Attachment: 4017 Determination of Internal Pressure Resistance for Glass Containers

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Internal pressure resistance is the ability of glass container to bear hydraulic pressure, expressed as the pressure value. The internal pressure resistance can be affected by glass internal structure, unevenness of the wall thickness, and surface appearance defects of the glass.

This method applies to the determination of internal pressure resistance of glass containers. The determination methods can be divided into constant-pressure method and constant-rate Increase pressure method.

Method I. Constant-pressure method

Instruments: The pressure machine shall comply with several technical requirements: it can ensure that the sample is tested under suspension condition, and the bottle mouth is easily clamped on the test instrument; In order to ensure no leakage of the pressurized medium during the test, elastic material must be in place between the indenter and the sealing surface of the bottle mouth, and there shall be enough pressure on the contact surface to prevent leakage of medium during the pressurization process. The test instrument shall be equipped with a device capable of increasing the hydraulic pressure to a predetermined value at a rate of 0.58 MPa/s ±0.10 MPa/s, maintaining constant pressure during the test and keeping for a predetermined pressurization time; The instrument shall be able to show the pressure at which the test is terminated in any case.

Determination: The sample shall be untested for other properties (such as mechanical, thermal properties, etc.) and shall be placed at room temperature for 30 min. Unless otherwise specified, water with a temperature difference of no more than 5℃ from room temperature shall be used as the test medium to avoid introducing additional pressure before the test. Carry out one of the following test procedures based on the type of test:

Pass test: After the internal pressure of the sample reaches the predetermined value as specified, maintain the constant pressure for 60 s ±2 s, and observe whether the sample is broken; or maintain for different duration, but the instrument should be able to correct the pressure value to obtain the test result equivalent to that for 60 s.

Progressive test: After the pass test, increase the pressure in the increments of 0.1 MPa or 0.2 MPa, until the broken rate of the sample reaches 50% or 100%, respectively.

Method II. Constant-rate Increase pressure method

Instruments: The pressure machine shall comply with several technical requirements: it can ensure that the sample is tested under suspension condition, and the bottle mouth is easily clamped on the test instrument; In order to ensure no leakage of the pressurized medium during the test, elastic material must be in place between the indenter and the sealing surface of the bottle mouth, and there shall be enough pressure on the contact surface to prevent leakage of medium during the pressurization process; The test instrument shall be equipped with a device capable of increasing the hydraulic pressure at a rate of 0.58 MPa/s ±0.10 MPa/s, until the predetermined value is reached or the container is broken, and the repeatability of the pressurization rate shall be ±2%. The test instrument shall be equipped with a device to show the pressure value at which the test is terminated in any case and to show that the test has reached the required specified value; The instrument shall be equipped with a device to show the relationship between constant-rate pressurization and fixed-time pressure holding.

Note: The relationship between constant-rate pressurization and fixed-time pressure holding (for 60s) is as follows:

$$P_R = 1.38P_{60} + K$$

P_R is the actual pressure value, in MPa;

P_{60} is the constant pressure value held for 60 seconds, in MPa.

K=0.1783 (Note: when pressure is measured in bar or psi, the K value corresponds to 1.783 or 25.9, respectively)

Determination: With the same requirements as Method I. Carry out any of the following test procedures based on the type of test:

Pass test: Increase the internal test pressure at a rate of 0.58 MPa/s±0.10 MPa/s to the predetermined pressure value（P_R is the actual pressure value corresponding to P_{60}）and observe whether the sample is broken.

Destructive test: Increase the test pressure at a rate of 0.58 MPa/s±0.10 MPa/s until the container is broken.

Result Representation

Pass test: The pressure used in the test and the number of broken containers.

Progressive test: The pressure under which the first break occurs and the number of broken samples under this pressure. The pressure required to reach a predetermined percentage, which is rounded to the nearest 0.01 MPa; Mean breakdown pressure and standard deviation.

Destructive test: The 60 s pressure at which the first break occurs and the number of broken samples under this pressure. 60 s pressure required to break the predetermined percentage of the sample, expressed to the nearest 0.01 MPa; Mean breakdown pressure and standard deviation.

Result Evaluation

After the internal pressure resistance test is carried out in accordance with the corresponding pressure value as specified, if the number of broken samples is less than the specified number, it is adjudicated as qualified.

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