INTERNATIONAL STANDARD

ISO 17717

First edition
2017-08

Meteorological balloons — Specification

Ballons météorologiques — Spécifications

Reference number
ISO 17717:2017(E)

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Foreword

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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).

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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;