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Vertical self-priming pumps

立式自吸泵

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Foreword

Please note that some of the contents of this standard may involve patents. The issuing authority of this standard shall not be held responsible for the identification of such patents.

Appendix A of this standard is a normative appendix.

This standard was proposed by the China Machinery Industry Federation.

This standard shall be under the jurisdiction of the National Agricultural Machinery Standardization Technical Committee (SAC/TC 201).

The responsible drafting organizations of this standard: Jiangsu University Fluid Machinery Engineering Technology Research Center, China Agricultural Mechanization Research Institute.

The main drafters of this standard: Wang Yang, Zhang Xiansheng, Cong Xiaoqing, Shi Weidong, Li Hong, Zhu Rongsheng.

This standard is the first release.

Vertical self-priming pumps

1 Scope

This standard specifies the type, model and basic parameters, technical requirements, test methods, inspection rules, marking, packaging, transportation and storage of vertical self-priming pumps.

This standard applies to the non-sealed vertical self-priming pump (hereinafter referred to as pump) which is used to deliver medium containing solid particles, corrosive liquid or other liquid in such fields as agriculture, electric power, chemical industry, metallurgy, medicine, electroplating, textile printing and dyeing, and sewage treatment.

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

GB/T 1032 Test procedures for three-phase induction motors

GB/T 1220 Stainless steel bars

GB 1971 Terminal markings and direction of rotation of rotating electrical machines

GB/T 2828.1 Sampling procedures for inspection by attributes - Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection (GB/T 2828.1-2003, ISO 2859-1:1999, IDT)

GB/T 3077 Alloy structural steels

GB/T 3216 Rotodynamic pumps - Hydraulic performance acceptance tests - Grades 1 and 2 (GB/T 3216-2005, ISO 9906:1999, MOD)

GB/T 4942. 1 Degrees of protection provided by the integral design of rotating electrical machined (IP code) - Classification (GB/T 4942.1-2006, IEC 60034-5:2000, IDT)

GB 10395.8 Tractors and machinery for agriculture and forestry - Technical means for ensuring safety - Part 8: Irrigation pumps and machines

GB 10396 Tractors, machinery for agriculture and forestry, powered lawn and garden equipment - Safety signs and hazard pictorials - General principles (GB 1039-1999, eqv ISO 11684:1995)

GB/T 12785 Test methods for submersible motor-pumps

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

JB/T 5673 Tractors and machinery for agriculture and forestry painting - General technical requirements

JB/T 6880.1 Gray iron castings for pumps

JB/T 8097 Methods of measuring and evaluating vibration of pumps

JB/T 8098 Methods of measuring and evaluating noise of pumps

JB/T 6664.3 Self-priming pump - Part 3: Test methods of self-priming characteristics

JB/T 50080 Submersible electric pump - Reliability check and evaluation method

3 Type, model and basic parameters

3.1 Type

3.1.1 The pump is self-priming without seal.

3.1.2 Based on the connection with the motor, pump is divided into:

a) Coaxial;

b) Non-coaxial.

4.2 The pump shall function properly under the following conditions of use:

a) The delivered medium and temperature shall comply with the provisions of Appendix A:

b) The volume of the solid phase of the delivered medium is less than 2%:

c) The kinematic viscosity of the delivered medium is (7 ~ 23) × 10^{-6} m^2/s;

d) The delivered medium density is not greater than 1.05 × 10^3 kg/m^3.

4.3 During the operation of the pump, the variation of the supply voltage and frequency and its influence on the motor performance and temperature rise limits shall comply with the provisions of GB 755.

4.4 Performance and its deviations:

4.4.1 Under the prescribed flow rate, the head deviation shall comply with the level 2 requirements in GB/T 12785.

4.4.2 Pump flow rate is within the range of 0.7 ~ 1.3 times of the specified flow rate, AND the shaft power shall not exceed the rated power of the pump.

4.4.3 As for the coaxial connection pump, the motor electrical performance guarantee value and tolerance deviation shall comply with the provisions of GB 755.

4.4.4 Under the specified flow rate and the allowable suction depth, the pump shall be capable of normal startup and operation.

4.5 The vibration of the pump shall comply with Class C requirements of JB/T 8097.

4.6 The pump noise shall comply with the level C requirements of JB/T 8098.

4.7 The working pressure bearing parts of the pump shall be subjected to water (or gas) pressure test without leakage, AND the test pressure is 1.5 times the working pressure which lasts for 5 min.

4.8 Pump suction and discharge flanges shall be capable of withstanding the maximum permissible working pressure. The flange pressure of the non-metal pump shall be not less than 0.6MPa, the flange pressure of the metal pump shall be not less than 1.0MPa, AND the sizes shall comply with the provisions of the relevant standards.

4.9 Assembly:

$$M_J \leqslant e \cdot G \times 10^{-6} \quad \cdots\cdots (1)$$

$$M_D \leqslant e \cdot (G/2) \times 10^{-6} \quad \cdots\cdots (2)$$

Where:

M_J - Unbalanced moment as allowed by static balance, in N•m;

M_D - Unbalanced moment as allowed by dynamic balance, in N•m;

e - Allowable eccentricity, in μm; when the synchronous rotation speed is 3000 r/min, e = 20 μm; when the synchronous rotation speed is 1500 r/min, e = 40 μm

G - Gravity of a single impeller, in N.

When the calculated static unbalanced moment as allowed by the impeller is less than 0.03R (N•m), it is calculated as 0.03R (N•m). When the dynamic unbalanced moment is less than 0.015R (N•m), it is calculated as 0.015R (N•m). R is the radius of the impeller de-weight portion, in the unit of m.

When the impeller diameter is greater than 200 mm, it shall be subjected to dynamic balance test.

4.20 Main parts material requirements of pumps:

4.20.1 Cast iron parts shall comply with the provisions of JB/T 6880.1.

4.20.2 Stainless steel parts shall comply with the provisions of GB/T 1220.

4.20.3 Alloy steel parts shall comply with the provisions of GB/T 3077.

4.20.4 Others shall comply with the provisions of the corresponding standards.

5 Test methods

5.1 Performance tests of coaxial pumps shall follow the provisions of GB/T 12785.

5.2 Performance tests of non-coaxial pump shall follow the provisions of GB/T 3216; AND the performance tests of motor shall follow the provisions of GB/T 1032.

5.3 The diameters of the solid particles passing through the pump shall be determined in accordance with the provisions of GB/T 12785, AND the value shall comply with the provisions of 3.3.4.

6.1.2 Inspection items:

a) Appearance inspection;

b) Rotation inspection;

c) Suction inlet solenoid valve (or electric valve) and discharge outlet check valve test;

d) Self-priming test;

e) Allowable suction depth test;

f) Determination of head at specified flow rate;

g) Safety mark inspection;

h) Item a), b), c), d), g) is subjected to full inspection, AND item e), f) is subjected to spot inspection.

6.1.3 Sampling inspection and judgment disposal rules shall comply with the provisions of GB/T 2828.1. It may use normal inspection one time sampling plan, with the inspected batch in monthly (or daily) production or one time ordering number (set), the inspection level is ordinary inspection level II, AND the accepted quality level is 4.0; it may also be determined by the supplier and the buyer through negotiation.

6.2 Type inspection

6.2.1 Under any one of the following circumstances, it shall conduct type test:

a) The trial production type finalization for new product or old product trans-factory production;

b) After the official production, the structure, material or technology has greatly changed which may affect the product performance;

c) Production restoration after stop production for a long time;

d) When the products manufactured in batches are subjected to regular inspection (at least once every year);

e) There is major difference between the exit-factory test results and the last type test results;

7 Marking, packaging, transportation and storage

7.1 Marking

7.1.1 Product plates

7.1.1.1 The material of the plates and the data on the plates shall be stamped in such a way as to ensure that it is not easily erased throughout the life of the marking.

7.1.1.2 The plates shall be fixed to the obvious position of the pump. It shall indicate at least the following items:

a) The name of the manufacturer;

b) The pump model and name;

c) The specified flow rate, in m^3/h;

d) The specified head, in m;

e) The synchronous speed, in r/min;

f) Rated (or matched) power, in kW;

g) Suction inlet diameter, in mm;

h) Discharge diameter (as required), in mm;

i) Allowable suction depth, in m;

j) Rated voltage, in V; rated current, in A (only for coaxially connected pumps);

k) Insulation class or temperature rise (only for coaxially connected pumps);

l) Exit-factory number;

m) The date of manufacture;

n) Mass (net), in kg;

o) Implemented product standard number.

7.1.2 Package marking

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