INTERNATIONAL STANDARD

ISO 9475

First edition
1994-12-01

Aircraft inner tube and tubeless tyre valves — Cores and caps — Test methods

Valves pour pneumatiques d'aéronef avec ou sans chambre — Mécanismes et bouchons de valves — Méthodes d'essai

Reference number
ISO 9475:1994(E)

Foreword

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

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

International Standard ISO 9475 was prepared by Technical Committee ISO/TC 31, *Tyres, rims and valves*, Subcommittee SC 9, *Valves for tube and tubeless tyres*.

International Organization for Standardization
Case Postale 56 • CH-1211 Genève 20 • Switzerland

Printed in Switzerland

Aircraft inner tube and tubeless tyre valves — Cores and caps — Test methods

1 Scope

This International Standard specifies the test methods used for valve cores and caps for aircraft tyres, with or without inner tubes, and minimum airtightness standards. It constitutes a detailed method allowing products to be evaluated on the same basis, and results to be compared.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 37:1994, *Rubber, vulcanized or thermoplastic — Determination of tensile stress-strain properties.*

ISO 48:1994, *Rubber, vulcanized or thermoplastic — Determination of hardness (hardness between 10 IRHD and 100 IRHD).*

ISO 815:1991, *Rubber, vulcanized or thermoplastic — Determination of compression set at ambient, elevated or low temperatures.*

ISO 868:1985, *Plastics and ebonite — Determination of indentation hardness by means of a durometer (Shore hardness).*

3 General

For the test methods, the requirements laid down under the test conditions are obligatory. The procedure and certain additional performance requirements shall be fixed by agreement between the valve manufacturer and the client, with an obligation to meet the minimum airtightness requirements defined in this International Standard.

4 Valve cores

4.1 Types of tests

Aircraft tyre valve cores shall be submitted to the following tests:

a) tightening torque test (4.4.1);

b) washout test (4.4.2);

c) blowout test (4.4.3);

d) pressurized pulse test (4.4.4);

e) environmental tests at low temperature (4.4.5);

f) environmental tests at constant high temperature (4.4.6);

g) environmental tests at peak high temperature (4.4.7).

4.2 Minimum airtightness requirements

Valve cores shall be rejected if the leakage rate during tests is greater than 0,2 cm^3/min.

4.3 General test conditions

Unless otherwise specified, all tests shall be conducted under the following conditions:

a) ambient temperature and pressure;

b) valve cores shall be installed in a six-position manifold as shown in figure 1;

c) tightening torques for cores with elastomeric valve seats shall be between 0,17 N·m and 0,34 N·m;

d) tightening torques for cores with metal (or elastomeric plus metal stop) valve seats shall be between 0,34 N·m and 0,54 N·m;

e) the pressure inside the manifold shall be 3 800 kPa;

f) airtightness shall be verified by immersing the core in water, acetone or alcohol.

4.4 Test methods

4.4.1 Tightening torque test

4.4.1.1 Test conditions

a) Carry out the test on six cores installed in a manifold in accordance with figure 1.

b) Tighten the cores to the minimum torque specified in 4.3.

c) The test pressure is 200 kPa to 3 800 kPa.

4.4.1.2 Performance requirement

The core leak-rate shall not be greater than the value set in 4.2 throughout the pressure range. Checks shall be made at least at the minimum and maximum pressures.

4.4.2 Washout test

This test simulates rapid deflation at high pressure.

4.4.2.1 Test conditions

a) Carry out this test on cores which have successfully passed the tightening torque test (4.4.1).

b) Set the manifold pressure to 3 800 kPa.

c) Carry out 10 test cycles, defined as follows, on each valve core:

1) open each core manually and keep it open for at least 3 s to allow the pressurized air to escape at high speed across the valve seal;

2) allow the core to close freely.

4.4.2.2 Performance requirement

The leak-rate, measured after 10 cycles, shall not be greater than the value specified in 4.2.

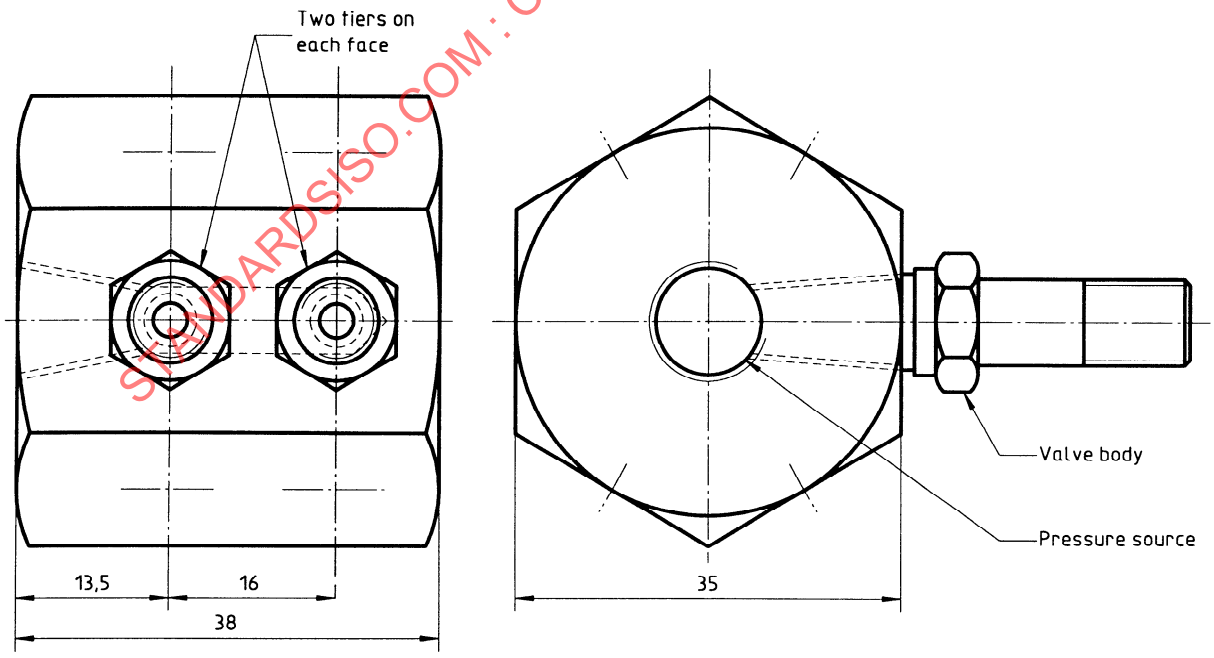

Figure 1 — Manifold

4.4.3 Blowout test

This test simulates rapid inflation at high pressure.

4.4.3.1 Test conditions

a) Carry out this test on the cores that have passed the tightening torque test (4.4.1) and the washout test (4.4.2).

b) Carry out 10 test cycles, defined as follows, on each valve core:

1) reduce the manifold pressure to 0 kPa;

2) attach a standard connector to a 3 800 kPa compressed air system;

3) keep each core open for at least 3 s to allow the pressurized external air to enter the manifold at high speed across the valve seal;

4) after 3 s, remove the inflation connector and let the core close freely.

4.4.3.2 Performance requirement

The leak-rate, measured after 10 cycles, shall not be greater than the value specified in 4.2.

4.4.4 Pressurized pulse test

4.4.4.1 Test conditions

a) Carry out this test on six new cores installed in a manifold in accordance with figure 1.

b) Carry out the pulse tests on the valve cores in accordance with table 1.

4.4.4.2 Performance requirement

Throughout the test, the leak-rate shall not be greater than the value set in 4.2. It shall be noted after every 1 000 cycles.

4.4.5 Environmental test at low temperature

4.4.5.1 Test conditions

a) Carry out this test on six new cores installed in a test manifold in accordance with figure 1.

b) Hold the cores at a temperature of – 54 °C for 24 h.

c) Check the airtightness in acetone or alcohol cooled to – 54 °C with air cooled to – 54 °C at a pressure of 3 800 kPa.

d) After cooling, check the airtightness at each of the following stages, in the order indicated:

1) at 3 800 kPa; if the core leaks, retighten to the maximum torque defined in 4.3;

2) washout test (4.4.2);

3) blowout test (4.4.3);

4) at 200 kPa;

5) at 620 kPa;

6) at 1 380 kPa;

7) at 3 800 kPa.

Perform seven test cycles at each pressure.

4.4.5.2 Performance requirement

Under each test condition, the leak-rate shall not be greater than the value set in 4.2.

Table 1

Operation	Pressure kPa		Cycles per minute	Total cycle in this condition
	min. [1]	max.		
High-pressure cycle	1 380	3 800	35	1 000
Normal cycle	620	1 380	35	1 000
Low-pressure cycle	200	620	5	1 000

1) Never let the pressure fall below the indicated minimum pressures.

4.4.6 Environmental test at constant high temperature

4.4.6.1 Test conditions

a) Carry out this test on the same cores as passed the low-temperature test (4.4.5).

b) Place them in an oven and increase the temperature to + 93 °C. Hold this for 24 h.

c) Cool the samples to + 52 °C and check the airtightness in water at + 52 °C with air at + 52 °C at a pressure of 3 800 kPa.

d) Then follow the test procedure in 4.4.5.1d).

4.4.6.2 Performance requirement

Under each test condition, the leak-rate shall not be greater than the value set in 4.2.

4.4.7 Environmental test at peak temperature

4.4.7.1 Test conditions

a) Carry out this test on the same cores as passed the low-temperature test (4.4.5) and constant high-temperature test (4.4.6).

b) Place them in an oven and increase the temperature to +120 °C. Hold this for 20 min.

c) Cool the samples to + 52 °C and check the airtightness in water at + 52 °C with air at + 52 °C at a pressure of 3 800 kPa.

d) Then follow the test procedure in 4.4.5.1 d), 10 times.

4.4.7.2 Performance requirement

Under each test condition, the leak-rate shall not be greater than the value set in 4.2.

5 Tyre valve caps

5.1 Test types

Aircraft tyre valve caps shall be submitted to the following tests:

a) determination of mechanical properties of seal material (5.3.1);

b) temperature resistance test (5.3.2);

c) ageing test (5.3.3);

d) screwing/unscrewing test (5.3.4).

5.2 Minimum airtightness requirement

No leakage is acceptable during the various airtightness checks. Leaking caps shall be rejected.

5.3 Test methods

5.3.1 Mechanical properties of gasket materials

5.3.1.1 Test conditions

a) Determine the following initial properties of the gasket material as indicated:

— breaking strength, in accordance with ISO 37;

— elongation in accordance with ISO 37;

— hardness in accordance with ISO 48 or ISO 868;

— compression set in accordance with ISO 815.

b) Determine the properties of the seal again after oven-ageing at + 93 °C for 7 days.

5.3.1.2 Performance requirements

Variations in tensile strength, elongation and hardness characteristics determined after oven-heating shall not differ from initial characteristics by more than the maximum variation values given in table 2.

Table 2

Characteristic	Increase max.	Decrease max.
Tensile strength	—	20 %
Elongation	—	30 % or 40 % (to be specified)
Shore A hardness	10 %	—

5.3.2 Temperature resistance test

5.3.2.1 Test conditions

a) Carry out this test on six valve caps.