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Safety devices against over loading for lifting appliances

起重机械超载保护装置

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Safety devices against over loading for lifting appliances

1 Scope

This standard specifies the terms and definitions, technical requirements, test methods, inspection rules, markings, packaging, transportation and storage of overload protection devices for lifting appliances.

This standard applies to overload protection devices (hereinafter referred to as "devices") used by electric hoists, bridge cranes, gantry cranes, mobile cranes, tower cranes and jib cranes. The overload protection devices used by other types of lifting appliances may refer to it.

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 standard.

GB/T 2423.4-2008 Environmental testing for electric and electronic products - Part 2: Test method - Test Db: Damp heat, cyclic (12h + 12h cycle)

GB/T 3811-2008 Design rules for cranes

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

GB/T 8923.1-2011 Preparation of steel substrates before application of paints and related products - Visual assessment of surface cleanliness - Part 1: Rust grades and preparation grades of uncoated steel surface and steel surface after comprehensive removal of the original coating

GB/T 13306 Plates

GB/T 13384 General specifications for packing of mechanical and electrical product

GB/T 14048.1-2012 Low-voltage switchgear and control equipment - Part 1: General

GB/T 17626.5 Electromagnetic compatibility - Testing and measurement techniques - Surge immunity test

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3.6

Configuration

For mobile cranes, tower cranes and jib cranes, etc., the combination and arrangement of structural parts, counterweights, supports or outriggers, hook pulley block winding systems, as well as the combinations, positioning and installation of similar members as carried out according to the manufacturer's instructions and operation preparations.

3.7

Dangerous directions

When the lifting appliance is overloaded, the direction which makes the load or torque increase and other directions that aggravate dangerous actions.

3.8

Safety directions

When the lifting appliances is overloaded, the direction which makes the load or torque decrease and other directions that reduce dangerous actions.

4 Technical requirements

4.1 Environmental conditions

The device shall work normally under the following environmental conditions:

a) Temperature: -20 °C ~ 60 °C;

b) Relative humidity: 90% at 20 °C;

c) Altitude: Not more than 2000 m.

Note: When the above environmental conditions are exceeded, the user and the manufacturer shall negotiate and resolve it.

4.2 Basic requirements

4.2.1 Component identification

The exposed operable elements (switches, knobs, etc.) of the device shall have clear and permanent external markings. The identification shall be clear. The text identification shall have at least simplified Chinese.

4.2.2 Material and structure

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4.3.2.3 If the power supply is interrupted, the limiter shall retain its settings.

4.3.2.4 The limiter shall have the function of recording dangerous conditions such as working hours, working cycles and overloading actions of the lifting appliances.

4.3.2.5 The limiter with recording function shall have a communication output interface. When a digital communication interface is used, the communication protocol shall conform to the open protocol stipulated by the current national standards, to facilitate users to obtain basic data such as weight/torque.

4.4 Indicator

4.4.1 Rated lifting capacity indicator

4.4.1.1 The rated lifting weight indicator shall have the following functions:

a) When the load reaches 90% ~ 95% of the rated lifting weight, a visual and/or audible warning signal shall be issued;

b) When the load reaches the alarm action value, a visual and/or audible alarm signal shall be issued.

4.4.1.2 The visual and/or audible signals shall be clear and continuous. Once the signal is triggered, it shall be maintained continuously during a working cycle of the lifting appliances, until the overload is removed. Audio warning and alarm signals shall be different, meanwhile there is a clear difference from the environmental noise of lifting appliances. It shall be not less than 75 dB(A) at a position 1 m from the sound-issuing part as well as the position of the operator. The light early-warning signal shall be yellow; the light warning signal shall be red, which shall be clearly visible in the driver's field of vision.

4.4.1.3 The crane operator shall not be able to cancel the warning from the control station, unless the audible and visual warnings are used at the same time under the same condition, in which case the audible warning can be cancelled by operating the manual cancellation device 5 s after its action. If this kind of cancellation device is used, it shall act automatically when the lifting appliances needs to resume the audible warning.

The audible warning can be cancelled during the calibration and test of the lifting appliance.

4.4.2 Numerical information indicator

4.4.2.1 Indicators that provide numerical information shall meet the following basic requirements:

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5.1.1 Visually inspect the device samples:

a) The structure is firm; whether the assembly parts are loose;

b) Whether the shell has cracks, blisters, scratches and other defects;

c) Whether the assembly positions of sensors, connectors and other components conform to the instruction manual;

d) Whether there are waterproof measures for each connection part and cable hole;

e) Check the quality certificates of the materials used in the main components and check whether they meet the requirements of the design calculations;

f) Whether the exposed operable elements are marked;

g) Whether to install a power supply switch;

h) If the function release switch and audio signal cancellation device are set, check whether they meet the requirements.

5.1.2 Check whether the device samples meet the following requirements:

a) For the parts of the device installed in the lifting appliance's load-bearing system, check the corresponding material quality certificates, design drawings and design calculations, to confirm that their strength shall not be less than the strength of the load-bearing parts in the system.

b) Have the analysis, calculation and processing functions of the dynamic load status of the equipped crane. When necessary, use a signal generator to simulate the dynamic load state, to input the dynamic load signal to the limiter sample.

5.1.3 For the limiter with a force sensor as a force measuring element, connect the sample parts according to the wiring diagram, to form a complete system; check whether it has a self-check function when starting up.

5.1.4 For indicators that provide numerical information, check whether the setting position of the sample indicator is correct and whether the information is clear and correct.

5.1.5 For an indicator which uses a force sensor as a force measuring element equipped with a lifting appliance configuration selection device, visually check whether the configuration selection device meets the configuration requirements. If the selection device is configured, check whether the direct description or code configured on the device is consistent with the use.

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product angle, length sensor or position transition switch to give test points of corresponding amplitude. If it is difficult to achieve in the laboratory, it can also be replaced by analog signals.

5.2.2 Vibration test

During the vibration test, the device is in a non-energized state. The test is carried out according to the parameter conditions specified in Table 1. After the test, check whether the action error meets the requirements according to 5.2.1.

5.2.3 Impact test

During the impact test, the device is in a non-energized state. The test is carried out according to the parameter conditions as specified in Table 2. After the test, check whether the action error meets the requirements according to 5.2.1.

5.2.4 High temperature test

Put the device into the high temperature test box. After the temperature in the box reaches 60 °C, it lasts for 16 h. After taking it out, check whether the action error meets the requirements according to 5.2.1 within 30 min.

5.2.5 Low temperature test

Put the device into the low temperature test box. After the temperature in the box reaches -20 °C, it lasts for 16 h. After taking it out, check whether the action error meets the requirements according to 5.2.1 within 30 min.

5.2.6 Voltage fluctuation test

When supplied by AC power, apply 0.9 times ~ 1.1 times the rated voltage for 10 min and 60 min. When supplied by DC power, apply 0.85 times ~ 1.35 times the rated voltage for 10 min and 60 min. In the process of step-down and step-up, respectively, check whether the action error meets the requirements according to 5.2.1.

5.2.7 Insulation resistance test

Between the power inlet end of the device and the metal part of the shell, it shall use an insulation measuring instrument of the corresponding insulation voltage level (at least 500 V) for insulation resistance measurement.

5.2.8 Power frequency withstanding voltage test

The power frequency withstanding voltage test shall be carried out according to the method specified in 8.3.3.4 of GB/T 14048.1-2012.

5.2.9 Cyclic damp heat test

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5.3.1.1 After the limiter that uses the force sensor as the load measuring element of the lifting appliance is tested in the laboratory, the limiter is installed on the lifting appliance according to the actual configuration for installation test.

5.3.1.2 When the limiter for measuring the load of the lifting appliances in other special ways cannot be tested in the laboratory, the limiter is installed on the lifting appliance according to the actual configuration for installation test.

5.3.2 Test conditions

The lifting appliance used for the test shall be adjusted, inspected and test-run according to requirements. The test site and environmental conditions shall comply with relevant requirements. The accuracy of the test weight shall not be less than 1% and shall meet the requirements of the test range. The device shall be calibrated in advance.

5.3.3 Rated lifting capacity test

According to the rated load test methods and procedures in the relevant standards of equipped lifting appliances, lift the corresponding rated load for the test; the lifting appliance shall be able to work normally. For the lifting mechanism with multi-speed transmission performance, each gear shall be tested separately.

5.3.4 Test of combined error and action function and indicator function

5.3.4.1 The test requirements are as follows:

a) For lifting appliances with constant rated lifting capacity: the lifting object shall be braked and stopped at 100 mm ~ 200 mm from the ground, then the device will be activated by gradual loading. The limiter's action function shall meet the requirements of 4.3.1.2; measure the actual lifting capacity. Lower the heavy object to the ground; the control system returns to normal. Use the lifting operation method (including inching) of the lifting appliances to slowly lift the heavy weight again. Check whether the limiter operates reliably.

b) For lifting appliances whose rated lifting capacity changes with the working range and the allowable load-changing amplitude: Prepare a test weight for each test point; lift it with a working range smaller than the test point; gradually increase the working range to make the device move; the limiter's action function meets the requirements of 4.3.1.2. After the actual working range is measured, the corresponding rated lifting weight can be found on the rated lifting capacity chart. If for the actual measured working range, it cannot directly find the corresponding rated lifting capacity from the rated lifting capacity chart, it shall use the calculation method as provided by the manufacturer of the lifting appliance or the other methods

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b) After formal production, if there are major changes in product structure, materials, processes, functions, etc., which may affect product performance;

c) There is a big difference between the exit-factory inspection results and the last type inspection;

d) When the product resumes production after stopping production for 1 year;

e) When the national quality supervision agency puts forward a requirement for type inspection.

6.3.2 Type inspection items are as shown in Table 7.

7 Marking, packaging, transportation and storage

7.1 Marking

Signs shall be installed at the obvious positions of the products; their requirements shall meet the requirements of GB/T 13306. The signs shall at least indicate the following:

a) Name and model;

b) The name of the manufacturer;

c) Product number;

d) Date of exit-factory.

7.2 Packaging

The packaging of the product shall meet the requirements of GB/T 13384. At least the following accompanying documents shall be attached when the product is exit-factory:

a) Product qualification certificate;

b) Product instruction manual.

7.3 Transportation and storage

7.3.1 During transportation, it shall avoid direct rain and snow and strong vibration and shock.

7.3.2 The device shall be stored in a warehouse with ventilation, no strong electromagnetic field influence, no other corrosive gases.

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