INTERNATIONAL STANDARD

ISO 10692-2

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Gas cylinders — Gas cylinder valve connections for use in the micro-electronics industry —

Part 2: Specification and type testing for valve to cylinder connections

Bouteilles à gaz — Raccords pour robinets de bouteilles à gaz pour l'industrie de la microélectronique —

Partie 2: Spécifications et essais de type pour les raccords entre le robinet et la bouteille

Reference number
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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 3.

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 part of ISO 10692 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 10692-2 was prepared by Technical Committee ISO/TC 58, *Gas cylinders*, Subcommittee SC 2, *Cylinder fittings*.

ISO 10692 consists of the following parts, under the general title *Gas cylinders — Gas cylinder valve connections for use in the micro-electronics industry*:

— *Part 1: Outlet connections*

— *Part 2: Specification and type testing for valve to cylinder connections*

Annexes A to C of this part of ISO 10692 are for information only.

Introduction

While there are ISO standards for a tapered thread system of connecting gas cylinders and cylinder valves, this technology is not always suitable for cylinders and valves for gases which are used in some microelectronics applications. These applications require that the gas be almost completely free of particles which can be generated by the fitting of a valve to a cylinder. This part of ISO 10692 specifies a prototype test programme for the valve to cylinder connection for these special applications. Whilst passing the required safety tests, existing connecting systems such as tapered threads may not necessarily pass the recommended tests for durability and other operational features. Because of the opportunity for new technical solutions, this is a performance standard rather than a document detailing a dimensioned system.

Gas cylinders — Gas cylinder valve connections for use in the micro-electronics industry —

Part 2: Specification and type testing for valve to cylinder connections

1 Scope

This part of ISO 10692 specifies a test sequence and acceptability criteria for connections between gas cylinders and valves for gases and gas mixtures used under special conditions of service where the highest levels of cleanliness and/or freedom from particles are demanded for e.g. the manufacturing of microelectronic components. It specifies a mandatory type test programme to ensure the safety of the valve to cylinder connection. Additional tests recommended for assessment of durability and other operational features of the connection are given in annex A.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 10692. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 10692 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 10297, *Gas cylinders — Refillable gas cylinder valves — Specification and type testing.*

ISO 11114-1, *Transportable gas cylinders — Compatibility of cylinder and valve materials with gas contents — Part 1: Metallic materials.*

ISO 11114-2, *Transportable gas cylinders — Compatibility of cylinder and valve materials with gas contents — Part 2: Non-metallic materials.*

ISO 11114-3, *Transportable gas cylinders — Compatibility of cylinder and valve materials with gas contents — Part 3: Autogenous ignition test in oxygen atmosphere.*

ISO 11117:1998, *Gas cylinders — Valve protection caps and valve guards for industrial and medical gas cylinders — Design, construction and tests.*

3 General requirements

The valve shall meet the appropriate requirements of ISO 11114-1, ISO 11114-2, ISO 11114-3 and ISO 10297 and shall be marked accordingly. The connection shall be capable of withstanding all situations encountered during normal transport, handling and use without loss of integrity. This includes resistance to impact damage, temperature and pressure variation and vibration. The connection shall also be capable of meeting the user's requirements concerning leak integrity and maintenance of gas purity.

4 Sequence for safety tests

Every type of valve to cylinder connection for use in the microelectronics industry shall be prototype tested according to the sequences given below before being put into service. Any modification on material requires a new type test.

This test shall be performed with a valve mounted on a gas cylinder with a water capacity of approximately 50 l and a maximum operating pressure of 200 bar. If the connection is specifically designed for use with cylinders with a smaller capacity than 50 l, a cylinder of this size shall be used.

The tightness of the connection shall be tested after each step by pressurizing the cylinder with air or nitrogen at 10 bar gas pressure to check for leaks. No visible leaks shall be evident when using leak detection fluid over a period of 1 min. Any other equivalent method enabling detection of leaks of 10^{-3} mbar·l·s^{-1} can be used.

The following 5 steps shall be fulfilled:

a) fill the cylinder with water and tighten connection as specified;

b) effect 200 hydraulic pressure cycles from atmospheric pressure to the cylinder test pressure and back, at ambient temperature: $\Delta p/\Delta t \approx 40$ bar/min;

c) after fitting the protective device (cap or guard) if any, stand the cylinder filled with the same quantity of water as in ISO 11117 on a flat, planar concrete floor covered as in clause 6.7.2 of ISO 11117:1998 and push it over six times with the impact line on the cylinder turned by 60° after each impact. Measure leak rate as above after the sixth test;

d) after refitting the protective device, carry out a drop test as specified in ISO 11117;

e) let the cylinder roll down a 1,5 m long ramp inclined at 30° such that the spinning cylinder comes to a sudden stop by e.g. hitting a wall at the bottom of the ramp. Do this 5 times.

Repeat step e) with the reverse direction of rotation.

5 Test report

A written report shall be prepared summarizing all the tests carried out and the results obtained.

This report shall be signed by the responsible person(s) of the testing organization and shall include drawings, parts lists, material certificates, etc.

The report shall be obtainable from the valve manufacturer on request.

Annex A
(informative)

Test sequence for performance tests

The following tests should be carried out with a valve or a valve body assembled in a suitable adaptor. If a valve is not available, a dummy may be used which shall have approximately the same mass and mass distribution as the valve. If parts are used which have been used in the previous tests, they shall be thoroughly cleaned and dried, and a new seal shall be used. The tightness of the connection shall be measured after each step by means of the procedure for the helium leak test which is given in annex B.

The following 7 steps shall be fulfilled:

a) pressurize the connection with 1 bar, 10 bar and 120 % of the maximum working pressure of the cylinder and make a helium leak test at each pressure level;

b) effect 10 charging/emptying cycles or test from atmospheric pressure to 120 % the maximum working pressure of the cylinder and back, at ambient temperature: $\Delta p/\Delta t \approx 40$ bar/min;

c) effect 10 temperature cycles (from – 50 °C to + 65 °C) under a pressure load equivalent to the maximum working pressure of the cylinder at 15 °C. Measure helium leak rate during the tenth cycle at the temperature extremes and after the tenth cycle at ambient temperature;

d) effect 40 baking cycles with valve temperature (from 25 °C to 100 °C) in a circulating air oven or similar at a pressure $\leqslant$ 1 mbar inside the connection. Measure the inboard helium leak rate after the last cycle with the cylinder still under vacuum conditions. Following this test repressurize the cylinder to 120 % of its working pressure and measure the outboard helium leak rate;

e) after pressurizing the connection to 10 bar, perform the vibration test in accordance with annex C. Measure helium leak rate after the test at 120 % of the maximum operating pressure of the cylinder;

f) break and make the connection 20 times using a new seal each time. Pressurize the connection to the maximum working pressure of the cylinder at 15 °C;

g) replace the test valve or valve body with a new valve or valve body and using a new seal (if the system provides for one) remake the connection. Pressurize the connection to the maximum working pressure and measure the helium leak rate.

Annex B
(informative)

Helium leak test procedure

The helium leak test procedure should be carried out with the connection covered by a hood. The hood should be designed and should be fitted in such a way that only gas leaking from the connection itself is detected, e.g. not gas leaking through the valve. Helium leak rates of 10^{-7} mbar·l·s^{-1} or better are recommended for microelectronics use.

Annex C
(informative)

Vibration test procedure

The vibration test should be performed with the assembly being pressurized to 10 bar. The assembly shall be shaken in the three axes according to the input spectrum given in Figure C.1. The power spectral density should be 15×10^{-3} $g^2 \cdot s$ at 10 s^{-1} and 40 s^{-1}, 15×10^{-5} $g^2 \cdot s$ at 500 s^{-1}, and linear in the double-logarithmic plot between 40 Hz and 500 Hz. The test duration should be one hour per axis.

If it is known that excitation is expected below 10 s^{-1}, the curve should be extended to comply with realistic conditions.

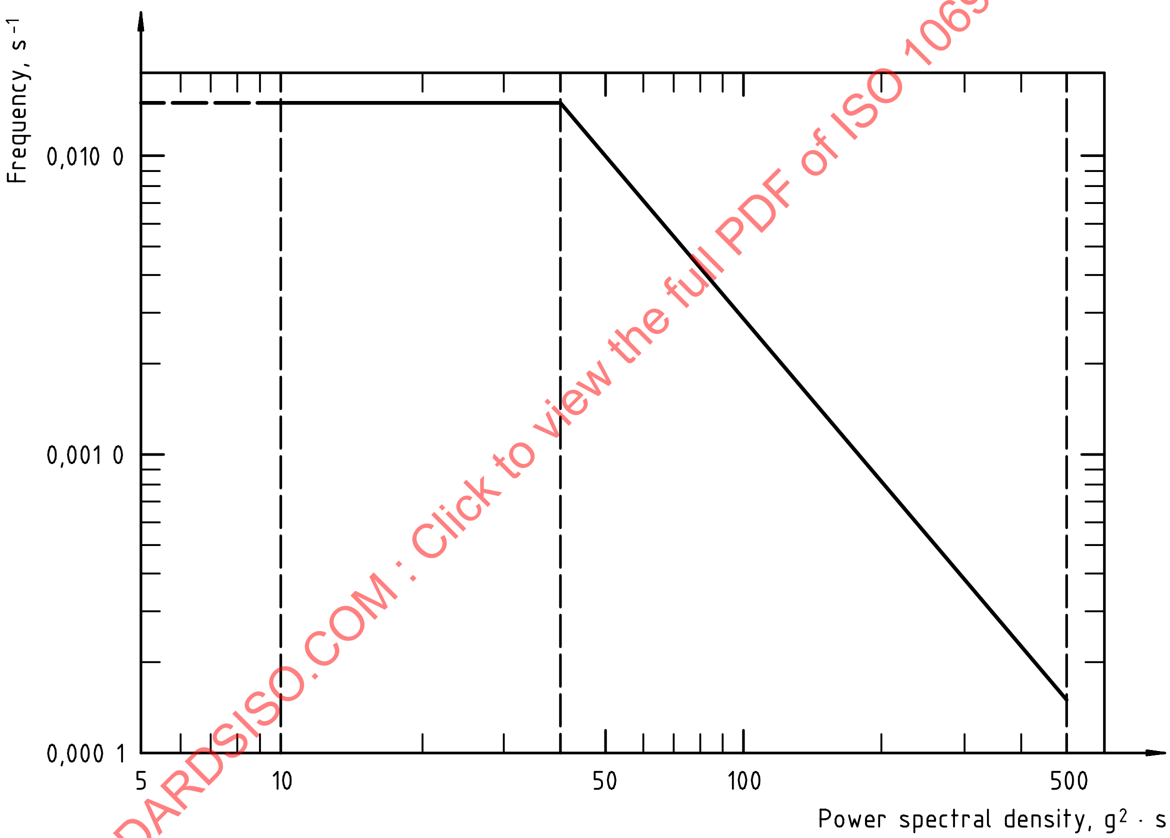

Figure C.1 — Vibration input

