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INDUSTRY STANDARD

OF THE PEOPLE'S REPUBLIC OF CHINA

JB/T 9101-1999

Replacing ZB J72 042-90

Fan Rotor Balance

通风机转子平衡

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Foreword

This standard references to and adopts ISO 1940-1:1986 "Mechanical Vibration - Balance Quality Requirements for Rigid Rotor - Part 1: Determination of the Allowable Residual Unbalance".

This standard is the revision of ZB J72 042-90 "Fan Rotor Balance". It only makes some editorial changes to the previous standard.

This standard replaces ZB J72 042-90 from the implementation date.

Appendix A is informative.

This standard was proposed by and shall be under the jurisdiction of National Fan Standardization Technical Committee.

Responsible drafting organization of this standard: Shenyang Fan Factory Co., Ltd.

Chief drafting staffs of this standard: Lin Xuemin, Chen Liangming, and Jiang Jilin.

Fan Rotor Balance

1 Scope

This standard specifies the balance method, grade of balance quality, precision requirements of the balancing equipment, calibration method, and verification of the fan rotor.

This standard is applicable to the balance of the rotor or impeller of the centrifugal fan and axial fan.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision. The parties who enter into agreement based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below.

GB/T 1184-1996 *"No Marking Tolerance Value of Shape and Position Tolerance"*
GB/T 4201-1984 *"Method of Verification for Universal Horizontal Balancing Machines"*
GB/T 6444-1995 *"Mechanical Vibration - Balancing Vocabulary"*

3 Terms and symbols

The relevant terms and symbols which are involved in this standard shall meet the requirements of GB/T 6444.

4 Rotor type

According to the structure, fan rotors are classified into 8 types, see Figure 1.

5 Rotor balancing method

Generally, fan rotor belongs to rigid rotor. Its balance methods are classified into single-plane (static) balancing and double-plane (dynamic) balancing.

5.1 Single-plane (Static) Balancing

5.1.1 Single-plane (static) balancing is a kind of balance method that based on the unbalanced force of the rotator which is approximately located in the plane where the mass center of the rotator is located at. It is the method to use a calibration plane to perform the balancing, through the swing in the gravitational field.

5.1.2 If the single-plane (static) balancing condition is adopted, the following requirements shall be met.

a) If the maximum working speed n is lower than 1500 r/min, and the RATIO of the width

[1)] This machine number does not belong to the R40 series. According the operating requirements, it shall be kept temporarily.

6 Precision of balance equipment and process equipment

6.1 Select corresponding balance equipment according to the mass of the balance work piece and its balance quality grade.

6.2 The balance equipment must be measured regularly according to the requirements of GB/T 4201. And its precision shall be equal to or higher than the requirement of the balance quality.

6.3 The balance shaft itself shall be equipped with adequate rigidity. Its mass shall be minimized. And it shall be double-plane (dynamic) balanced. Its balance quality grade is 2.5mm/s.

6.4 The coordination between the balance shaft and impeller must not have gaps. The coaxial tolerance BETWEEN the balance supporting surface or axial diameter on the driving end of the balance shaft AND the work piece coordination parts shall not be more than 0.02mm. The balance supporting surface shall be hardening. Its hardness is not less than 40 HRC. The roughness Ra of the supporting surface is not more than 1.60μm. The cylindrical tolerance shall not be less than the grade 6 tolerance specified in GB/T 1184.

6.5 If the rotor is single-bond structure, half-bond (half mass of the bond. That is, remain the bond's length and width unchanged, the height is halved) shall be equipped in the corresponding bond groove for the balance compensation.

7 Calibration method and requirement

7.1 The material quality of the welded-structure impeller calibration mass (counter weight) shall be identical to that of the welded parental material. Its thickness shall not be more than the thickness of the welded parental material. Use the same method of welding impeller to full-weld it on the lateral surface of the impeller disk (cover). The surrounding of the calibration mass (counter weight) shall be chamfering. The contour shall be clean and neat. The welding seams must not have crack. The quantity and position of the calibration mass (counter weight) are same as the requirements of 7.5.

7.2 The calibration mass (counter weight) of riveted structure impeller is typically fixed to the lateral surface of the impeller disc (cover) by adopting riveting method. The rivet's quality, diameter and quantity (quantity shall not be less than 2, and it shall have a certain interval distance) shall be determined by strength calculation. The quantity, shape and position of the calibration mass (counter weight) are same as the requirements of 7.1 and 7.5.

7.3 When the calibration mass (counter weight) of the cast structural impeller and band pulley id fixed onto the steel plate with screws, the screw's quality, diameter and quantity (quantity shall not be less than 2, and it shall have a certain interval distance) shall be determined by strength calculation. Anti-loosing measures must be taken after fastening the screws. The quantity, shape and position of the calibration mass (counter weight) are same as the requirements of 7.1 and 7.5.

shown in formula (7):

$$m_i r_i = U_i \quad (7)$$

Where:

U_i — Residual imbalance amount of a certain calibration plane as shown by the balancing machine, g·mm.

r_i — Calibration radius on the calibration plane, mm;

m_i — Calibration mass on the calibration plane, kg.

10 Inspection and verification of balance quality

10.1 The inspection of balance quality is consisted of inspection made in regular production of the manufacturer AND delivery acceptance of the user OR the verification of product sampling to the finished balancing rotors. For the balance made in the regular production of the manufacturer, the residual imbalance amount shall be less than the specified value of the allowable imbalance amount. During the delivery acceptance of the user and the verification or product sampling, the residual imbalance amount is allowed to be more than the specified value of the allowable imbalance amount. The limit value of the two inspections shall comply with those specified in Table 3.

Table 3

Balance quality grade *G* mm/s	Regular production inspection limit	Limit value of delivery acceptance or verification of product sampling
2.5	≤90% of the specified value	≤115% of the specified value
4.0		
5.6		
6.3		

10.2 The verification of double-plane (dynamic) balance components on the soft supporting dynamic balancer may adopt the following 2 methods.

10.2.1 Weighting method verification

Fix the calibration mass (counter weight) to the rotor. According to the test meter reading and phase of the residual imbalance amount on the 2 calibration planes displayed by the balancing machine meter, add a test mass (test weight) on the weight-bias phase of calibration planes respectively, so as to make it equal to the allowable imbalance amount on that calibration plane. Then, turn on the balancing machine to observe the instrument's reading. If the new reading is more than 1 time of the reading before adding the test mass (test weight), it is deemed that the balance is qualified under general precision requirements.

10.2.2 Curve chart method verification

When the calibration mass (counter weight) has been fixed to the rotor, and the test meter reading and phase of the residual imbalance amount on the 2 calibration planes displayed by the balancer meter are known, then add a test mass (it is about 2~5 times of the allowable imbalance amount of the calibration plane) on each calibration plane respectively (inspections

card of rotor or impeller.

11 Note of balance requirements in design diagram

11.1 The design diagram shall indicate the position of the calibration plane.

11.2 The design diagram shall indicate the maximum working speed, rotor mass and required balance quality grade of the rotor or impeller.

Appendix A

(Informative)
Balance inspection record card of fan Rotor (impeller)

Product models and specifications No.:

Item	Unit	Position	
		Wheel cap side (calibration plane I)	Disc side (calibration plane II)
Residual imbalance angle (see from the driving end, and the angle shall be recorded in the figure)			
Maximum working speed	r/min		
Balance quality grade *G*	mm/s		
Mass of the work piece	kg		
Mass of the balance shaft	kg		
Balance rotation rate	r/min		
Allowable imbalance amount	g·mm		
Residual imbalance amount	g·mm		
Maximum diameter of work piece	mm		
Calibration radius	mm		
Calibration mass (counter weight)	kg		
Specification and model of the dynamic balancer			

Operator: Inspector:

Date: YYYY MM DD Date: YYYY MM DD

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