unfold the balloon to be inspected on the hemispheroid, inspect the balloon's surface by pulling it from left to right, and from top to bottom. Repeat this process for reverse side.

A.2 Test preparation

A.2.1 Use an unqualified balloon with a certain volume of air filled into it. Hold the balloon nozzle by one hand, and squeeze balloon along with the balloon nozzle upward by another hand, so that a height of about 80 cm of a hemispherical hollow balloon bag is formed, and knot and fasten in the bottom of the balloon bag.

A.2.2 Have a dedicated workbench with several hemispherical balloon bags settled. An operation station consists of a balloon bag and a work chair with appropriate compatible height from the ground to the top of the balloon bag. Soft and smooth textile fabric should be used to cover up the whole workbench, preventing inspected product from being damaged due to contact friction with the workbench surface.

A.2.3 A fluorescent lamp should be installed over each work station, which can help workers to see clearly under the conditions of sight and sitting position.

A.2.4 Latex gloves should be worn before inspecting product.

A.3 Test procedure

A.3.1 Grip the two nozzle edges of meteorological balloon by two hands, and squeezing inward to each edge to open the nozzle, then lifting the balloon instantly to let less air in it.

A.3.2 Put the middle part of a balloon bag as a centre, and spread out the balloon surface parallel to the operator of left and right, up and down direction.

A.3.3 Along the balloon edges, inspect the appearance of balloon by pulling it. Any suspected appearance flaw can be determined finally by stretching it in any directions slightly. Using a plastic ruler whose index value is not more than 1 mm, measure the diameter of defects (e.g. air bubble, thin spot and latex coagulum) .When the balloon surface is inspected over within visible range over the balloon bag under natural spread state, the whole balloon should be turned over, and be inspected by the same method.

A.3.4 After completing the inspection of the above two balloon surfaces (A.3.3), along the balloon edges spreading out over the balloon bag naturally, stretching it and turning it over to another surface.

A.3.5 Repeat the operation of A.3.3, and try to inspect all surfaces of the whole balloon as far as possible to prevent any defect from being undetected.

A.4 Inspection report

The inspection report shall include the following information:

a) the temperature and the humidity in the workplace;

b) the product name, quantity, size and batch;

c) the type and quantity of defects;

d) the name of the inspector and reinspector;

e) the test date.

Annex B
(normative)

Inflatable inspection of meteorological balloons

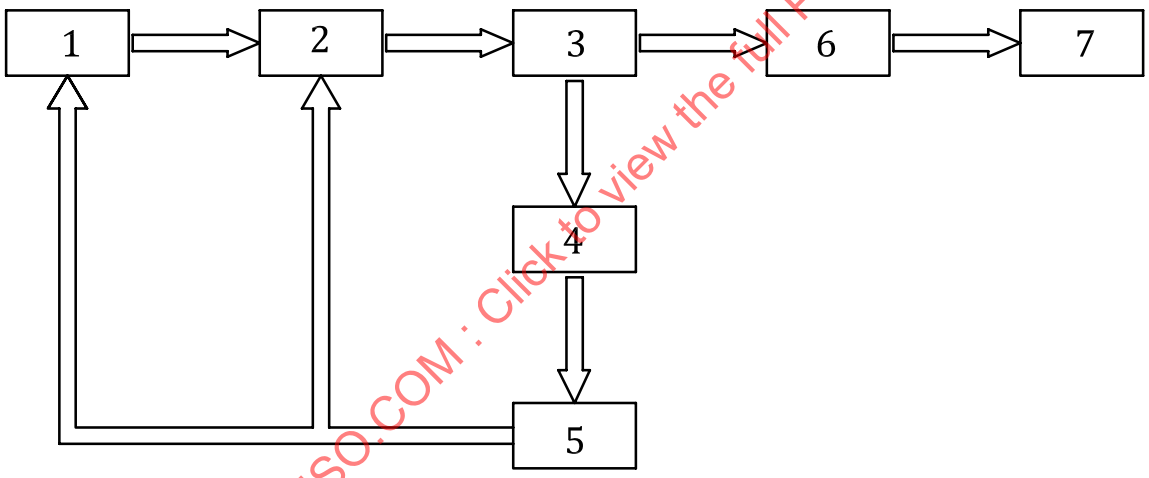
B.1 Principle

Inflate balloons to a certain volume by pressure air, inspect product surface visually and observe the intended volume of balloons in visible light.

B.2 Test equipment

B.2.1 Inflator for meteorological balloons (see schematic diagram in Figure B.1).

B.2.2 Inspection room, should be flat and smooth, and the whole work area should be covered by soft and smooth fabrics to protect the inspected product from being damaged when it touches the ground.



Key

1 gas source
2 electronic control valve
3 transducer of flow quantity
4 cumulative flow control instrument
5 controller
6 nozzle
7 meteorological balloon

Figure B.1 — Schematic diagram of inflator for meteorological balloons

B.3 Test procedure

B.3.1 The inspector shall wear latex gloves before operating.

B.3.2 Insert the nozzle to the balloon neck banded up by latex strips, which help fasten the nozzle when inflated.

B.3.3 The balloon is freely hanged up, and its height should be increased with the enlargement of balloon diameter.

B.3.4 Turn on the inflator (B.2.1), and move the balloon gently at the beginning of inflation to avoid fierce shaking.

B.3.5 Observe the balloon surface, judge and confirm balloon defects, record defect types and quantities. Inspect the whole balloon surface as far as possible in case of missing inspection.

B.3.6 When the balloon diameter reaches the diameter specified in Table B.1 (for type 1 meteorological balloons) and Table B.2 (for type 2 meteorological balloons), stop the inflator and remove the nozzle. Collect sample after the balloon exhausts naturally.

Table B.1 — Diameter of inflatable inspection of the type 1 meteorological balloons

Size g	Diameter mm	Size g	Diameter mm	Size g	Diameter mm
10	≥ 330	300	≥ 2 600	1 000	≥ 5 000
20	≥ 480	350	≥ 2 700	1 200	≥ 5 500
30	≥ 640	400	≥ 2 800	1 600	≥ 6 000
50	≥ 900	500	≥ 3 800	2 000	≥ 6 500
70	≥ 1 000	600	≥ 4 000	3 000	≥ 7 000
100	≥ 1 220	700	≥ 4 400	—	—
200	≥ 1 650	800	≥ 4 700	—	—

Table B.2 — Diameter of inflatable inspection of the type 2 meteorological balloons

Size g	Diameter mm	Size g	Diameter mm
200	≥ 2 100	800	≥ 4 900
300	≥ 2 900	1 000	≥ 5 300
350	≥ 3 200	1 200	≥ 5 800
400	≥ 3 500	1 500	≥ 6 300
500	≥ 3 800	1 600	≥ 6 800
600	≥ 4 200	2 000	≥ 7 300
700	≥ 4 400	3 000	≥ 9 000

B.4 Test result

Describe the type and specify the quantity of defect of samples. During the inspection process, the sample shall be disposed as serious defect if balloon bursts.

B.5 Test report

The test report shall include the following information:

a) the test temperature and the humidity of the inspection room;

b) the name of product, quantity, size and lot;

c) the test result of each sample;

d) the description of any deviations from this document;

e) the name of the inspector, reinspector.

f) the inspection date.

Annex C
(normative)

Mass measurement

C.1 Test equipment

C.1.1 **Balance**, at least accurate to 0,5 g;

C.1.2 **Balance**, at least accurate to 2,0 g;

C.1.3 **Balance** or **platform balance**, at least accurate to 5,0 g.

C.2 Sample

An entire meteorological balloon shall be used for mass measurement.

C.3 Test procedure

C.3.1 Remove the remaining talc from the balloon as much as possible. Ensure that all air has been removed from the balloon.

C.3.2 Put the balloon on the measuring balance and record the result. Based on the size of the balloon, the following balances may be used with corresponding least accurate:

a) 0,5 g for balloon weighing less than 300 g (see C.1.1);

b) 2,0 g for balloon weighing between 300 g and 1 000 g (see C.1.2);

c) 5,0 g for balloon weighing 1 000 g and more than 1 000 g (see C.1.3).

C.4 Test result

Take one measured value for each balloon's mass.

C.5 Test report

The test report shall include the following information:

a) the test temperature and the humidity of the laboratory/workplace;

b) the name of product, quantity, size and lot;

c) the test result;

d) the name of the examiners and/or the reviewers;

e) the test date.

Annex D
(normative)

Dimension measurement

D.1 Test equipment

D.1.1 Scales, one with a least count of 1 mm and one with a least count of 10 mm. The scales shall not have any rough edges and the surface shall be smooth and free of any imperfections that may damage the balloons.

D.1.2 Desk, with a smooth flat surface.

D.1.3 Thickness gauge, with a pressure on the foot of 22 kPa ± 5 kPa. The diameter of the foot shall be 2 mm to 10 mm and the least count no more than 0,002 mm.

D.2 Sample

An entire meteorological balloon shall be used for dimension measurement.

D.3 Procedure

The construction of a meteorological balloon is shown in Figure D.1.

D.3.1 Neck length

Place the balloon on the desk (D.1.2) and using the scale (D.1.1) measure the shortest distance between the end of the neck and the junction of the neck and the body of balloon. See Figure D.1.

D.3.2 Neck diameter

Place the balloon neck on the desk (D.1.2) and using the scale (D.1.1) flatten it to measure the width (W) of the balloon neck at the centre (see Figure D.1). The circumference (C) of the balloon neck is twice the width [see Formula (D.1)]. The diameter of the balloon neck (D) is calculated using Formula (D.2).

$$C = 2\,W \tag{D.1}$$

$$D = C/\pi \tag{D.2}$$

where

W is the width of the neck of the meteorological balloon at centre, in mm;

D is the diameter of meteorological balloon neck, in mm;

C is the circumference of meteorological balloon neck, in mm;

π is the circumference ratio, 3,14.

D.3.3 Body length

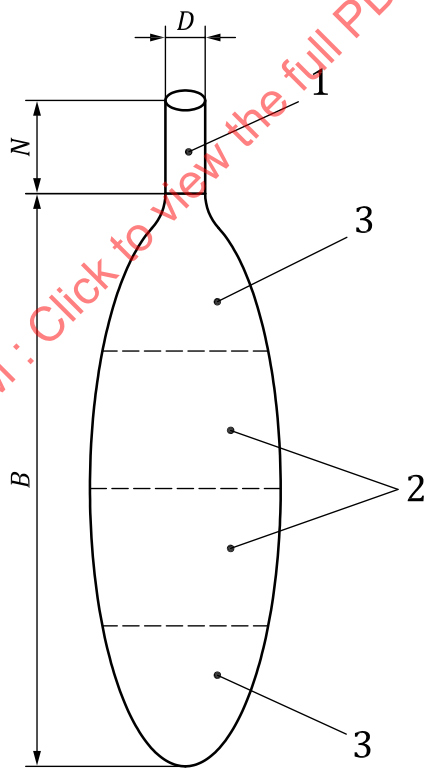
Exclude any air from the inside of the test balloon and lay it down on the desk (D.1.2). Measure the shortest distance between the tip of the balloon body and the junction of the neck and the body of balloon (see Figure D.1). Care should be taken not to apply any force and stretch the balloon while measuring the length. When the body length is no more than 1,0 m use the scale (D.1.1) with a least count of 1,0 mm. When the body length of the balloon is greater than 1,0 m, the scale (D.1.1) with a least count of 10,0 mm may be used.

D.3.4 Body thickness

Measure the double-wall thickness of the two parts in the middle of the balloon with a thickness gauge (D.1.3), along the balloon circumferential direction, measure the circumference of a circle at the same interval points, measuring points shall be not less than nine points. The test result is the average of all measured values, and the body thickness is a half of the test result.

D.3.5 Neck thickness

Neck thickness is the single-wall thickness of neck. Measure the double-wall thickness at two ends and middle part of the neck by a thickness gauge (D.1.3), measuring points at every part shall not be less than three points. The test result is the average of all measured values, and the neck thickness is a half of the test result.



Key

1 meteorological balloon neck
2 middle part of meteorological balloon
3 end of meteorological balloon
B body length
D neck diameter
N neck length

Figure D.1 — Construction of a meteorological balloon

D.4 Test result

Measure the neck length, neck width, body thickness, neck thickness and body length of each balloon, take one measured value of each measurement.

D.5 Test report

The test report shall include the following information:

a) the temperature and the humidity of the laboratory/workplace;

b) the name of product, quantity, size and lot;

c) the test result;

d) the name of the experimenter and the reviewers;

e) the test date.