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NATIONAL STANDARD
OF THE PEOPLE'S REPUBLIC OF CHINA

GB/T 3797-2005

Replacing GB/T 3797-1989

Electrical Control Assemblies

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Foreword

This standard is a revision to GB/T 3797-1989 *"Electric-driving Controlgear - Part 2: Electric-driving Controlgear Incorporating Electronic Devices"*.

Compared with GB/T 3797-1989, the main changes in this standard are as follows:

- due to the abolishment of GB 4720-1984 *"Electric-driving Controlgear - Part 1: Electric-driving Controlgear Composed of Low-voltage Apparatus"*, the standard name was change by deleting "Electric-driving Controlgear - Part 2" in the name.
- the items and details of environment test were modified, with humid heat test added and transport test deleted.
- the no-load test, low-voltage current test and load test in the type test were incorporated into energized operation test.
- the interference resistance test was modified. Refer to GB 7251.1-2005 *"Low-voltage Switchgear and Controlgear Assemblies - Part 1: Type-tested and Partially Type-tested Assemblies"* and IEC 61800-3 *"Adjustable Speed Electrical Power Drive Systems - Part 3 EMC Requirements and Specific Test Methods"* for details.
- due to different product features, electrical performance test was changed into an optional item of which the specific requirements are provided in product technical documents.

Appendix A in this standard is normative.

Appendix B in this standard is informative.

From the implementation date, this standard replaces GB/T 3797-1989 *"Electric-driving Controlgear - Part 2: Electric-driving Controlgear Incorporating Electronic Devices"*.

This standard was proposed by China Electrical Equipment Industrial Association.

This standard is under the jurisdiction of the National Technical Committee on Low-voltage Switchgear and Controlgear Assemblies of Standardization Administration of China.

Chief drafting organizations of this standard: Tianjin Design and Research Institute of Electric Drive, China National Center for Quality Supervision and Test of Electrical Control and Distribution Equipment, Tianshui Electric Drive Research Institute, Chengdu Jialing Electric Manufacture Co., Ltd., Suzhou Intelligent Power Distribution Automation Co., Ltd., and Zhejiang Jianhuan Electric Machine Co., Ltd.

Chief drafting staffs of this standard: Yu Xiuwen, Ou Huian, Zou Yi, Liu Shumin, Ma Jiquan, Yu Zhibin, Wu Jialin, Fu Hangning, Li Tingting, and Niu Yongzhe.

The previous editions replaced by this standard are as follows:

GB 3797-1983 and GB/T 3797-1989.

Electrical Control Assemblies

1 Scope

This standard specifies the terms and definitions, usage conditions of electrical control assemblies, and the basic requirements of their design, manufacture and test.

This standard is applicable to electrical control assemblies with frequency less than or equal to 1000Hz and rated voltage less than or equal to 1000(1140)V (AC) and 1500V (DC) (hereinafter referred to as control assemblies or assemblies).

2 Normative References

The following normative documents contain provisions which, through reference in this text, constitute provisions of this standard. For dated references, subsequent amendments (excluding corrigendum) or revisions of these publications do not apply. However, all parties who reach an agreement according to this standard are encouraged to study whether the latest editions of these documents are applicable. For undated references, the latest edition of the normative documents referred to applies.

GB 156 Standard Voltage (neq IEC 60038)

GB/T 762 Standard Current (eqv IEC 60059)

GB/T 2681 Colours of Insulated Conductors Used in Electrical Assembly Devices

GB/T 2682 Colours of Indicator Lights and Push-buttons Used in Electrical Assembly Devices

GB/T 3047.1 Series of Basic Dimensions of Panels, Rack and Cabinets for Vertical Increment of 20mm

GB/T 3859.1 Semiconductor Convertors - Specification of Basic Requirements (eqv IEC 601 46)

GB/T 4205 Standard Directions of Movement for Actuators Which Control the Operation of Electrical Apparatus (eqv IEC: 60447)

GB 4208 Degrees of Protection Provided by Enclosure (IP Code) (eqv IEC 60529)

GB/T 4588.1 Sectional Specification: Single and Double Sided Printed circuit boards with Plain Holes

GB/T 4588.2 Sectional Specification: Single and Double Sided Printed circuit boards With Plated-through Holes

GB 7251.1-2005 Low-voltage Switchgear and Controlgear Assemblies - Part 1: Type-tested and Partially Type-tested Assemblies (idt IEC 60439-1: 1999)

GB/T 10233 Basic Test Method for Electric-drive Controlgear Assemblies

JB/T 3085 Code for Package and Transport of Electric-drive Controlgear

IEC 61800-3:1996 Adjustable Speed Electrical Power Drive Systems - Part 3: EMC

Product Standard including Specific Test Methods

3 Terms and Definitions

For the purpose of this standard, the following terms and definitions as well as those defined in GB 7251.1-2005 apply.

3.1

Electrical control assemblies

The control assemblies equipped with information technology electronic devices and (or) non-electronic devices.

3.2

Control unit

Universal assembling unit of electrical control assemblies, which mainly consists of printed-circuit board with electronic devices, with panel and connector assembly (or enclosure and terminal), capable of unifying signal level and with the specified power functions.

3.3

Electromagnetic compatibility (EMC)

Capability of guaranteeing that the assemblies or systems operate normally in electromagnetic environment and that the electromagnetic disturbance is acceptable for everything in such environment.

3.4

Low frequency interference

Disturbance related to the conduction of low-frequency disturbance in the same low-voltage supply network (from DC to 20kHz).

3.5

High frequency interference

Disturbance over hundreds of MHz, with the radiation disturbance up to 1000MHz.

4 Technical Requirements

4.1 Basic parameters

The rated voltage of assemblies shall be in accordance with the requirements of GB 156.

The rated current of assemblies shall be in accordance with the requirements of GB/T 762.

In practice, the above parameters shall be subject to those specified in product technical documents.

4.2 Normal usage conditions

The control assemblies in compliance with this standard shall be installed indoor and shall be able to operate normally under the following conditions.

5.2.1 General inspection

The following inspection items shall be carried out for assemblies:

- a) Whether the assemblies comply with the manufacturing drawings and appropriate standards and whether the components and devices are firmly and correctly installed;
- b) Whether the dimension, appearance and welding of assemblies meet relevant requirements;
- c) Whether the surface of cabinet (console) body and panel are flat and smooth with uniform paint layer;
- d) Whether the door opening angle of assemblies is greater than or equal to 90° and can open and close flexibly;
- e) Whether all moving components as mechanical operating components, interlock and lock catch operate flexibly and correctly;
- f) Whether the specification, dimension, color mark, phase sequence and arrangement of busbar and wire meet relevant requirements;
- g) Whether the inserters and drawers are well installed;
- h) Whether the protective functions of assemblies meet relevant requirements;
- i) Whether the markings and accompanied technical documents and information of assemblies are complete.

5.2.2 Electric clearance and creepage distance inspection

The minimum electric clearance and creepage distance between non-equipotential bare conductors of assemblies as well as between their energized bare conductors and exposed conductive components shall meet the requirements of Section 4.7 in this standard.

Visual inspection can be carried out during ex-factory test to guarantee the specified electric clearance and creepage distance.

5.2.3 Enclosure protection grade test

According to GB 4208, the enclosure protection grade of assemblies shall meet the requirements of Article 4.12.1.2 in this standard.

Visual inspection can be carried out during ex-factory test to guarantee the specified protection grade.

5.2.4 Insulation resistance test

During measurement, the voltage grade of tramegger in use shall be determined according to the rated operating voltage of assemblies. At least 500V insulation measuring instruments shall be used for insulation measurement.

The insulation resistance between circuits and exposed conductive components shall be 1000Ω/V at least by nominal voltage.

During test, the components (such as semiconductor component and capacitor) which can't withstand the specified tramegger shall be subject to short circuit. The water cooling assemblies shall be measured when there is no water.

5.2.5 Dielectric property test

9	0.5
10	0.5
>10	0.0

Note: when the change range of $L_{p1} \sim K_{Li}$ is less than or equal to 5.0dB, the arithmetic average may replace the energy average. Its calculation error is not greater than 0.7dB.

5.2.15 Drop test

One end of the package is supported and lifted up 100mm~150mm. Lift up the other end to freely drop it onto smooth ground or steel plate. According to the assemblies' characteristic as well as storage and transportation conditions, different dropping height can be selected (usually greater than or equal to 300mm). Each end shall drop twice. And the assemblies shall be free from visible damage and deformation.

The test methods for electrical control assemblies shall refer to GB/T 10233.

6 Nameplate, Marking, Packing and Transport

6.1 Nameplate and marking

The nameplate and marking of assemblies shall meet the requirements of Sections 5.1 and 5.2 of GB 7251.1-2005.

6.2 Packing and transport

The packing and transport of assemblies shall meet the requirements of JB/T 3085.

within the specified permissible deviation within 5min after the tested object is put inside or within 10% of the storage duration (whichever is smaller).

After high/low temperature cycle test, appearance inspection and electrical performance test shall be carried out as soon as the tested object restores to the ambient temperature in the lab. And it shall meet the specified requirements.

A.2 High-temperature storage test

The tested object is placed into high temperature cabinet with temperature T_{H1} , stored for the specified time t_4 before taking out, then placed at the lab room-temperature to restore. T_{H1} and t_4 shall be specified in relevant product technical documents. If there is no special requirement, they shall be selected from the following parameters:

$$T_{H1} = +60^{\circ}\text{C}, +70^{\circ}\text{C} \text{ or } 85^{\circ}\text{C};$$

$$t_4 = 72\text{h}.$$

After high-temperature storage test, the electrical and mechanical performance of the tested object shall be measured as soon as the tested object restores to the lab room-temperature. And it shall meet the specified requirements.

Appendix B

(Informative)

Temperature Rise Measurement by Resistance Method

For coil, the temperature rise is usually measured by resistance method.

During temperature rise test, the location of assemblies shall meet the specified ventilation and heat dissipation conditions. The coil resistance (R_1 , T_1) shall be measured at stable ambient temperature. And the circuits or components to be inspected shall be energized by rated current.

The test shall be carried out for sufficient time so that the temperature at different positions of the assemblies reaches the stable value of thermal balance. If the temperature change is less than 1°C/h, it is deemed that the temperature rise has become stable. The resistance (R_2 , T_2) shall be measured immediately after power-off. High-precision bridge or DC measuring circuit shall be adopted to measure the resistance.

The coil temperature rise shall be calculated according to the following formula:

$$\text{Coil temperature rise value } K = \frac{R_2 - R_1}{R_1} (234.5 + T_1) - (T_2 - T_1) \quad (\text{for copper coil})$$

Where,

R_1 - the cold resistance of coil at T_1 , Ω ;

R_2 - the hot resistance of coil at T_2 , Ω ;

T_1 - the ambient air temperature when the cold resistance is measured, °C;

T_2 - the ambient air temperature when the hot resistance is measured, °C.

_____ END _____

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