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Replacing JB/T 1306-1994

Electric single girder crane

电动单梁起重机

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Foreword

This standard replaces JB/T 1306-1994 “Electric single girder crane”.

As compared with JB/T 1306-1994, the main changes of this standard are as follows:

- MODIFY the contents of the normative references;
- EXTEND the rated voltage and rated frequency of the main circuit of the crane from the original 380V and 50Hz to 220V ~ 660V, 50Hz or 60Hz;
- MAKE additions and adjustments for such basic parameters as the rated capacity, span, and working speed, etc;
- CANCEL the model representation and marking examples;
- CANCEL the Appendix A and Appendix B.

This standard was proposed by the China Machinery Industry Federation.

This standard shall be under the jurisdiction of the National Hoisting Machinery Standardization Technical Committee (SAC/TC 227).

The responsible drafting organizations of this standard: Tianjin Lifting Equipment Co., Ltd., Beijing Hoisting and Transportation Machinery Research Institute.

The participating drafting organizations of this standard: National Hoisting and Transportation Machinery Quality Supervision and Inspection Center, Guangzhou Hoisting Machinery Co., Ltd., Jiangxi Hoisting Machinery General Factory, Nanjing Switchgear Co., Ltd., Nanjing Hoisting Machinery General Factory Co., Ltd., Jiangyin Kaicheng Hoisting Machinery Co., Ltd., Jiangsu Sanma Crane Co., Ltd., Hubei Yinlun Listing Machinery Co., Ltd., Hangzhou Lifting Equipment Factory, Heilongjiang Fujin Fuhua Crane Co., Ltd., Changzhou Wujin Hoisting Appliance Limited, Wuxi Xinli New Gear Power Electromotor Co., Ltd.

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This Standard replaces the standard previously issued as follows:

- JB 1306-1973; JB 1306-1984; JB/T 1306-1994.

Electric single girder crane

1 Scope

This standard specifies the type and basic parameters, technical requirements, test methods, inspection rules, marking, packaging, transportation and storage of electric single girder cranes (hereinafter referred to as cranes).

This standard applies to the general purpose cranes using the electric hoist as the lifting mechanism; AND the cranes of other types or special purposes may also make reference to this standard.

This standard does not apply to cranes operating under the following environmental conditions:

- Explosive gas, inflammable dust and corrosive gas environment;

- Lifting of molten metal, inflammable and explosive materials.

2 Normative references

The provisions in following documents become the provisions of this Standard through reference in this Standard. For the dated references, the subsequent amendments (excluding corrections) or revisions do not apply to this Standard; however, parties who reach an agreement based on this Standard are encouraged to study if the latest versions of these documents are applicable. For undated references, the latest edition of the referenced document applies.

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

GB 755-2000 Rotating electric machines - Rating and performance (idt IEC 60034-1:1996)

GB/T 3323 Radiographic examination of fusion welded joints in metallic materials (GB/T 3323-2005, EN 1435:1997, MOD)

GB/T 3811 Design rules for cranes

GB/T 5905 Cranes - Test code and procedures (GB/T 5905 1986, idt ISO 4310:1981)

GB 6067 Safety rules for lifting appliances

GB/T 8923 Rust grades and preparation of steel surfaces before application of paints and related products (GB/T 8923-1988, eqv ISO 8501-1:1988)

GB/T 9286 Paint and varnishes - Cross cut test for films (GB/T 9286-1998, eqv ISO 2409:1992)

GB/T 10183 Cranes - Overhead travelling cranes and portal bridge cranes - Tolerances for cranes manufacture and tracks laying (GB/T 1013-2005, ISO 8306:1985, MOD)

GB/T 13306 Plate

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

GB 14048.1-2006 Low-voltage switchgear and controlgear - Part 1: General rules (IEC 60947-1:2001, MOD)

JB/T 4315 Crane electric control equipment

JB/T 5317 Electric chain hoist

JB/T 6391.1 Conductor systems - Part 1: Insulated conductor systems

JB/T 8110.2 Rubber buffer for crane

JB/T 8437 Wireless remote control unit for hoisting machinery

JB/T 9008.1 Electric wire rope hoists - Part 1: Type and basic parameters, specification

JB/T 10559 Non-destructive testing of lifting appliances - Ultrasonic testing of steel welds

JB/T 10833 The polyurethane buffer for cranes

3 Types and basic parameters

3.1 Type

3.1.1 Based on the position and running mode of the hoisting mechanism, it is divided into:

4.2 Basic requirements

4.2.1 Cranes shall be designed and manufactured in accordance with the relevant provisions of GB/T 3811 and this standard.

4.2.2 The electric hoist and the hoist running trolley as equipped for the crane shall comply with the requirements of JB/T 9008.1 and JB/T 5317.

4.3 Use performance

4.3.1 It shall, based on the use level and load status level of the crane, reasonably select the cranes of corresponding working levels (SEE Table 1).

4.3.2 When the crane is subjected to static load test, it shall be able to bear the test load of 1.25 times rated capacity. It shall conduct visual inspection after the test, AND each stress bearing steel structural members shall be free from cracks or permanent deformation or paint peeling; AND all connections shall be free from loose phenomenon. The actual girder camber shall not be less than 0.8S/1000.

4.3.3 The static rigidity of the crane is defined as below: when the electric hoist is located at the mid span of the main girder, the relationship between the vertical net deflection f as generated by the rated capacity and the self-weight of the electric hoist AND the crane span S is recommended as follows:

- As for the cranes with low positioning accuracy OR the cranes with stepless speed control system OR the cranes with low lifting speeds and low accelerations to achieve acceptable positioning accuracy: $f \leqslant \frac{1}{500} S$;
- As for the cranes with a simple control system to achieve medium positioning accuracy: $f \leqslant \frac{1}{750} S$;
- As for the cranes having high positioning accuracy requirements: required for high positioning accuracy: $f \leqslant \frac{1}{1000} S$;
- When the user doses not put forward to the speed regulating and positioning accuracy requirements, the manufacturer may supply products or provide inspection and acceptance based on the vertical net deflection of $f \leqslant \frac{1}{750} S$.

4.4.1.5 After the power is turned on, it shall ensure that the action direction of crane and electric hoist matches with the indications on the button.

4.4.1.6 The crane insulation resistance at room temperature shall not be less than 1MΩ.

4.4.1.7 The crane grounding resistance shall not exceed 4Ω.

4.4.1.8 Cranes shall be provided with normally closed brakes.

4.4.1.9 The crane cab shall comply with the following requirements:

a) The clearance height of the driver cab shall not be less than 1.8m; AND the driver cab fence height shall be not less than 1000mm;

b) The driver cab shall be provided with fire extinguisher and bell or siren;

c) The doors leading into the crane AND the doors from the driver cab to the bridge shall be equipped with electrical interlock protection device, in order to ensure that when any door is open, all the mechanisms of the crane shall not work.

4.4.2 Hygiene

The sound pressure level noise of the overall crane shall not exceed 85dB (A).

4.5 Welding

4.5.1 Weld appearance quality requirements: during weld appearance inspection, it shall not have visually visible cracks, cavities, solid inclusions, infusion, lack of penetration, and other defects.

4.5.2 Nondestructive testing requirements for butt welds: the butt welds at the main girder tensioning zone shall be subjected to nondestructive testing, with the radiographic testing not lower than the level II as specified in GB/T 3323 AND the ultrasonic testing not less than the level I as specified in JB/T 10559.

4.6 Bridge (After crane operation mechanism assembled)

4.6.1 Local deflection of the main girder web: when the web height is less than 700mm, USE the 500mm levelling ruler to conduct inspection, AND the compression area (within H/3) of the web shall not exceed 3.5mm AND the tensioning area (beyond H/3) of the web shall not exceed 5mm; when the web height is more than 700mm, USE the 1000mm levelling ruler to conduct

inspection, AND the compression area (within H/3) of the web shall not exceed 5.5mm AND the tensioning area (beyond H/3) of the web shall not exceed 8mm.

4.6.2 The maximum camber of the main girder shall be located within the S/10 range of the middle span (SEE Figure 4). Before doing the static load test, it is recommended for the main girder camber value F to be (1/1000 ~ 1.4/1000) S.

4.6.3 The horizontal bending value f of the main girder shall not be greater than S/2000 AND such value shall be measured on the web at a distance of 100mm from the top of the girder. As for the cranes equipped with angular trolley, it is only allowed to concave towards the main track side (SEE Figure 4).

4.6.4 After assembling the running mechanism of the crane, it shall measure the crane span limit deviation ΔS: when S is not greater than 10m, it is ±2mm; when S is greater than 10m, ΔS = ± [2 +0.1 (S-10)] mm.

4.6.5 The diagonal difference $|E_1-E_2|$ as measured at the reference point of the wheel loading is not more than 5mm (SEE Figure 4). This value is allowed to be controlled prior to assembly of the operating mechanism.

4.6.6 The base distance W is (1/8 ~ 1/5) S, BUT generally it not less than S/6.

4.6.7 As for the deviation from the base distance ΔW, when W is not greater than 3m, ΔW is ±3mm; when W is greater than 3m, ΔW is ±W/1000.

4.7 Assembly

4.7.1 After assembly of the crane, the vertical deflection of the wheel shall be controlled within the following range: $0.0005 \leq \tan\alpha \leq 0.0030$ (SEE Figure 5).

4.8.3 Crane power supply can use trolley conductor or cable; when using the trolley conductor, it shall provide protective devices. When there is driver cab, the trolley conductor and the driver cab are generally distributed at different ends of the main girder of the crane. It is recommended for the trolley conductor to use the sliding contact line as recommended in JB/T 6391.1.

4.8.4 The electric hoist operation use cable or sliding transmission device for power supply; the wire rope used for mobile cable installation shall be subjected to galvanized treatment, AND the pulley and pulley track shall be coated with antirust paint or galvanized.

4.8.5 The bushing shall be firmly fixed on the bridge, the mouth shall be equipped with a mouth protection, AND the conductors in the bushing shall not have joints.

4.8.6 The conductors laid in the bushing, the control box, AND the conductors laid in the driver cab shall adopt multi-strand copper conductor. The main circuit conductor cross-section is to be selected in accordance with the controlled power, which shall not be less than 1.5mm^2.

4.8.7 Metal enclosures of all electrical equipment on cranes shall be earthed effectively.

4.8.8 The ground insulation resistance of each circuit in the electrical control equipment of the cranes shall comply with the provisions of 4.4.1.6.

4.8.9 When the crane is operated by remote control, it shall comply with the provisions of JB/T 8437.

4.9 Steel pretreatment and painting

4.9.1 The steels used for crane metal structure shall be subjected to surface rust treatment, the rust removal quality of important members shall reach to level Sa2-1/2 or St3 as specified in GB/T 8923, AND that of the other members shall reach to level Sa2 or St2.

4.9.2 Cranes shall be surface-treated and painted before exit-factory. As for the mechanism part, the dried coating thickness shall be not less than 50μm; as for the metal structure part, the coating thickness of each layer is 25μm ~ 35μm AND the total thickness is 75μm ~ 105μm. The uncoated exposed surfaces shall adopt antirust measures. The paint film adhesion shall comply with the level I quality requirements as specified in GB/T 9286.

5.4 Rated load test

After 2 ~ 3 times of gradual load increase until reaching to the rated lifting capacity, CONDUCT action test along each direction, in order to check whether the following items comply with the requirements of the design drawing and this standard.

5.4.1 Lifting height

MEASURE the lifting height, that is, the distance from the upper limit position to the lower limit position of the hook; if it is limited by the height of the test bench, it may also count the wire rope lap n on the drum outside the rope guide when the hook is at the upper limit position, AND use the following equation to calculate the lifting height:

$$H=\frac{\pi(D_0+d)\times n}{1000\times a}$$

Where:

H - Lifting height, in m

D_0 - Drum groove bottom diameter, in mm;

d - Diameter of wire rope, in mm:

n - Wire rope lap on the drum outside the rope guide;

a - Pulley magnification.

5.4.2 Hook limit position

5.4.2.1 CHECK the upper and lower limit position of the hook: MAKE the stopper action in order to check whether the hook stops the action in the corresponding direction, AND at this time the action in the opposite direction shall be possible.

5.4.2.2 CHECK the left and right limit position of hook: respectively START the electric hoist to move to both ends of the main girder, CHECK whether the block can effectively block the electric hoist.

5.4.3 Lifting speed

When the lifting distance exceeds 0.5m, USE a stopwatch to measure the lifting distance within 10s, or otherwise TAKE a fixed distance and MEASURE the

5.6 Static rigidity test

After the static load test, MOVE the electric hoist to the span end; USE the theodolite to measure the data at vertical direction of the reference point at the main girder mid span; then MOVE the electric hoist to the mid span; after lifting the rated load to a position 100mm ~ 200mm above ground, MEASURE the vertical direction data of the reference point; AND the relative difference between the two data is the static rigidity of the crane.

5.7 Dynamic load test

During the test, the crane shall be controlled in accordance with the operating regulations AND the acceleration, deceleration and speed shall be limited to the normal operating range of the crane.

LIFT the load 1.1 times of the rated load to the mid span; meanwhile START the electric hoist lifting mechanism and the crane operating mechanism; REPEAT the start, forward, stop and reversal actions; and based on the working level, MAKE the test last at least for 1h. The test shall also include the aerial startup of the suspended test load, during which the test load shall not be reversed. OBSERVE each mechanism to see whether it is flexible, stable and reliable, and meanwhile CHECK the reliability of the limit switch and the protective device.

5.8 Crane span deviation

The span deviation is obtained by comparing the actual span value with the theoretical span value. The method of measuring the crane span deviation by the steel tape AND the testing conditions are as follows:

a) At the time of testing, the supporting point of the crane (bridge) shall be below the end beam AND close to the position of the wheel;

b) The bridge is leveled by the four reference points of the top beam of the end beam (the peak of the wheel support center), with an error of no more than 3mm in the span direction AND no more than 2mm in the direction of the base distance;

c) The bridge shall be measured in the absence of sunshine;

d) Tension and correction values as used for span measurement are given in Table 10;

Figure 9

5.13 Crane wheel vertical deflection and horizontal deflection

ESTABLISH the measurement points: As shown in Figure 10, DISTRIBUTE uniformly four measurement points A, B, C and D along the circle outside the end beam which uses the wheel axle center O as the center AND ΦE (it is recommended for ΦE ≈ wheel tread diameter) as the diameter; as for the point A, B and C, DRILL Φ18 holes on the web to prepare for use, AND the point D is located on the wheel. As shown in Figure 10, point C and D are used to measure the vertical deflection AND point A and B are used to measure the horizontal deflection.

DETERMINE the baseline: SET O_1O_2 as the center of the both end beam wheelbase, LEAD the parallel line O_3O_4 as the benchmark ($O_1O_2 = O_3O_4$) as a baseline. Based on the locations as shown in the Figure, USE two steel tapes of the same specification and accuracy, with one end being able to fix onto the main girder AND the other end being supported onto a frame and fixed; or otherwise MAKE the both ends of the steel tape respectively fix onto the frame; it must adjust the steel tape A and B to make it as perpendicular to the baseline O_3O_4 as possible; KEEP parallel along the up and down AND left and right directions as far as possible, at this time the scales on the steel tape shall be in line with the intersection point C and D between the steel tape and O_3O_4. PLACE the theodolite on the outer side of the outer end beam on which the wheel measured is located. It shall ensure the horizontal distance from the theodolite to the nearest wheel is more than 2m, the distance to the nearest steel tape is more than 2m, AND the distance to the outside of the end beam must be within the micro-drum inside micrometer reading range. After leveling the theodolite, USE the telescope to observe the readings of the two steel tapes, and ADJUST the position of the theodolite until the readings of the two steel tapes are the same; then ROTATE the azimuth of the theodolite for 90°, then the direction as observed from the telescope (through the cross hairs in the mirror) may be used as a measurement datum plane N-N or M-M perpendicular to the transverse centerline O_1O_2 of the crane.

e) When the national quality supervision institute puts forward to type test requirements.

6.2.2 As for the type test items, SEE Table 12.

7 Marking, packaging, transportation and storage

7.1 Marking

7.1.1 In the crane main girder mid span, it shall provide the eye-catching weight tonnage plate, on which it shall mark the rated lifting capacity.

7.1.2 Each crane shall be provided with the plate at an eye-catching position, the requirements for which shall comply with the provisions of GB/T 13306. In the plate, it generally shall mark the following information:

a) Manufacturer name;

b) The name of the product;

c) Product type;

d) The date of exit-factory;

e) The exit-factory number;

f) Rated lifting capacity;

g) Span;

h) Lifting height;

i) Working speed;

j) Working level;

k) Trademarks and others.

7.2 Packaging, transportation and storage

7.2.1 Crane shall be packed in accordance with the relevant provisions of GB/T 13384.