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NATIONAL STANDARD

OF THE PEOPLE'S REPUBLIC OF CHINA

GB/T 11944-2012

Replacing GB/T 11944-2002

Insulating glass unit

中空玻璃

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Foreword

This Standard is drafted according to the rules specified in GB/T 1.1-2009.

Compared with GB/T 11944-2002, in addition to editorial changes, the main technical changes of this Standard are as follows:

- DELETE the requirements of insulating glass unit specification (See the Version 4 in 2002);
- ADD requirements on dislocation (See 6.1.4);
- Thickness of sealant layer is changed into width of sealant layer, and requirements are modified (See 6.1.5, the Version 5.2.4 in 2002);
- MODIFY the appearance requirements of insulating glass unit (See 6.2, the Version 5.3 in 2002);
- DELETE the sealing performance requirements (See the Version 5.4 in 2002);
- DELETE the durability of climate cycle (See the Version 5.7 in 2002);
- DELETE the requirements on durability of high temperature and humidity (See the Version 5.8 in 2002);
- ADD the requirements on durability of water vapor seal (See 6.5);
- ADD requirements on initial gas content of inflatable insulating glass unit (See 6.6);
- ADD requirements on the gas seal durability of inflatable insulating glass unit (See 6.7);
- ADD requirements on Value 17 (See 6.8);
- MODIFY the test method of dew point (See 7.3, the Version 6.4 in 2002);
- ADD description about failure cause and service life of insulating glass unit (See Annex A);
- ADD methods for testing edge sealing bond performance (See Annex B);
- ADD methods for testing water vapor permeability of edge sealing material (See Annex C);
- ADD methods for testing moisture content in drying agent (See Annex D);
- ADD description about optical phenomenon and visual quality of insulating glass unit (See Annex E);

This Standard adopts the redrafting method and is prepared with reference to EN1279:2002 *Insulating glass unit for Building*. Of which the degree of consistency is not equivalent to this Standard.

This Standard was proposed by China Building Material Council.

This Standard is administered by the National Architectural Glass Standardization Technical Committee (SAC/TC 255).

The organizations responsible for drafting this Standard are: Qinhuangdao Glass Industry Research and Design Institute, National Glass Quality Supervision and Inspection Center, and China Building Material Test & Certification Center.

The organizations participating in drafting this Standard are: Shanghai Yaohua Pilkington Glass Co., Ltd., Dow Corning (China) Investment Co., Ltd., CSG Holding Co., Ltd., Hangzhou Zhijiang Silicone Chemicals Co., Ltd., Xinyi Glass Holdings Co., Ltd., Zhengzhou Zhongyuan Applied Technology Research and Development Co., Ltd., Zhengzhou Fulong New Materials Technology Co., Ltd., Wuxi Saili Molecular Sieve Co., Ltd., Chengdu Guibao Science and Technology Co., Ltd., Guangzhou Baiyun Chemical Industry Co., Ltd., CHAC Technology Co., Ltd., and Dongying Shengming Glass Co., Ltd.

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The previous versions replaced by this Standard are as follows:

- GB 7020-1986;
- GB 11944-1989;
- GB/T 11944-2002.

Insulating glass unit

1 Scope

This Standard specifies the terms, definitions, classification, requirements, test methods, inspection rules. Packaging, marks, transportation and storage of Insulating glass unit.

This Standard applies to the insulating glass unit used for cold storage, decoration and transportation in the field of building and other fields, and can be taken as reference by the insulating glass unit used for other purposes.

2 Normative references

The articles contained in the following documents have become part of this Standard when they are quoted herein. For the dated documents so quoted, all the modifications (Including all corrections) or revisions made thereafter shall be applicable to this Standard.

GB/T 1216 External micrometer

GB/T 8170 Rules of rounding off for numerical values & expression and judgment of limiting values

GB/T 22476 Calculation and determination of steady-state U values (thermal transmittance) of multiple glazing

3 Terms and definitions

The following terms and definitions are applicable to this document.

3.1

Insulating glass unit

2 or more sheets of glass are separated with effective support and are bond-sealed at edges, thus it becomes the glass product with dry gas space in between the glass layers.

Note: quality of various materials for producing insulating glass unit is closely related to the service life of insulating glass unit; therefore, the material required in standard specification shall be used in insulating glass unit production, and generally its service life shall not less than 15 years, see Annex A.

4 Classification

4.1 Classified according to the shape

Flat insulating glass;

Curved surface insulating glass.

4.2 Classified according to the gas inside the hollow cavity

Ordinary insulating glass unit: the insulating glass unit with air in the hollow cavity;

Inflatable insulating glass unit: the insulating glass unit with argon, krypton and other gases in the hollow cavity.

5 Material

5.1 Glass

The sheet glass, coated glass, laminated glass, toughened glass, fire-resistant glass, semi-toughened glass, figured glass and other glasses can be adopted. The glass used shall be in compliance with the corresponding standard requirements.

5.2 Edge sealing materials

The edge sealing materials for insulating glass unit shall comply with the corresponding standard requirement, and shall be able to realize the water vapor and gas seal performance of insulating glass unit and keep the insulating glass unit structure stable. Sealant bond performance and water vapor permeability of edge sealing materials are shown in Annex B and C.

5.3 Spacing materials

Spacing materials can be aluminum spacing strip, stainless steel spacing strip, composite spacing strip, composite gaskets, etc., and shall conform to the requirements of relevant standards and technical documents.

5.4 Desiccant

Desiccant shall be in compliance with the requirements of relevant standards.

6 Requirements

The performance and test methods of insulating glass unit shall comply with the provisions of the corresponding terms in Table 1.

than 15mm. Damage during the test is allowed to occur to 1 sample, and replace the spare sample to retest. First carry out 28 high-low temperature cycle tests according to test method for stage 1 specified under 7.5.2, then carry out constant temperature and humidity test for 4 weeks according to the test method for stage 2. After test, place the sample under the temperature of $23^{\circ}\text{C}\pm 2^{\circ}\text{C}$, relative humidity of 30%-75% for at least 24h, then measure gas content as specified under 7.6.

Insulating glass unit with two cavities shall be respectively measured.

7.8 U value

U value of insulating glass unit shall be calculated or measured according to the method specified in GB/T 22476.

8 Inspection rules

8.1 Inspection classification

8.1.1 Type inspection

Type inspections include all inspection items in the technical requirements.

Type inspection shall be carried out if one of the following circumstances occurs:

- a) There are major changes in structure, material or process and such changes would affect the product performance in process of production;
- b) In normal production, it shall periodically carry out one inspection on a regular basis or after the accumulation of certain amount;
- c) Resumption of production after a long-term shutdown;
- d) There is significant difference between the results of Exit-factory inspection and the preceding type inspection;
- e) When the state administration of quality supervision institutions put forward type inspection.

8.1.2 Exit-factory inspection

Exit-factory inspection includes appearance quality, dimensional deviation, dew point, initial gas content of inflatable insulating glass unit. In the case of adding other test items shall be negotiated between the supplier and demander.

8.2 Batching and sampling

Annex A

(Informative)

Failure cause and service life of insulating glass unit

In the insulating glass unit elements, spacing strip, desiccant, sealant (or composite materials) and the glass form the edge sealing system of insulating glass unit. Quality of the edge sealing system determines the service life of insulating glass unit.

If water vapor visible to the eye can be observed in the cavity of insulating glass unit, it shall be deemed as a failure.

As the water vapor in the environment will continuously permeate from the insulating glass unit edge to the cavity, so the desiccant in edge sealing system will finally lose the water vapor adsorption ability due to continuous adsorption of water molecules, and the failure of insulating glass unit will be resulted due to water vapor content increase in the cavity.

Due to the change of environmental temperature, gas in the cavity of insulating glass unit will always be under the thermal expansion or shrinkage state, making the sealant always under the stress state; simultaneously, the effect of ultraviolet light, water and moisture in the environment can accelerate the aging of sealant, and further accelerate the water vapor permeation into the cavity, and eventually result in failure of insulating glass unit.

Failure of insulating glass unit shall be deemed as the end of its service life.

The edge material (such as spacing strip, desiccant, and sealant) quality and production process will directly impact the service life of insulating glass unit. The installation conditions and service environment will also impact service life of the insulating glass unit.

The expected service life of insulating glass unit is 15 years.

Conduct the tensile test at the speed of (5 ± 0.25) mm/min, record the maximum tensile load and deformation of the sealant, and calculate the maximum stress value. Test environment temperature is $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$.

Record the stress and strain value at the intersection of the stress/strain curve and Line AB in Figure B.1, remove the maximum and minimum values out of the 7 results, and calculate the arithmetic mean value of the rest 5 measured values of stress and strain.

If the stress value at the intersection of the stress/strain curve and Line AB in Figure B.1 is smaller than the maximum stress value, the cohesive force and binding power of the sample are not damaged.

B.2.5 Applications

For replacement of sealant, the edge sealing bond performance shall be conducted, corresponding to each homologous test condition, the variation range of stress values at the intersection of the stress curve of the new sealing materials and it of the original materials is within 20%, or the difference no exceeding 0.02 MPa, and the cohesive force and binding power of the sample are not damaged.

Otherwise, conduct water vapor seal durability and gas seal durability detection of insulating glass unit after replacement of sealant.

furnace, within 60 min±20 min, the class A desiccants are heated to 950°C±20°C and the class B desiccants are heated to 350°C±10°C, which shall be kept for 120 min ± 5 min under corresponding temperature, take them out and put into the dryer to be cooled to room temperature, then weigh the total mass m_r . Initial moisture content of the desiccant is calculated as follows:

$$T_i = \frac{m_i - m_r}{m_r - m_0}$$

Initial moisture content of the desiccant

Calculation results are rounded to four decimal places.

The initial moisture content of desiccant of insulating glass unit is the arithmetic mean value of the 4 sheets of insulating glass unit samples.

D.1.4.2 Determination of final moisture content of the desiccant

Take the desiccants out of the 5 sheets of insulating glass unit samples which have gone through the water vapor seal durability test according to D.1.4.1.1, then respectively measure the mass of crucible m_0 , the mass prior to calcinations m_i and the mass after calcinations m_r according to the method specified in D.1.4.1.2. Final moisture content of the desiccant is calculated as follows:

$$T_f = \frac{m_f - m_r}{m_r - m_0}$$

Final moisture content of the desiccant

Calculation results are rounded to four decimal places.

Calculate the final moisture contents of the 5 sheets of samples respectively.

D.1.4.3 Determination of standard moisture content of desiccant

D.1.4.3.1 Configuration of saturated solution

Add appropriate deionized water into the dryer, and add calcium chloride crystals constantly and stir until undissolved calcium chloride crystals appear. During the whole test process, it must ensure the undissolved calcium chloride crystals exist all the time.

Place the prepared saturated solution into the dryer for 24 h and then use.

D.1.4.3.2 Determination

Take out desiccants of 2 sheets of insulating glass unit according to the method specified in D.1.4.1.1 and put into the constant weighed crucible (mass of m_0), put the crucible into the dryer containing saturated calcium chloride solution at the place 20mm above the solution. Weigh its mass after placing for 4 weeks, and weigh again after placing for another week, if the difference of the masses does not exceed 0.005 g, then the constant mass is reached, the later shall be

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