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**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 10590-2006

Replacing GB/T 10590-1989, GB/T 11159-1989

**Specifications for high and low temperature / low air pressure
testing chambers**

高低温/低气压试验箱技术条件

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Foreword

This standard is one of the series of specifications for environmental testing equipment. The series is made up of GB/T 10586-2006 Specifications for damp heat testing chambers, GB/T 10587-2006 Specifications for salt mist testing chambers, GB/T 10588-2006 Specifications for mould growth testing chambers, GB/T 10589-1989 Specifications for low temperature and damp heat chambers, GB/T 10590-2006 Specifications for high and low temperature / low air pressure testing chambers, GB/T 10591-2006 Specifications for high temperature / low air pressure testing chambers, GB/T 10592-1989 Specifications for high and low temperature testing chambers and GB/T 11158-1989 Specifications for high temperature testing chambers.

From the date it comes into force this standard replaces GB/T 10590-1989 Specifications for low temperature / low air pressure testing chambers and GB/T 11159-1989 Specifications for low air pressure testing chambers.

The main differences from GB/T 10590-1989 and GB/T 11159-1989 are the following: a) a chapter on terms and definitions has been added, taking its content from the relevant part of IEC 60068-3-5; b) following the concept of temperature fluctuation of IEC 60068-3-5, the temperature fluctuation figure has been changed to 1 degree C (see Table 1); c) following the temperature data recording requirement of IEC 60068-3-5, the data are now recorded once every minute (see 6.3); d) the method for testing the rate of temperature change has been revised in line with IEC 60068-3-5 (see 6.6); e) the range of atmospheric pressure in the conditions of use has been widened (see 4.1); f) the working temperature classes of the product have been adjusted slightly, with a low temperature class of minus 30 degrees C added and the high temperature class of 200 degrees C removed (see Table 1); g) the temperature deviation figures are now graded according to the air pressure (see Table 1); h) a requirement on the quality of the cooling water has been added (see 4.3 c)); i) a requirement on electric insulation strength has been added (see 5.3.1); j) the testing of the temperature performance is now carried out with the chamber empty (see 6.3.2); k) a method for evaluating the uncertainty of the measurement of temperature deviation, and information on its application, have been added (see Annex B).

Annex A and Annex B of this standard are informative annexes.

This standard was proposed by the China Machinery Industry Federation and is under the administration of the Instrument and Meter Comprehensive Technical and Economic Research Institute of the machinery industry. It was drafted by Chongqing Wanda Instrument Co., Ltd., Chengdu Tianyu Test Equipment Co., Ltd., the Fifth Electronics Research Institute of the Ministry of Information Industry and Chongqing Yinhe Test Equipment Co., Ltd. The main drafters are Chen Yunsheng, Que Zhengxin, Lai Wenguang and Xu Qinglu.

1 Scope

China's national specification for the combined high and low temperature with low air pressure testing chamber - the altitude chamber, which reproduces together the temperature and the reduced pressure found at height. Combining the two conditions is the whole point of the machine, because they interact and testing for each of them separately misses most of what actually goes wrong: at low pressure there is little air left to carry heat away, so a component that runs cool at sea level overheats even though the surrounding air is colder, the dielectric strength of air falls so that a clearance which insulates on the ground flashes over above it, sealed assemblies burst or leak as the differential rises, and liquids boil at temperatures they would never reach otherwise. Anything meant for aircraft, for high-altitude vehicles or for equipment carried by air has to be proved in a chamber of this

kind before it is allowed near a real aeroplane. The standard belongs to the family of specifications for environmental testing equipment, alongside the damp heat, salt mist, mould growth and high temperature chambers, and it is the document a laboratory quotes when it buys such a chamber and the document an inspector uses when he checks that the chamber does what its plate says. It fixes the classes of temperature and of air pressure the chamber may be built to, the deviations and fluctuations allowed at each of them, the gradient across the working space, the rates at which temperature and pressure may be changed, and the air speed - and it fixes them for the combined condition, which is always the harder one, since with the air thinned out the usual forced convection barely works. To those it adds the requirements on the construction of the chamber, the insulation, the door seals that must not harden in the cold, the refrigeration circuit, the electrical safety of a heated vessel that is also being evacuated, and the noise. Finally it sets out the test methods, from the placing of the measuring points inside the working space to the arithmetic by which each figure is worked out, so that two laboratories measuring the same chamber arrive at the same number. Issued on 3 April 2006 and in force since 1 October 2006, it replaced GB/T 10590-1989 and GB/T 11159-1989.

This standard specifies the terms and definitions, the conditions of use, the technical requirements, the test methods, the inspection rules and the marking, packaging and storage of high and low temperature with low air pressure testing chambers, referred to below as the test chamber.

This standard applies to test chambers used to carry out high and low temperature with low air pressure tests on electrical and electronic products, on other products, on components and on materials.

2 Normative references

The provisions of the following documents become provisions of this standard through being referred to in it. For dated references, later amendments (excluding corrections) or revisions do not apply; however, the parties to an agreement based on this standard are encouraged to examine whether the latest editions of those documents may be used. For undated references, the latest edition applies.

GB/T 191-2000 Packaging - Pictorial marking for handling of goods (eqv ISO 780:1997)

GB/T 14048.1-2000 Low-voltage switchgear and controlgear - General rules (eqv IEC 60947-1:1999)

JB/T 9512-1999 Climatic environmental testing equipment and test chambers - Determination of the sound power level of noise

JJF 1059-1999 Evaluation and expression of uncertainty in measurement

3 Terms and definitions

The following terms and definitions apply to this standard.

- 3.1 test chamber: a closed cabinet or space, some part of which is able to meet the specified test conditions.
- 3.2 temperature setpoint: the desired temperature set by means of the control device of the test chamber.
- 3.3 achieved temperature: after stabilisation, the temperature at any point within the working space of the test chamber.
- 3.4 temperature stabilization: the condition in which the temperature at every point of the working space has reached the temperature setpoint and is held within the given tolerance.
- 3.5 temperature fluctuation: after stabilisation, the difference between the highest and the lowest temperature at any one point of the working space during a given interval of time.
- 3.6 working space: the part of the test chamber within which the specified conditions can be maintained inside the specified tolerances.
- 3.7 temperature gradient: after stabilisation, the greatest value of the difference between the mean temperatures of any two points of the working space during a given interval of time.
- 3.8 temperature rate of change: the rate of transition between two given temperatures, measured at the centre of the working space and expressed in degrees C per minute.
- 3.9 temperature variation in space: after stabilisation, the difference during a given interval of time between the mean temperature at the centre of the working space and the mean temperature at the other points of the working space.
- 3.10 temperature extremes: after stabilisation, the highest and the lowest temperatures reached within the working space.

4.1 Ambient conditions

- a) temperature: 15 degrees C to 35 degrees C; b) relative humidity: not greater than 85 %; c) atmospheric pressure: 80 kPa to 106 kPa; d) no severe vibration and no corrosive gas in the surroundings; e) no direct sunlight and no direct radiation from other sources of heat or cold; f) no strong air currents in the surroundings, and where the surrounding air has to be moved by force, the air stream shall not blow directly onto the body of the chamber; g) no magnetic field in the surroundings capable of disturbing the control circuits of the chamber; h) no high concentration of dust and no corrosive substances in the surroundings.