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Safety of machinery - Specification for two-hand control devices

机械安全 双手操纵装置技术条件

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Safety of machinery - Specification for two-hand control devices

1 Scope

This document specifies technical requirements, testing and usage information for two-hand control devices.

This document applies to two-hand control devices for safety functions by pressing two buttons simultaneously.

This document does not apply to pneumatic or hydraulic valve type two-hand control devices.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

GB/T 2423.7, *Environmental testing - Part 2: Test methods - Test Ec: Rough handling shocks, primarily for equipment-type specimens*

GB/T 2423.22, *Environmental testing - Part 2: Tests methods - Test N: Change of temperature*

GB/T 4208-2017, *Degrees of protection provided by enclosure (IP code)*

GB/T 14048.1-2012, *Low-voltage switchgear and control gear - Part 1: General rules*

GB/T 14048.5-2017, *Low-voltage switchgear and control gear - Part 5-1: Control circuit devices and switching component - Electromechanical control circuit devices*

GB/T 15706-2012, *Safety of machinery - General principles for design - Risk assessment and risk reduction*

GB/T 19671-2005, *Safety of machinery - Two-hand control device - Functional aspects and design principles*

the reach of the hand.

The two-hand control device shall be equipped with a corresponding safety control system to achieve the predetermined simultaneous control or synchronous control function, see GB/T 19671-2005.

4.2 Safety requirements

4.2.1 Structural requirements

The height of the two-hand control device with brackets from the ground or standing surface shall not be less than 1100mm.

The inner edge distance between the two buttons of the two-hand control device shall be 550mm~600mm. If measures such as different-direction operation, cover plate, shape, are used (see Annex A in GB/T 19671-2005) to prevent the two-hand control device from being abandoned, the inner edge distance between the two buttons shall not be less than 260mm.

The buttons of the two-hand control device shall be self-resetting buttons.

The contact unit of the push button shall include at least one normally open contact.

Each button conforming to Type IIIA in GB/T 19671-2005 shall adopt a normally open contact switch.

For two operating buttons conforming to Type IIIC in GB/T 19671-2005, each button shall contain a normally closed contact switch and a normally open contact switch. The normally closed contact switch shall adopt a direct disconnect structure.

4.2.2 Mean cycles to dangerous failure (B_{10D})

The B_{10D} value of the two-hand control device shall not be less than 100,000 times.

4.2.3 Prevention of deprecations and accidental operations

The possibility of deprecation and accidental operation shall be minimized by adopting countermeasures, covers, shapes and so on.

NOTE: Annex A of GB/T 19671-2005 gives examples of relevant measures.

4.3 Environmental adaptability

The selection, assembly, connection and protection of parts, devices and components of a two-hand control device shall be such that they can operate correctly under the expected operating conditions and environmental influences.

The two-hand control device shall function properly under the following conditions:

- Temperature: -10℃~55℃;
- When the maximum temperature is 40°C, the relative humidity of the air does not exceed 50%. Higher relative humidity can be allowed at lower temperatures, such as 90% at 20°C. Special measures shall be taken for occasional condensation due to temperature changes.

4.4 Mechanical behavior

During the intended use, the two-hand control device shall have sufficient resistance to vibration, shock and drop. Prevents loss of safety function due to vibration, shock and drop.

4.5 Electrical properties

4.5.1 Withstand voltage

After the two-hand control device is subjected to the withstand voltage test according to 8.3.3.4 in GB/T 14048.1-2012, there shall be no breakdown and no arcing.

4.5.2 Clearance and creepage distance

Pollution level is 3.

The minimum value of clearance and creepage distance shall meet the requirements given in Table 13 and Table 15 in GB/T 14048.1-2012.

4.5.3 Enclosure protection level

The enclosure protection level of the two-hand control device shall be at least IP65.

5 Tests

5.1 Safety requirements test

5.1.1 Structural requirements test

Check the structural schematic. The structure shall meet the requirements of 4.2.1.

Measure according to Annex A in GB/T 19671-2005. The measurement results shall meet the requirements of 4.2.1.

5.1.2 Mean cycles to dangerous failure (B_{10D})

- Maximum acceleration: 50m/s^2;

- Crossover frequency: 58Hz~62Hz.

During the test, closed contacts shall not open. Open contacts (if applicable) shall not close. The latch mechanism shall not lock.

The detection device shall be able to detect the opening or closing of any contact greater than 0.2ms.

5.3.2 Impact test

The two-hand control device shall be tested in the resting position. Bear 15g of impact in both directions of the corresponding axis. The duration is 11ms.

During the test, closed contacts shall not open. Open contacts (if applicable) shall not close. The latch mechanism shall not lock.

The detection device shall be able to detect the opening or closing of any contact greater than 0.2ms.

5.3.3 Drop test

After the two-hand control device is subjected to a drop test with a height of 1m according to GB/T 2423.7, the function shall meet the requirements of 4.4.

5.4 Electrical performance tests

5.4.1 Withstand voltage test

The withstand voltage test is carried out according to 8.3.3.4 in GB/T 14048.1-2012. The voltage value (effective value of alternating current) of the power frequency withstand voltage test is 1890V, and the time is 1s.

Withstand voltage test conditions between the same-pole terminals of the two-hand control device: AC2500V, 50/60Hz, 1min.

Withstand voltage test conditions between each terminal and the ground: AC2500V, 50/60Hz, 1min.

The test shall be free of breakdown and arcing.

5.4.2 Clearance and creepage distance

The test of clearance and creepage distance shall be carried out in accordance with the provisions of Annex G of GB/T 14048.1-2012. The test results shall meet the requirements of 4.5.2.

5.4.3 Enclosure protection level

The enclosure protection level test shall be carried out in accordance with the provisions of 13.4 and 14.2.5 of GB/T 4208-2017. After the test, there shall be no obvious dust deposition in the shell. Waterproof shall meet the requirements of 14.3 of GB/T 4208-2017.

6 Usage information

6.1 General requirements

The information provided to the user and its presentation shall meet the requirements of 6.4 in GB/T 15706-2012.

6.2 Shell identification

The two-hand control device shall be permanently and clearly marked.

On the enclosure (or outer packaging) of the two-hand control device, at least the following information shall be given by means of marking:

- Manufacturer's name or trademark;
- Product name;
- Model;
- Date of manufacture;
- IP protection level;
- Electrical parameters;
- Implement standard number.

6.3 User's manual

The user's manual shall include at least the following:

a) Manufacturer's name and full address;

b) Product name and model;

c) Dimensions;

d) Schematic diagram of the structure principle;

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