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NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

GB/T 13166-2018

Replacing GB/T 13166-1991

Design margin and abuse tests for electronic measuring instrument

电子测量仪器设计余量与模拟误用试验

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Foreword

This Standard was drafted as per the rules specified in GB/T 1.1-2009. This Standard replaced GB/T 13166-1991 Design Margin and Abuse Tests for Electronic Measuring Instruments. Compared with GB/T 13166-1991, this Standard has the major technical changes as follows besides the editorial modifications.

--- Delete Test Objective (see Clause 2 of Edition 1991);

--- Add Normative References (see Clause 2 of this Edition);

--- Delete Test Requirements (see Clause 3 of Edition 1991);

--- Add Terms and Definitions (see Clause 3 of this Edition);

--- Delete Program (see Clause 4 of Edition 1991);

--- Increase the three-level indicator of the instrument (see

4.1.1 of this Edition);

--- Increase the design margin contents of the instrument (see

4.1.2 of this Edition);

--- Increase the parameter and indicator determination of the instrument (see

4.1.3 of this Edition);

--- Increase the margin design solution of the instrument (see

4.2 of this Edition);

1 Scope

GB/T 13166-2018 is the Chinese national standard on design margin and abuse tests for

electronic measuring instrument, in the field of metrology and measurement. The /T suffix marks it as a recommended standard: it is not compulsory by itself, but it becomes binding as soon as a contract, a tender or a customer specification calls it up - which in practice is how most foreign buyers meet it. It was issued on 7 June 2018 by the State Administration for Market Regulation; Standardization Administration of China, and has been in force since 1 January 2019. Classification: ICS 17.220, CCS L85. This page is published from the official record of the standard held by the Chinese standards administration: the identification, the dates, the classification and the issuing body are taken from there. The clause text, the tables and the numeric limits are in the document itself, which is delivered complete in English translation.

This Standard specifies the design margin and abuse test that shall be carried out during the design of new electronic measuring instruments (hereinafter referred to as instrument). This Standard is applicable to the electronic measuring instruments in all environmental groups.

2 Normative References

The following documents are essential to the application of this document. For the dated documents, only the versions with the dates indicated are applicable to this document; for the undated documents, only the latest version (including all the amendments) are applicable to this document.

GB 4824 Industrial, Scientific and Medical (ISM) Radio-Frequency Equipment - Electromagnetic Disturbance Characteristics - Limits and Methods of Measurement

GB/T 6587 General Specification for Electronic Measuring Instruments

GB/T 17626.2 Electromagnetic Compatibility - Testing and Measurement Techniques -Electrostatic Discharge Immunity Test

GB/T 17626.3 Electromagnetic Compatibility - Testing and Measurement Techniques - Radiated, Radio-Frequency, Electromagnetic Field Immunity Test

GB/T 17626.4 Electromagnetic Compatibility - Testing and Measurement Techniques -Electrical Fast Transient/Burst Immunity Test

GB/T 17626.6 Electromagnetic Compatibility - Testing and Measurement Techniques - Immunity to Conducted Disturbances Induced by Radio-Frequency Fields

4.2.1 Component derating design Reduce the temperature stress and electrical stress that the component is subjected to in the circuit. The optimal derating shall be at or below the area near the inflection point of the reliability curve corresponding to the electrical stress and temperature stress; determine the derating level according to the different applications of the product. The derating shall not only consider the steady state, but also the transient overload and dynamic electrical stress that may occur in the circuit.

4.2.2 Derating design for mechanical and structural components Find the best match between stress and strength; obtain the expected design values; so that the instrument can obtain best effects in the terms of weight, cost and material availability when the instrument meets stress and strength requirements.

4.2.3 Environmental adaptability design The environmental adaptability design shall meet the requirements of internal control indicators from the developer, at least including high/low temperature design, vibration/impact design, electromagnetic compatibility design.

4.2.4 Software engineering design The developer shall carry out the software engineering design.

4.2.5 Redundant design The redundancy shall be designed in the following cases.

a) When required by the user;

b) When the user does not require; but the reliability of the product is still not met by other applied technologies (such as derating, simplifying the circuit, and applying more reliable components, etc.).

4.3 Design verification

4.3.1 General It is used for the early failure due to the defects of components, processes and design or other causes; the instrument shall be tested repeatedly according to the margin design requirements; so that obtain the working limit of the product, and discover the potential weak links and components in the design phase. See Appendix A for Examples of Design Margin Tests.

4.3.2 High/Low temperature test the requirements of internal control indicators; while the electrostatic discharge immunity test shall, according to the provisions of

GB/T 17626.2, improve one test level for each test till meets the requirements of internal control indicators.

5 Abuse

5.1 Identification and analysis of abuse The abuse shall be predicted; identify and analyze the instrument performance degradation, instrument damage or personal injury due to the human error. The analytical procedures are as follows:

a) Record and analyze system failure; handle one failure at a time;

b) List and analyze the human operation relevant to each failure;

c) Classify and estimate the corresponding error probability.

5.2 Abuse type The abuse type that may occur during the installation, use and handling of the instrument; including missing necessary operating procedures, increasing the

redundant operating procedures, and reversing the operating sequence, etc. The following are typical examples; but not limited to the following examples; thereof,

f) abuse type that may result from improper installation;

o) abuse type that may occur due to improper use;

s) abuse type that may be caused by improper handling and storage.

a) Work in a narrow space such as cabinet; there is no proper exhaust ventilation;

b) The input signal is inconsistent with the signal specified by the signal terminal;

c) The power supply is poorly grounded or the wiring is incorrect;

d) Access to the wrong power supply;

e) Fail to take the anti-static measures;

f) Wrong connection of cable or adapter;